



7750 SR OS Services Guide

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Preface

About This Guide

This guide describes subscriber services, and mirroring support provided by the 7750 SR OS and presents examples to configure and implement various protocols and services.

This document is organized into functional chapters and provides concepts and descriptions of the implementation flow, as well as Command Line Interface (CLI) syntax and command usage.

Audience

This manual is intended for network administrators who are responsible for configuring the 7750 SR routers. It is assumed that the network administrators have an understanding of networking principles and configurations. Protocols, standards, and services described in this manual include the following:

- CLI concepts
 - Subscriber services
 - Service mirroring
 - Operation, Administration and Maintenance (OAM) operations
-

List of Technical Publications

The 7750 SR documentation set is composed of the following books:

- 7750 SR OS Basic System Configuration Guide
This guide describes basic system configurations and operations.
- 7750 SR OS System Management Guide
This guide describes system security and access configurations as well as event logging and accounting logs.
- 7750 SR OS Interface Configuration Guide

This guide describes card, Media Dependent Adapter (MDA), and port provisioning.

- 7750 SR OS Router Configuration Guide

This guide describes logical IP routing interfaces and associated attributes such as an IP address, port, link aggregation group (LAG) as well as IP and MAC-based filtering, VRRP, and Cflowd.

- 7750 SR OS Routing Protocols Guide

This guide provides an overview of routing concepts and provides configuration examples for RIP, OSPF, IS-IS, Multicast, BGP, and route policies.

- 7750 SR OS MPLS Guide

This guide describes how to configure Multiprotocol Label Switching (MPLS) and Label Distribution Protocol (LDP).

- 7750 SR OS Services Guide

This guide describes how to configure service parameters such as service distribution points (SDPs), customer information, and user services.

- 7750 SR OS OAM and Diagnostic Guide

This guide describes how to configure features such as service mirroring and Operations, Administration and Management (OAM) tools.

- 7750 SR OS Triple Play Guide

This guide describes Triple Play services and support provided by the 7750 SR and presents examples to configure and implement various protocols and services.

- 7750 SR OS Quality of Service Guide

This guide describes how to configure Quality of Service (QoS) policy management.

- OS Multi-Service ISA Guide

This guide describes services provided by integrated service adapters such as Application Assurance, IPSec, ad insertion (ADI) and Network Address Translation (NAT).

Technical Support

If you purchased a service agreement for your 7750 SR-series router and related products from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance. If you purchased an Alcatel-Lucent service agreement, contact your welcome center:

Web: http://www1.alcatel-lucent.com/comps/pages/carrier_support.jhtml

Getting Started

In This Chapter

This book provides process flow information to configure provision services.

Alcatel-Lucent 7750 SR-Series Services Configuration Process

[Table 1](#) lists the tasks necessary to configure subscriber services and configure mirroring. This guide is presented in an overall logical configuration flow. Each section describes a software area and provides CLI syntax and command usage to configure parameters for a functional area.

Table 1: Configuration Process

Area	Task	Chapter
Subscribers	Subscriber services	
	Global entities	Configuring Global Service Entities with CLI on page 87
	VLL services	Ethernet Pipe (Epipe) Services on page 195
		ATM VLL (Apipe) Services on page 180
		Frame Relay VLL (Fpipe) Services on page 201
		Circuit Emulation Services (Cpipe) on page 185
		IP Interworking VLL (Ipipe) Services on page 205
	VPLS service	Virtual Private LAN Service on page 417
	IES service	Internet Enhanced Service on page 857
	VPRN service	Virtual Private Routed Network Service on page 1049

Table 1: Configuration Process

Area	Task	Chapter (Continued)
	Cross connect aggregation groups	Versatile Service Module on page 1429
Reference	List of IEEE, IETF, and other proprietary entities.	Standards and Protocol Support on page 1939

Services Command Reference

In This Chapter

This chapter provides the command reference trees for the 7750 SR services.

Topics include:

- Global Services Commands
 - [Customer Commands on page 123](#)
 - [Pseudowire Template Commands on page 125](#)
- Service Configuration Commands
 - [Apipe Service Configuration Commands on page 303](#)
 - [Epipe Service Configuration Commands on page 309](#)
 - [Fpipe Service Configuration Commands on page 314](#)
 - [Ipipe Service Configuration Commands on page 317](#)
 - [VPLS Service Configuration Commands on page 591](#)
 - [IES Service Configuration Commands on page 897](#)
 - [VPRN Service Configuration Commands on page 1124](#)
 - [Cpipe Service Configuration Commands on page 306](#)

Services Overview

In This Section

This section provides an overview of the 7750 SR-Series subscriber services, service model and service entities. Additional details on the individual subscriber services can be found in subsequent chapters.

Topics in this section include:

- [Introduction on page 30](#)
 - [Service Types on page 31](#)
 - [Service Policies on page 32](#)
- [Alcatel-Lucent Service Model on page 38](#)
- [Service Entities on page 39](#)
 - [Customers on page 40](#)
 - [Service Access Points \(SAPs\) on page 40](#)
 - [Service Distribution Points \(SDPs\) on page 46](#)
- [Multi-Service Sites on page 53](#)
- [G.8031 Protected Ethernet Tunnels on page 54](#)
- [Mobile Solutions on page 65](#)
- [Internal Objects Created for L2TP and NAT on page 61](#)
- [Service Creation Process Overview on page 62](#)
- [Deploying and Provisioning Services on page 63](#)
- [Configuration Notes on page 64](#)

Introduction

A service is a globally unique entity that refers to a type of connectivity service for either Internet or VPN connectivity. Each service is uniquely identified by a service ID and an optional service name within a service area. The SR-Series service model uses logical service entities to construct a service. In the service model, logical service entities provide a uniform, service-centric configuration, management, and billing model for service provisioning.

In the SR-Series services can provide Layer 2/bridged service or Layer3/IP routed connectivity between a service access point (SAP) on one router and another service access point (a SAP is where traffic enters and exits the service) on the same (local) router or another router (distributed). A distributed service spans more than one router.

Distributed services use service distribution points (SDPs) to direct traffic to another SR-Series through a service tunnel. SDPs are created on each participating router, specifying the origination address (the router participating in the service communication) and the destination address of another router. SDPs are then bound to a specific customer service. Without the binding process, far-end router is not able to participate in the service (there is no service without associating an SDP with a service).

Service Types

The SR-Series offers the following types of subscriber services which are described in more detail in the referenced chapters:

- Virtual Leased Line (VLL) services:
 - Ethernet pipe (Epipe) — A Layer 2 point-to-point VLL service for Ethernet frames. See [Ethernet Pipe \(Epipe\) Services on page 195](#).
 - ATM VLL (Apipe) — A point-to-point ATM service between users connected to 7750 nodes on an IP/MPLS network. See [ATM VLL \(Apipe\) Services on page 180](#).
 - Frame-Relay (Fpipe) — A point-to-point Frame Relay service between users connected to 7750 nodes on the IP/MPLS network. See [Frame Relay VLL \(Fpipe\) Services on page 201](#).
 - IP Pipe (Ipipe) — Provides IP connectivity between a host attached to a point-to-point access circuit (FR, ATM, PPP) with routed IPv4 encapsulation and a host attached to an Ethernet interface. See [IP Interworking VLL \(Ipipe\) Services on page 205](#).
- Virtual Private LAN Service (VPLS) — A Layer 2 multipoint-to-multipoint VPN. See [Virtual Private LAN Service on page 417](#). VPLS includes Hierarchical VPLS (H-VPLS) which is an enhancement of VPLS which extends Martini-style signaled or static virtual circuit labeling outside the fully meshed VPLS core.
- Internet Enhanced Service (IES) — A direct Internet access service where the customer is assigned an IP interface for Internet connectivity. See [Internet Enhanced Service on page 857](#).
- Virtual Private Routed Network (VPRN) — A Layer 3 IP multipoint-to-multipoint VPN service as defined in RFC 2547bis. See [Virtual Private Routed Network Service on page 1049](#).
- Circuit Emulation Service (Cpipe) — Circuits encapsulated in MPLS use circuit pipes (Cpipes) to connect to the far end circuit. Cpipes support either SAP-Spoke SDP or SAP-SAP connections.

Service Policies

Common to all SR-Series connectivity services are policies that are assigned to the service. Policies are defined at a global level and then applied to a service on the router. Policies are used to define SR-Series service enhancements. The types of policies that are common to all SR-Series connectivity services are:

- SAP Quality of Service (QoS) policies which allow for different classes of traffic within a service at SAP ingress and SAP egress.

QoS ingress and egress policies determine the QoS characteristics for a SAP. A QoS policy applied to a SAP specifies the number of queues, queue characteristics (such as forwarding class, committed, and peak information rates, etc.) and the mapping of traffic to a forwarding class. A QoS policy must be created before it can be applied to a SAP. A single ingress and a single egress QoS policy can be associated with a SAP.

- Filter policies allow selective blocking of traffic matching criteria from ingressing or egressing a SAP.

Filter policies, also referred to as access control lists (ACLs), control the traffic allowed in or out of a SAP based on MAC or IP match criteria. Associating a filter policy on a SAP is optional. Filter policies are identified by a unique filter policy ID. A filter policy must be created before it can be applied to a SAP. A single ingress and single egress filter policy can be associated with a SAP.

- Scheduler policies define the hierarchy and operating parameters for virtual schedulers. Schedulers are divided into groups based on the tier each scheduler is created under. A tier is used to give structure to the schedulers within a policy and define rules for parent scheduler associations.
- Accounting policies define how to count the traffic usage for a service for billing purposes.

The routers provide a comprehensive set of service-related counters. Accounting data can be collected on a per-service, per-forwarding class basis, which enables network operators to accurately measure network usage and bill each customer for each individual service using any of a number of different billing models.

Multipoint Shared Queuing

Multipoint shared queuing is supported to minimize the number of multipoint queues created for ingress VPLS, IES or VPRN SAPs or ingress subscriber SLA profiles. Normally, ingress multipoint packets are handled by multipoint queues created for each SAP or subscriber SLA profile instance. In some instances, the number of SAPs or SLA profile instances are sufficient for the in use multipoint queues to represent many thousands of queues on an ingress forwarding plane. If multipoint shared queuing is enabled for the SAPs or SLA profile instances on the forwarding plane, the multipoint queues are not created. Instead, the ingress multipoint packets are handled by the unicast queue mapped to the forwarding class of the multipoint packet.

Functionally, multipoint shared queuing is a superset of shared queuing. With shared queuing on a SAP or SLA profile instance, only unicast packets are processed twice, once for the initial service level queuing and a second time for switch fabric destination queuing. Shared queuing does not affect multipoint packet handling. Multipoint packet handling in normal (service queuing) is the same as shared queuing. When multipoint shared queuing is enabled, shared queuing for unicast packets is automatically enabled.

Ingress Queuing Modes of Operation

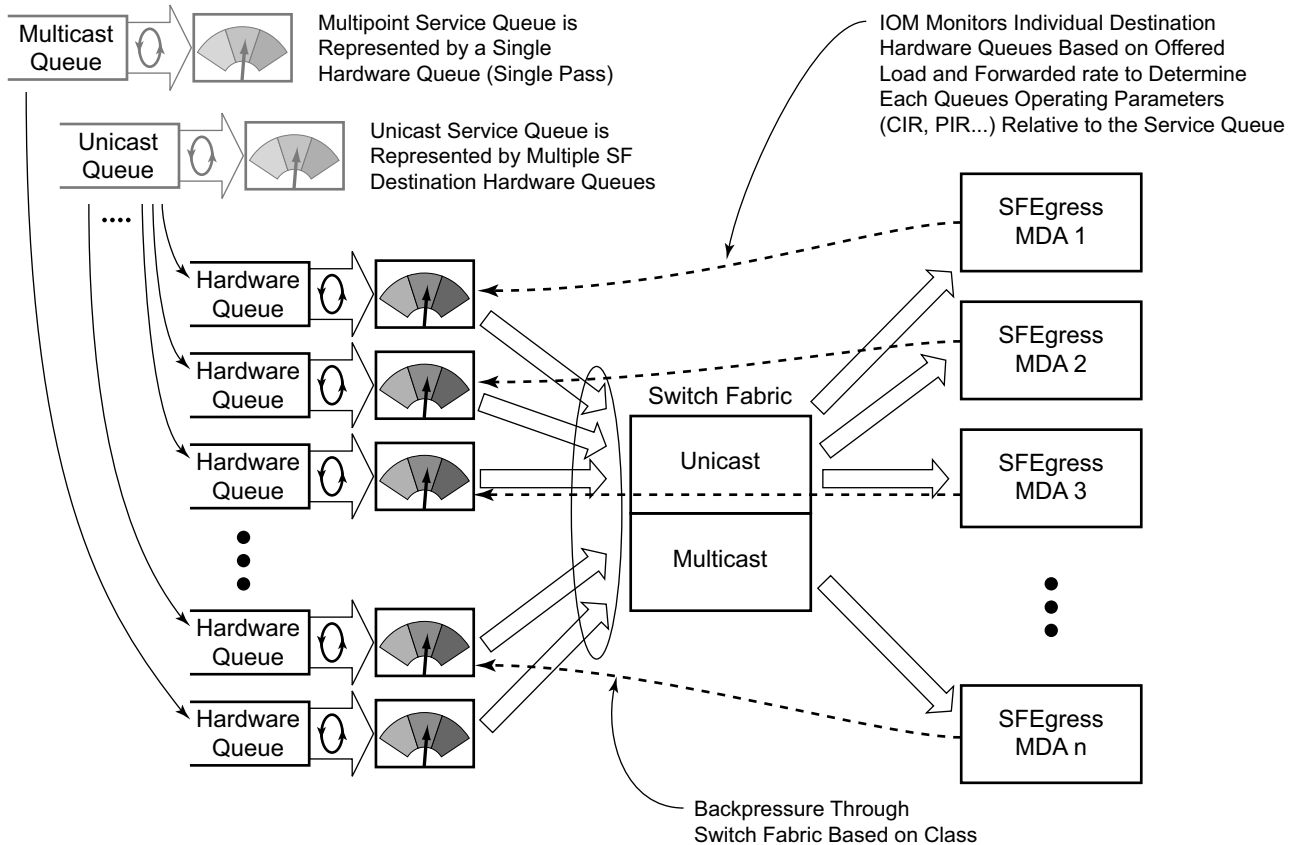
Three modes of ingress SAP queuing are supported for multipoint services (IES, VPLS and VPRN); service, shared, and multipoint shared. The same ingress queuing options are available for IES and VPLS subscriber SLA profile instance queuing.

Ingress Service Queuing

Normal or service queuing is the default mode of operation for SAP ingress queuing. Service queuing preserves ingress forwarding bandwidth by allowing a service queue defined in an ingress SAP QoS policy to be represented by a group of hardware queues. A hardware queue is created for each switch fabric destination to which the logical service queue must forward packets. For a VPLS SAP with two ingress unicast service queues, two hardware queues are used for each destination forwarding engine the VPLS SAP is forwarding to. If three switch fabric destinations are involved, six queues are allocated (2 unicast service queues multiplied by 3 destination forwarding complexes equals six hardware queues). [Figure 1](#) demonstrates unicast hardware queue expansion. Service multipoint queues in the ingress SAP QoS policy are not expanded to multiple hardware queues, each service multipoint queue defined on the SAP equates to a single hardware queue to the switch fabric.

When multiple hardware queues represent a single logical service queue, the system automatically monitors the offered load and forwarding rate of each hardware queue. Based on the monitored state of each hardware queue, the system imposes an individual CIR and PIR rate for each queue

that provides an overall aggregate CIR and PIR reflective of what is provisioned on the service queue.



OSSG225

Figure 1: Unicast Service Queue Mapping to Multiple Destination Based Hardware Queues

Ingress Shared Queuing

To avoid the hardware queue expansion issues associated with normal service based queuing, the system allows an ingress logical service queue to map to a single hardware queue when shared queuing is enabled. Shared queuing uses two passes through the ingress forwarding plane to separate ingress per service queuing from the destination switch fabric queuing. In the case of shared queuing, ingress unicast service queues are created one-for-one relative to hardware queues. Each hardware queue representing a service queue is mapped to a special destination in the traffic manager that 'forwards' the packet back to the ingress forwarding plane allowing a second pass through the traffic manager. In the second pass, the packet is placed into a 'shared'

queue for the destination forwarding plane. The shared queues are used by all services configured for shared queuing.

When the first SAP or SLA profile instance is configured for shared queuing on an ingress forwarding plane, the system allocates eight hardware queues per available destination forwarding plane, one queue per forwarding class. (Twenty four hardware queues are also allocated for multipoint shared traffic, but that is discussed in the following section.) The shared queue parameters that define the relative operation of the forwarding class queues are derived from the Shared Queue policy defined in the QoS CLI node. [Figure 2](#) demonstrates shared unicast queuing. SAP or SLA profile instance multipoint queuing is not affected by enabling shared queuing. Multipoint queues are still created as defined in the ingress SAP QoS policy and ingress multipoint packets only traverse the ingress forwarding plane a single time.

Enabling shared queuing may affect ingress performance due to double packet processing through the service and shared queues.

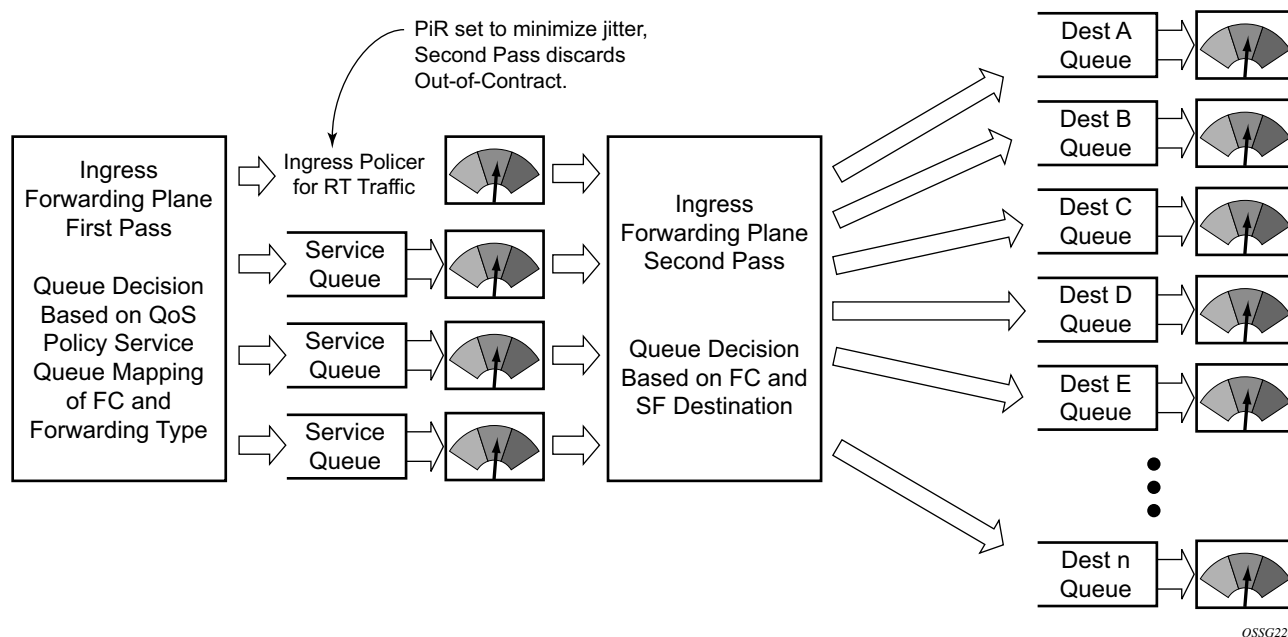


Figure 2: Unicast Service Queuing With Shared Queuing Enabled

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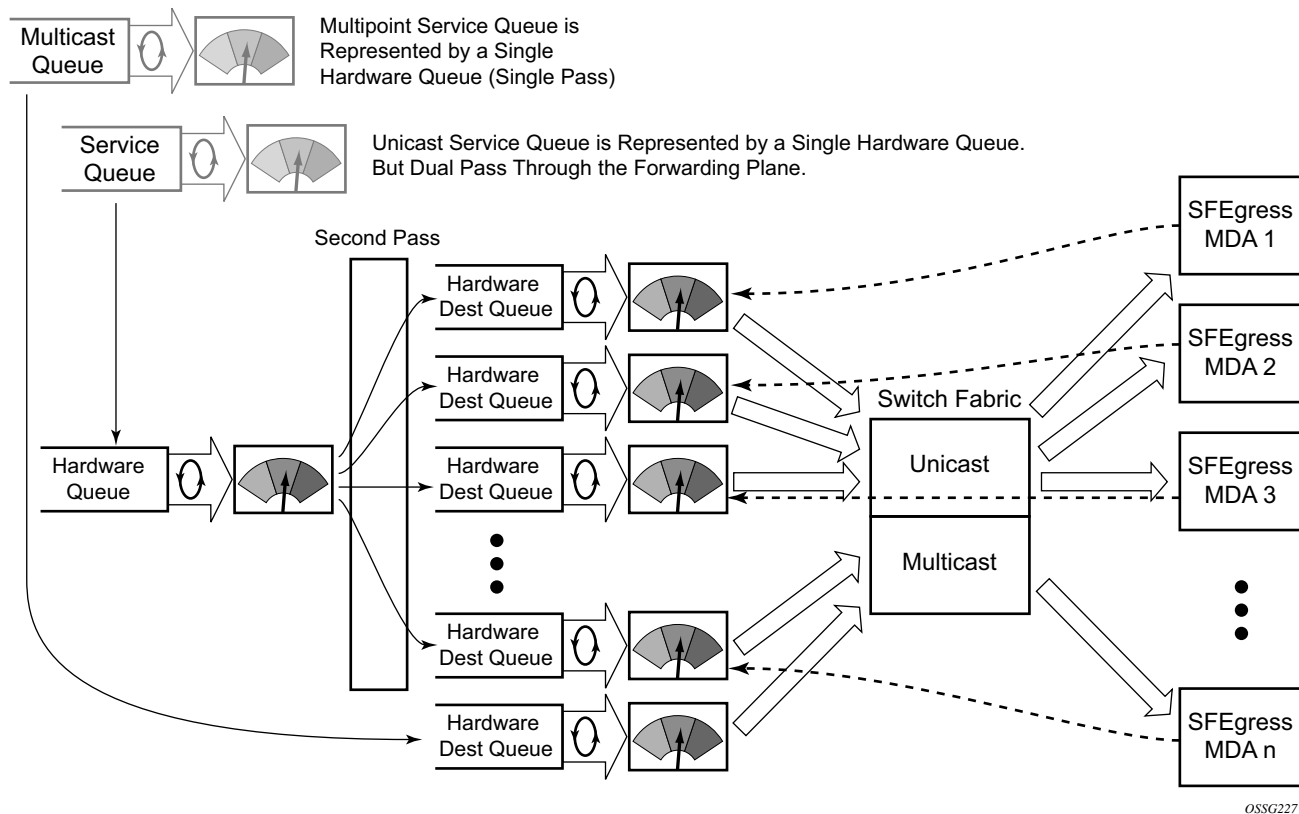


Figure 3: Multipoint Queue Behavior with Shared Queuing Enabled

Ingress Multipoint Shared Queuing

Ingress multipoint shared queuing is a variation to the unicast shared queuing defined in [Ingress Shared Queuing on page 34](#). Ingress unicast service queues are mapped one-for-one with hardware queues and unicast packets traverse the ingress forwarding plane twice. In addition to the above, the multipoint queues defined in the ingress SAP QoS policy are not created. Instead, multipoint packets (broadcast, multicast and unknown unicast destined) are treated to the same dual pass ingress forwarding plane processing as unicast packets. In the first pass, the forwarding plane uses the unicast queue mappings for each forwarding plane. The second pass uses the multipoint shared queues to forward the packet to the switch fabric for special replication to all egress forwarding planes that need to process the packet.

The benefit of defining multipoint shared queuing is the savings of the multipoint queues per service. By using the unicast queues in the first pass and then the aggregate shared queues in the second pass, per service multipoint queues are not required. The predominate scenario where multipoint shared queuing may be required is with subscriber managed QoS environments using a

subscriber per SAP model. Usually, ingress multipoint traffic is minimal per subscriber and the extra multipoint queues for each subscriber reduces the overall subscriber density on the ingress forwarding plane. Multipoint shared queuing eliminates the multipoint queues sparing hardware queues for better subscriber density. [Figure 4](#) demonstrates multipoint shared queuing.

One disadvantage of enabling multipoint shared queuing is that multipoint packets are no longer managed per service (although the unicast forwarding queues may provide limited benefit in this area). Multipoint packets in a multipoint service (VPLS, IES and VPRN) use significant resources in the system, consuming ingress forwarding plane multicast bandwidth and egress replication bandwidth. Usually, the per service unicast forwarding queues are not rate limited to a degree that allows adequate management of multipoint packets traversing them when multipoint shared queuing is enabled. It is possible to minimize the amount of aggregate multipoint bandwidth by setting restrictions on the multipoint queue parameters in the QoS node's shared queue policy. Aggregate multipoint traffic can be managed per forwarding class for each of the three forwarding types (broadcast, multicast or unknown unicast – broadcast and unknown unicast are only used by VPLS).

A second disadvantage to multipoint shared queuing is the fact that multipoint traffic now consumes double the ingress forwarding plane bandwidth due to dual pass ingress processing.

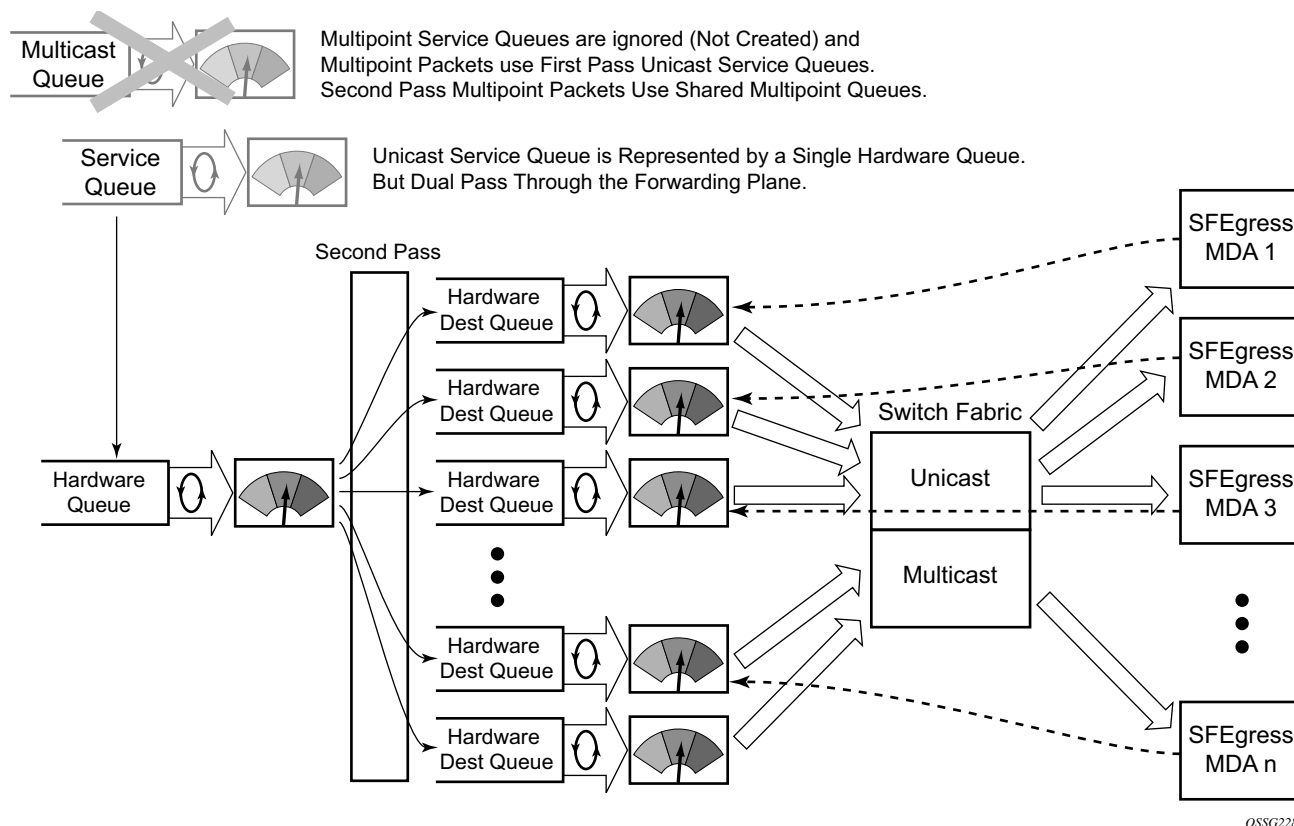


Figure 4: Multipoint Shared Queuing Using First Pass Unicast Queues

Alcatel-Lucent Service Model

In the Alcatel-Lucent service model, the service edge routers are deployed at the provider edge. Services are provisioned on the service routers and transported across an IP and/or IP/MPLS provider core network in encapsulation tunnels created using generic router encapsulation (GRE) or MPLS label switched paths (LSPs).

The service model uses logical service entities to construct a service. The logical service entities are designed to provide a uniform, service-centric configuration, management, and billing model for service provisioning. Some benefits of this service-centric design include:

- Many services can be bound to a single customer.
- Many services can be bound to a single tunnel.
- Tunnel configurations are independent of the services they carry.
- Changes are made to a single logical entity rather than multiple ports on multiple devices. It is easier to change one tunnel rather than several services.
- The operational integrity of a logical entity (such as a service tunnel and service end points) can be verified rather than dozens of individual services improving management scaling and performance.
- A failure in the network core can be correlated to specific subscribers and services.
- QoS policies, filter policies, and accounting policies are applied to each service instead of correlating parameters and statistics from ports to customers to services.

Service provisioning uses logical entities to provision a service where additional properties can be configured for bandwidth provisioning, QoS, security filtering, accounting/billing to the appropriate entity.

Service Entities

The basic logical entities in the service model used to construct a service are:

- [Customers](#) (see page 40)
- [Service Access Points \(SAPs\)](#) (see page 40)
- [Service Distribution Points \(SDPs\)](#) (see page 46) (for distributed services only)

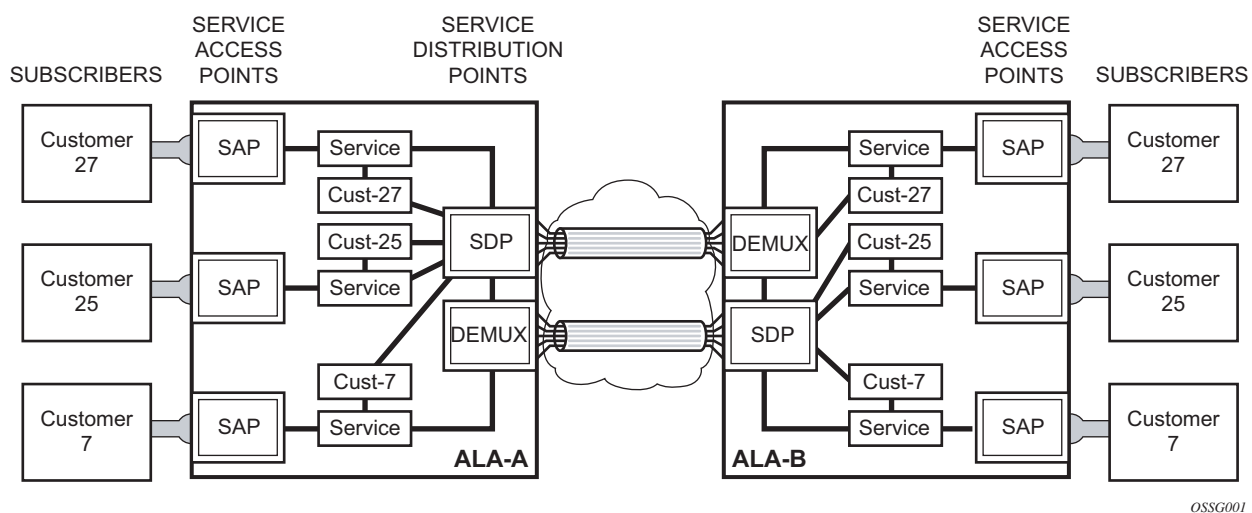


Figure 5: Service Entities

Customers

The terms customers and subscribers are used synonymously. The most basic required entity is the customer ID value which is assigned when the customer account is created. To provision a service, a customer ID must be associated with the service at the time of service creation.

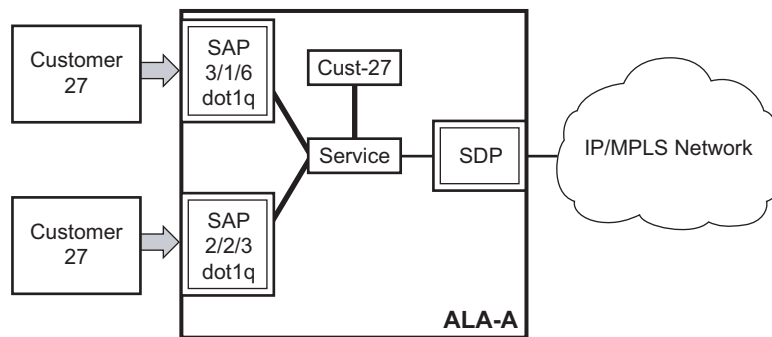
Service Access Points (SAPs)

Each subscriber service type is configured with at least one service access point (SAP). A SAP identifies the customer interface point for a service on an Alcatel-Lucent SR-Series router (Figure 6). The SAP configuration requires that slot, MDA, and port/channel information be specified. The slot, MDA, and port/channel parameters must be configured prior to provisioning a service (see the [Cards, MDAs, and Ports](#) sections of the 7750 SR OS Interface Configuration Guide).

A SAP is a local entity to the router and is uniquely identified by:

- The physical Ethernet port or SONET/SDH port or TDM channel
- The encapsulation type
- The encapsulation identifier (ID)

Depending on the encapsulation, a physical port or channel can have more than one SAP associated with it. SAPs can only be created on ports or channels designated as “access” in the physical port configuration. SAPs cannot be created on ports designated as core-facing “network” ports as these ports have a different set of features enabled in software.



OSSG002

Figure 6: Service Access Point (SAP)

SAP Encapsulation Types and Identifiers

The encapsulation type is an access property of a service Ethernet port or SONET/SDH or TDM channel. The appropriate encapsulation type for the port or channel depends on the requirements to support multiple services on a single port/channel on the associated SAP and the capabilities of the downstream equipment connected to the port/channel. For example, a port can be tagged with IEEE 802.1Q (referred to as dot1q) encapsulation in which each individual tag can be identified with a service. A SAP is created on a given port or channel by identifying the service with a specific encapsulation ID.

Ethernet Encapsulations

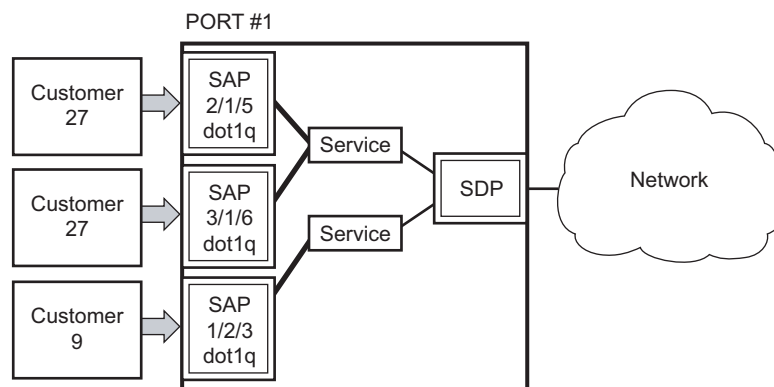
The following lists encapsulation service options on Ethernet ports:

- Null — Supports a single service on the port. For example, where a single customer with a single service customer edge (CE) device is attached to the port. The encapsulation ID is always 0 (zero).
- Dot1q — Supports multiple services for one customer or services for multiple customers ([Figure 7](#)). For example, the port is connected to a multi-tenant unit (MTU) device with multiple downstream customers. The encapsulation ID used to distinguish an individual service is the VLAN ID in the IEEE 802.1Q header.
- QinQ — The QinQ encapsulation type adds a IEEE 802.1Q tag to the 802.1Q tagged packets entering the network to expand the VLAN space by tagging tagged packets, producing a double tagged frame.

SONET/SDH Encapsulations

There are several encapsulation service options on SONET/SDH channels:

- Internet Protocol Control Protocol (IPCP) — Supports a single IP service on a SONET/SDH port or a single service per channel (if the interface is channelized). This is typically used for router interconnection using point-to-point protocol (PPP).
- Bridging Control Protocol (BCP-null) — Supports a single service on the SONET/SDH port or a single service per channel (if the interface is channelized). This is used for bridging a single service between two devices using PPP over SONET/SDH. The encapsulation ID is always 0 (zero).
- Bridging Control Protocol (BCP-dot1q) — Supports multiple services on the SONET/SDH port/channel. This encapsulation type is used for bridging multiple services between two devices using PPP over SONET/SDH. The encapsulation ID used to distinguish services is the VLAN ID in the IEEE 802.1Q header in the BCP-encapsulated frame.
- ATM — ATM, ATM-FR, ATM SAP-bridge encapsulation termination Epipe and VPLS.
- Frame Relay — Supports the switched data link layer protocol that handles multiple virtual circuits.



OSSG003

Figure 7: Multiple SAPs on a Single Port/Channel

Default SAP on a Dot1q Port

This feature introduces default SAP functionality on Dot1q-encapsulated ports. This is similar to the functionality provided by Q1* SAP on QinQ encapsulated ports, meaning that on On dot1q-encapsulated ports where a default SAP is configured, all packets with q-tags not matching any explicitly defined SAPs will be assigned to this SAP. SAPs with default QinQ encapsulation are supported in VPLS, Epipe, IES and VPRN services. Both DHCP snooping and IGMP snooping are supported for QinQ SAPs. In this context, the character “*” indicates default which means allow through. A 0 value means that it should not be there which allows the Qtag to be missing.

One of the applications where this feature can be applicable is an access connection of a customer who uses the whole port to access Layer 2 services. The internal VLAN tags are transparent to the service provider. This can be provided by a null encapsulated port. A dedicated VLAN (not used by the user) can be used to provide CPE management.

In this type of environment, logically two SAPs exist, a management SAP and a service SAP. The management SAP can be created by specifying a VLAN tag which is reserved to manage the CPE. The service SAP covers all other VLANs and behaves as a SAP on a null-encapsulated port.

There are a few constraints related for the use of default SAP on a Dot1q-encapsulated port:

- This type of SAP is supported only on VPLS and Epipe services and cannot be created in IES and VPRN services as it cannot preserve VLAN tag markings.
- For VPLS SAPs with STP enabled, STP listens to untagged and null-tagged BPDUs only. All other tagged BPDUs are forwarded like other customer packets. This is the same behavior as null-encapsulated ports.
- IGMP snooping is not supported on a default SAP. This would require remembering VLAN tags per hosts. By not allowing IGMP snooping of this SAP, all IGMP packets will be transparently forwarded.
- This type of SAP is mutually exclusive with a SAP defined by explicit null encapsulation (for example, 1/1/1:0). This avoids conflict as to which SAP untagged frames should be associated.

Services and SAP Encapsulations

Port Type	Encapsulation
Ethernet	Null
Ethernet	Dot1q
Ethernet	QinQ
SONET/SDH	IPCP
SONET/SDH	BCP-null
SONET/SDH	BCP-dot1q
SONET/SDH	ATM
SONET/SDH	Frame Relay
SONET/SDH	Cisco HDLC

SAP Configuration Considerations

When configuring a SAP, consider the following:

- A SAP is a local entity and only locally unique to a given device. The same SAP ID value can be used on another 7750 SR-Series.
- There are no default SAPs. All SAPs in subscriber services must be created.
- The default administrative state for a SAP at creation time is administratively enabled.
- When a SAP is deleted, all configuration parameters for the SAP will also be deleted. For Internet Enhanced Service (IES), the IP interface must be shutdown before the SAP on that interface may be removed.
- A SAP is owned by and associated with the service in which it is created in each router.
- A port/channel with a dot1q or BCP-dot1q encapsulation type means the traffic for the SAP is identified based on a specific IEEE 802.1Q VLAN ID value. The VLAN ID is stripped off at SAP ingress and the appropriate VLAN ID placed on at SAP egress. As a result, VLAN IDs only have local significance, so the VLAN IDs for the SAPs for a service need not be the same at each SAP.
- If a port/channel is administratively shutdown, all SAPs on that port/channel will be operationally out of service.
- A SAP cannot be deleted until it has been administratively disabled (shutdown).
- Each SAP can have one each of the following policies assigned:
 - Ingress filter policy
 - Egress filter policy
 - Ingress QoS policy
 - Egress QoS policy
 - Accounting policy
 - Ingress scheduler policy
 - Egress scheduler policy

Service Distribution Points (SDPs)

A service distribution point (SDP) acts as a logical way to direct traffic from one router to another through a uni-directional (one-way) service tunnel. The SDP terminates at the far-end device which directs packets to the correct service egress SAPs on that device. A distributed service consists of a configuration with at least one SAP on a local node, one SAP on a remote node, and an SDP binding the service to the service tunnel.

An SDP has the following characteristics:

- An SDP is locally unique to a participating routers. The same SDP ID can appear on other SR-Series routers.
- An SDP uses the system IP address to identify the far-end edge router.
- An SDP is not specific to any one service or any type of service. Once an SDP is created, services are bound to the SDP. An SDP can also have more than one service type associated with it.
- All services mapped to an SDP use the same transport encapsulation type defined for the SDP (either GRE or MPLS).
- An SDP is a management entity. Even though the SDP configuration and the services carried within are independent, they are related objects. Operations on the SDP affect all the services associated with the SDP. For example, the operational and administrative state of an SDP controls the state of services bound to the SDP.

An SDP from the local device to a far-end router requires a return path SDP from the far-end SR-Series back to the local router. Each device must have an SDP defined for every remote router to which it wants to provide service. SDPs must be created first, before a distributed service can be configured.

SDP Binding

To configure a distributed service from ALA-A to ALA-B, the SDP ID (1) ([Figure 8](#)) must be specified in the service creation process in order to “bind” the service to the tunnel (the SDP). Otherwise, service traffic is not directed to a far-end point and the far-end device(s) cannot participate in the service (there is no service). To configure a distributed service from ALA-B to ALA-A, the SDP ID (5) must be specified.

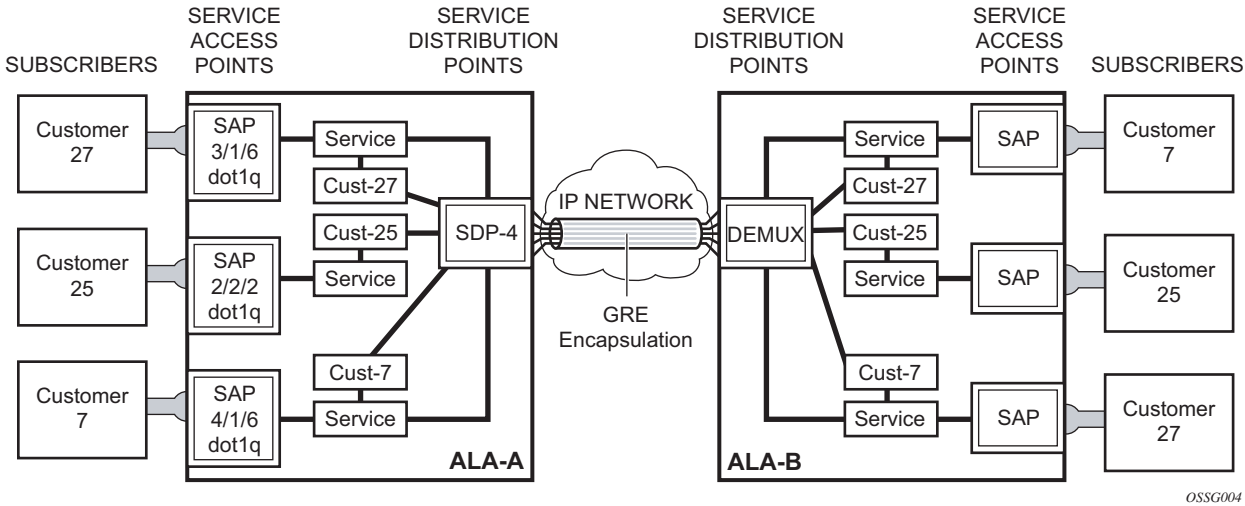


Figure 8: GRE Service Distribution Point (SDP) pointing from ALA-A to ALA-B

Spoke and Mesh SDPs

When an SDP is bound to a service, it is bound as either a spoke SDP or a mesh SDP. The type of SDP indicates how flooded traffic is transmitted.

A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received.

All mesh SDPs bound to a service are logically treated like a single bridge “port” for flooded traffic where flooded traffic received on any mesh SDP on the service is replicated to other “ports” (spoke SDPs and SAPs) and not transmitted on any mesh SDPs.

SDP Encapsulation Types

The Alcatel-Lucent service model uses encapsulation tunnels through the core to interconnect service edge routers. An SDP is a logical way of referencing the entrance to an encapsulation tunnel.

The following encapsulation types are supported:

- Layer 2 within generic routing encapsulation ([GRE](#))
 - Layer 2 within RSVP signaled, loose hop non-reserved MPLS LSP
 - Layer 2 within RSVP signaled, strict hop non-reserved MPLS LSP
 - Layer 2 within RSVP-TE signaled, bandwidth reserved MPLS LSP
 - Layer 2 with LDP signaled
-

GRE

GRE encapsulated tunnels have very low overhead and are best used for best-effort (be) class of service. Packets within the GRE tunnel follow the IGP (interior gateway protocol) shortest path from edge to edge. If a failure occurs within the service core network, the tunnel will only converge as fast as the IGP itself. If ECMP (equal cost multi-path) routing is used in the core, many loss-of-service failures can be minimized to sub-second timeframes.

MPLS

Multi-Protocol Label Switching (MPLS) encapsulation has the following characteristics:

- LSPs (label switched paths) are used through the network, for example, primary, secondary, loose hop, etc. These paths define how traffic traverses the network from point A to B. If a path is down, depending on the configuration parameters, another path is substituted.

Paths can be manually defined or a constraint-based routing protocol (e.g., OSPF-TE or CSPF) can be used to determine the best path with specific constraints.
- An MPLS 7750 SR router supports both signaled and non-signaled LSPs through the network.
- Non-signaled paths are defined at each hop through the network. This is also referred to as static LSPs.
- Signaled paths are communicated via protocol from end to end using resource reservation protocol (RSVP).

Because services are carried in encapsulation tunnels and an SDP is an entrance to the tunnel, an SDP has an implicit maximum transmission unit (MTU) value. The MTU for the service tunnel can affect and interact with the MTU supported on the physical port where the SAP is defined.

SDP Keepalives

SDP keepalives actively monitor the SDP operational state using periodic Alcatel-Lucent SDP ping echo request and echo reply messages. Alcatel-Lucent SDP ping is a part of Alcatel-Lucent's suite of service diagnostics built on an Alcatel-Lucent service-level OA&M protocol. When SDP ping is used in the SDP keepalive application, the SDP echo request and echo reply messages are a mechanism for exchanging far-end SDP status.

Configuring SDP keepalives on a given SDP is optional. SDP keepalives for a particular SDP have the following configurable parameters:

- Admin up/admin down state
- Hello time
- Message length
- Max drop count
- Hold down time

SDP keepalive echo request messages are only sent when the SDP is completely configured and administratively up and SDP keepalives is administratively up. If the SDP is administratively down, keepalives for the SDP are disabled.

SDP keepalive echo request messages are sent out periodically based on the configured Hello Time. An optional message length for the echo request can be configured. If max drop count echo request messages do not receive an echo reply, the SDP will immediately be brought operationally down.

If a keepalive response is received that indicates an error condition, the SDP will immediately be brought operationally down.

Once a response is received that indicates the error has cleared and the hold down time interval has expired, the SDP will be eligible to be put into the operationally up state. If no other condition prevents the operational change, the SDP will enter the operational state.

For information about configuring keepalive parameters, refer to [Configuring an SDP on page 94](#).

Class-Based Forwarding

- [Application of Class-Based Forwarding over RSVP LSPs on page 51](#)
- [Operation of Class-Based Forwarding over RSVP LSPs on page 52](#)

Application of Class-Based Forwarding over RSVP LSPs

Class based forwarding over RSVP LSPs allows a service packet to be forwarded over a specific RSVP LSP, part of an SDP, based on its ingress determined forwarding class. The LSP selected depends on the operational status and load-balancing algorithms used for ECMP and LAG spraying.

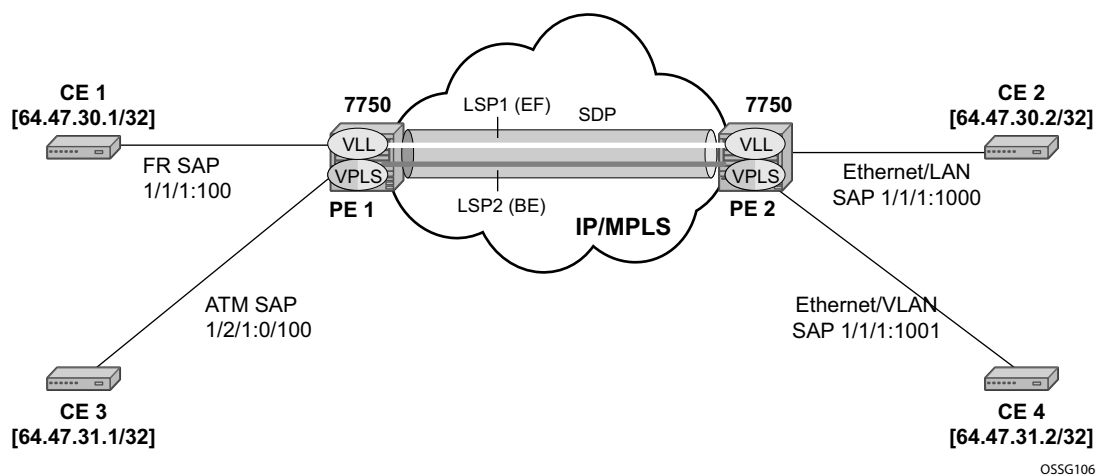


Figure 9: Class-Based Forwarding over SDP LSPs

Figure 9 illustrates the use of class-based forwarding to direct packets of a service to specific RSVP or static LSPs that are part of the same SDP based on the packets' forwarding class. The forwarding class of the packet is the one assigned to the packet as a result of applying the ingress QoS policy to the service SAP. The VLL service packets are all classified into the “**ef**” forwarding class and those that are destined to PE2 are forwarded over LSP1. Multicast and broadcast are classified into the “**be**” class and are forwarded over LSP2.

This feature allows service providers to dedicate specific LSPs with a determined level of traffic engineering and protection to select service packets. For example, packets of a VoIP service are assigned the “**ef**” class to expedite their forwarding but are also sent over carefully traffic-engineered and FRR-protected LSP paths across the service provider network.

Operation of Class-Based Forwarding over RSVP LSPs

The 7750 SR class-based forwarding feature applies to a set of LSPs that are part of the same SDP. Each LSP must be configured as part of an SDP specifying the forwarding classes it will support. A forwarding class can only be assigned to one LSP in a given SDP, meaning that only one LSP within an SDP will support a given class of service. However, multiple classes of services can be assigned to an LSP. Both RSVP and static LSPs are allowed. All subclasses will be assigned to the same LSP as the parent forwarding class.

When a service packet is received at an ingress SAP, it is classified into one of the eight 7750 SR forwarding classes. If the packet will leave the SR on an SDP that is configured for class-based forwarding, the outgoing LSP will be selected based on the packet's forwarding class. Each SDP has a default LSP. The default LSP is used to forward a received packet that was classified at the ingress SAP into a forwarding class for which the SDP does not have an explicitly-configured LSP association. It is also used to forward a received packet if the LSP supporting its forwarding class is down. Note that the SDP goes down if the default LSP is down.

Class-based forwarding can be applied to all services supported by the 7750 SR. For VPLS services, explicit FC-to-LSP mappings are used for known unicast packets. Multicast and broadcast packets use the default LSP. There is a per-SDP user configuration that optionally overrides this behavior to specify an LSP to be used for multicast/broadcast packets.

VLL service packets are forwarded based on their forwarding class only if shared queuing is enabled on the ingress SAP. Shared queuing must be enabled on the VLL ingress SAP if class-forwarding is enabled on the SDP the service is bound to. Otherwise, the VLL packets will be forwarded to the LSP which is the result of hashing the VLL service ID. Since there are eight entries in the ECMP table for an SDP, one LSP ID for each forwarding class, the resulting load balancing of VLL service ID is weighted by the number of times an LSP appears on that table. For instance, if there are eight LSPs, the result of the hashing will be similar to when class based forwarding is disabled on the SDP. If there are fewer LSPs, then the LSPs which were mapped to more than one forwarding class, including the default LSP, will have proportionally more VLL services forwarding to them.

Note that only user packets are forwarded based on their forwarding class. OAM packets are forwarded in the same way as an SDP with class-based forwarding disabled. In other words, LSP ping and LSP trace messages are queued in the queue corresponding to the forwarding class specified by the user and are forwarded over the LSP being tested. Service and SDP OAM packets, such as, service ping, VCCV ping, and SDP ping, are queued in the queue corresponding to the forwarding class specified by the user and forwarded over the first available LSP.

Class-based forwarding is not supported for protocol packets tunneled through a SDP. All packets are forwarded over the default LSP.

Class-based forwarding is not supported on a spoke SDP used for termination on an IES or VPRN service. All packets are forwarded over the default LSP.

Multi-Service Sites

A customer site can be designated a multi-service site where a single scheduler policy is applied to all SAPs associated with the site while retaining per-service and per-forwarding class shaping and policing. The SAPs associated with the multi-service site can be on a single port or on a single slot. The SAPs in a multi-service site cannot span slots.

Multi-service sites are anchor points to create an ingress and egress virtual scheduler hierarchy. When a site is created, it must be assigned to a chassis slot or port with the exception of the 7750 SR-1 in which the slot is set to 1. When scheduler policies are defined for ingress and egress, the scheduler names contained in each policy are created according to the parameters defined in the policy. Multi-service customer sites exist for the sole purpose of creating a virtual scheduler hierarchy and making it available to queues on multiple Service Access Points (SAPs).

The scheduler policy association with the customer site normally prevents the scheduler policy from being deleted until after the scheduler policy is removed from the customer site.

When the multi-service customer site is created, an ingress and egress scheduler policy association does not exist. This does not prevent the site from being assigned to a chassis slot or prevent service SAP assignment. After the site has been created, the ingress and egress scheduler policy associations can be assigned or removed at any time.

Each customer site must have a unique name within the context of the customer. Modifications made to an existing site immediately affect all SAPs associated with the site. Changing a scheduler policy association can cause new schedulers to be created and existing queues on the SAPs to no longer be orphaned. Existing schedulers on the site may cease to exist, causing queues relying on that scheduler to be orphaned.

G.8031 Protected Ethernet Tunnels

Alcatel-Lucent implementation of Ethernet Tunnels offers ITU-T G.8031 specification compliance to achieve 50 ms resiliency for failures in a native Ethernet backbone for native Layer 2 networks.

Ethernet Automatic Protection Switching (APS) as defined in ITU-T recommends G.8031 provides a linear 1:1 or 1+1 protection switching mechanism for VLAN-based Ethernet networks. The 7750 SR OS implementation of G.8031 supports 1:1 linear protection through implementation of point-to-point Ethernet Tunnels providing a working and protecting Ethernet circuit, where the path providing the protection is always available through health-monitoring. The 1:1 model is common practice for packet based services since it makes best use of available bandwidth.

Within each path, Y.1731 Maintenance Entity Group (MEG) Endpoints (MEPs) are used to exchange APS-specific information (specifically to co-ordinate switchovers) as well as optionally fast Continuity Check Messages (CCM) providing an inherent fault detection mechanism as part of the protocol. Failure detection of a working path by one of the mechanisms triggers to move from working to protecting circuits. Upon failure, re-convergence times are a dependent on the failure detection mechanisms. In the case of Y.1731, the CCM transmit interval determines the response time. The 7750 SR OS supports message timers as low as 10 milliseconds so the restoration times are comparable to SONET/SDH. Alternatively, 802.3ah (Ethernet in the First Mile) or simple Loss of Signal can act as a trigger for a protection switch where appropriate.

Revertive or nonrevertive behavior can be configured based on service provider environment. Revertive behavior is commonly deployed since it restores the traffic to a predictable state.

Ethernet APS can be configured on any port configured for access mode using dot1q or Q-in-Q encapsulation enabling support for Ethernet APS protected services on the service edge towards the customer site, or within the Ethernet backbone. ELINE, ELAN, and ETREE services can be afforded Ethernet APS protection and, although the Ethernet Tunnel providing the protection has a working/protecting path that is presented to the service as a single logical entity to the service layer. The intention of this is to cause minimum disruption to the service during Ethernet APS failure detection and recovery.

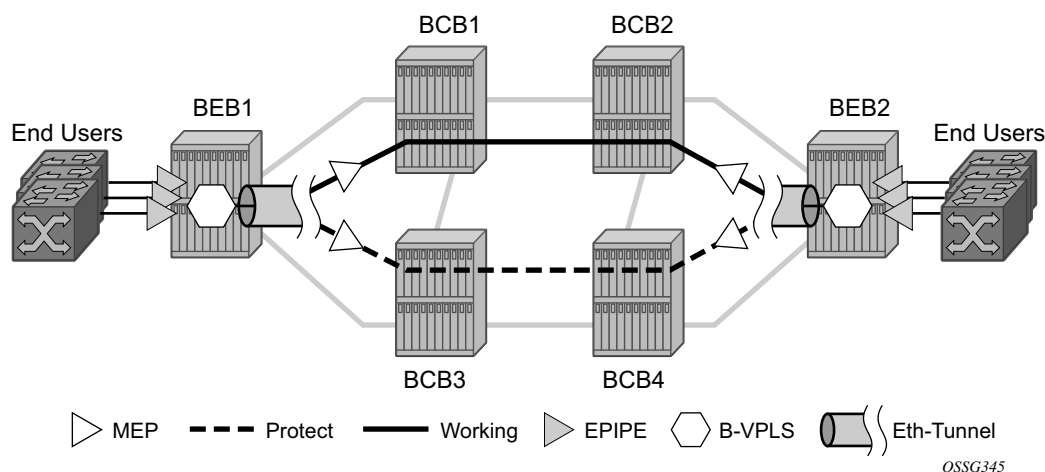


Figure 10: Ethernet Protected Ethernet Tunnel Example

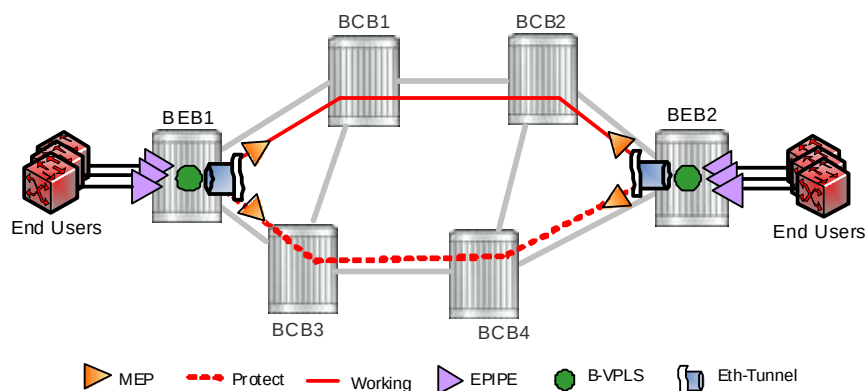


Figure 11: PBB G.8031 Protected Ethernet Tunnel Example

In the 7750 SR OS7450 ESS OS implementation, the Ethernet tunnel is a logical interface for a SAP defined L2 service similar to a LAG. The implementation offers ITU G.8031 1:1 compliance as well as some added capabilities such as fate sharing and emulated LAG support.

- Synchronization between services such that both send and receive on the same Ethernet path in stable state.
- Revertive/non-revertive choices.
- Emulated-LAG co-existence.

It is important that the configuration for the various services does not change when a new Ethernet tunneling type is introduced on the backbone side. This is achieved by using a SAP to map the eth-tunnel object into service instance.

The member port and control tag defined under each eth-tunnel path are then used for encapsulating and forwarding the CCMs and the G.8031 PDUs used for protection function, the latter frames being sent only on the secondary path. The configuration of the active path is also used to instantiate the SAP object in the forwarding plane.

If a failure of a link or node affects the primary eth-tunnel path, the services will fail to receive the CC messages exchanged on that path or will receive a fault indication from the link layer OAM module.

For fault detection using CCMs, a number of 3.5 CC intervals plus a configurable hold-off timer must be missed for a fault to be declared on the associated path. The latter mechanism is required to accommodate the existence of additional 50 ms resiliency mechanism in the optical layer. After it received the fault indication, the protection module will declare the associated path down, then sends an indication to the remote protection module to switch the transmit direction to the backup path.

In order to address unidirectional failures, the RDI bit will be set in CC messages transmitted in the reverse direction upon detection of failure at the receiving service. The same applies for link layer OAM. Until the protection switch indication arrives from the remote node, the local node will continue to receive frames from both primary and backup paths to avoid the loss of in-flight packets.

In case of direct connectivity between the nodes, there is no need to use Ethernet CCM messaging for liveliness detection. Link level detection mechanisms like LoS (Loss of Signal) or IEEE 802.3ah link layer OAM can be used to detect link or nodal failure. This can be achieved by not provisioning a MEP on the primary path.

Using the Ethernet Tunnel as a building block for Ethernet APS protection it is possible to provide different protection schemes with different fate-dependency; or indeed to mix protected and non-protected services on the same physical port.

The simplest model is the fate-independent model where each Ethernet Tunnel supports its own protection using Y.1731 CCMs for example. In this case a single VLAN Tag may be used for control and data traffic. In cases where Ethernet Tunnels can be guaranteed to share a common physical path, it is possible to implement a fate-sharing model. This approach provides the advantage of reducing the amount of Ethernet OAM signaling because only one control tag determines the fate of many user tags.

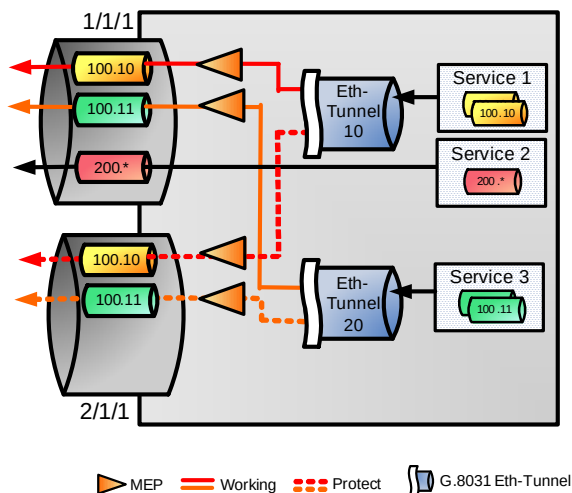


Figure 12: PBB Fate-Independent Ethernet Tunnels

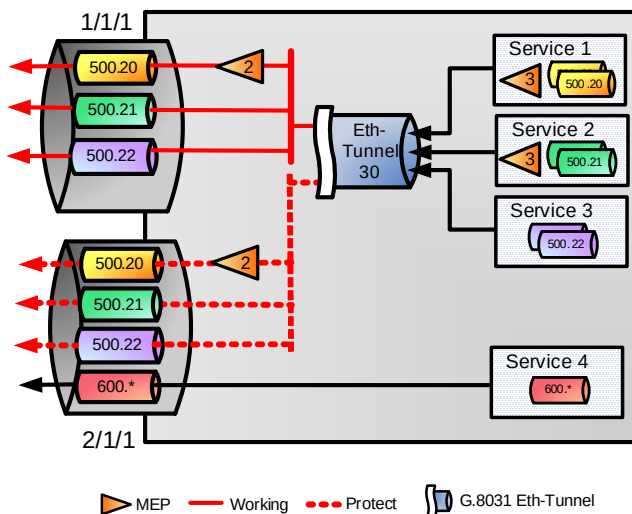


Figure 13: PBB Fate Sharing Ethernet Tunnels

One of the advantages of access redundancy using Ethernet APS is that because it operates at the VLAN level protection mechanisms can be varied between services supported on the physical port. For example, it is possible to provide a protected service for “Premium” customers and also provide non-protected services for “Standard” users on the same physical port.

OAM Considerations

Ethernet CFM can be enabled on each individual path under an Ethernet tunnel. Only down MEPs can be configured on each of them and CCM sessions can be enabled to monitor the liveliness of the path using interval as low as 10 msec. Different CCM intervals can be supported on the primary and secondary paths in an Ethernet tunnel.

MEPs can still be configured under the services independent of the Ethernet Tunnels.

The following rules control the interaction between the MEP defined under the eth-tunnel path and the MEP defined in the service:

- The down MEPs configured on the eth-tunnel paths MUST be lower level than any down.
- MEPs configured on the associated SAP. The same applies for Virtual MEPs associated with services such as BVPLS. Checks are provided to prevent the user from configuring anything that violates the above rule. An error message is generated to indicate the mismatch.
- Other service MEPs (up direction, down higher levels) are allowed with no restriction.
- Any down MEP on the associated SAP will transmit only over the active path entity.

QoS Considerations

When Ethernet tunnel is configured on two member ports located on different IOMs, the SAP queues and virtual schedulers will be created with the actual parameters on each IOM.

The protection mode '8031-1to1' (default) activates only the primary path at any point in time, guaranteeing the use of the desired QoS resources.

Ethernet tunnel CC messages transmitted over the SAP queues using the default egress QoS policy will use NC (network class) as a forwarding class. If user traffic is assigned to the NC forwarding class, it will compete for the same bandwidth resources with the Ethernet CCMs. As CCM loss could lead to unnecessary bouncing of the Ethernet tunnel, congestion of the queues associated with the NC traffic should be avoided. The operator must configure different QoS Policies to avoid congestion for the CCM forwarding class by controlling the amount of traffic assigned into the corresponding queue.

Mirroring and Lawful Intercept Considerations

Mirroring and Lawful Intercept (LI) cannot use the eth-tunnel as a source. Also, a SAP configured on an eth-tunnel cannot be used as mirror destination. The CLI blocks the above options. The SAP configured on the eth-tunnel, a filter associated with it and the member ports in the **eth-tunnel> path** context can be used as mirror and LI source.

Support Service and Solution Combinations

The Ethernet tunnels are supported Layer 2 service VLL, VPLS and B-VPLS instances. The following considerations apply:

- Only ports in access or hybrid mode can be configured as eth-tunnel path members. The member ports can be located on the same or different IOMs or MDAs.
 - Dot1q and QinQ ports are supported as eth-tunnel path members.
 - The same port cannot be used as member in both a LAG and an Ethernet Tunnel but LAG emulation is supported.
 - A mix of regular and multiple eth-tunnel SAPs and PWs can be configured in the same services.
 - Split horizon groups in VPLS and BVPLS are supported on eth-tunnel SAPs. The use of split horizon groups allows the emulation of a VPLS model over the native Ethernet core, eliminating the need for P-MSTP.
 - LAG Emulation offers another method offering MSTP or P-MSTP over Ethernet Tunnels.
 - MC-LAG access multi-homing into services is supported in combination with Ethernet tunnels.
-

LAG Emulation using Ethernet Tunnels

Ethernet Tunnels can provide G.8031 Ethernet APS protection as described in G.8031 Protected Ethernet Tunnels, or they can operate in a load-sharing manner providing an emulated LAG function. Moreover, as multiple Ethernet Tunnels can be provisioned on the same physical link(s), it is possible that two physical links could support one or more Ethernet Tunnels supporting APS protection for protected services whilst concurrently supporting one or more Ethernet Tunnels in load-sharing mode for non-protected services.

When Ethernet Tunnels have the protection type set to load-sharing, the precedence is configured to secondary, making the tunnels equal in order to implement load-sharing capability. A path

threshold parameter allows the loadsharing group to be declared down if the number of paths drops equal to or lower than the threshold value. The 'lag-emulation' context provides access to conventional LAG parameters such as the adapt-qos mode (link or distributed bandwidth distribution) and per-fp-ing-queuing to ensure that only one ingress queue is instantiated for every physical link supported on the same FP complex.

A typical use case for LAG emulation is to allow unprotected Ethernet services to capitalize on the LAG capability. RSTP and MSTP can also be used to network VPLS or B-VPLS over the Ethernet tunnels.

Internal Objects Created for L2TP and NAT

Some services such as L2TP LNS (L2TP Network Server) and NAT (Network Address Translation) automatically create service objects for internal use. In particular, an IES service with ID 2147483648 is created. In that service, or in configured VPRN services, service objects such as interfaces, SAPs and related objects can be automatically created for internal use.

Named objects reserved for internal use have a name that starts with "_tmnx_". Objects with a numeric identifier created for internal use have an identifier from a reserved range.

The general rules for objects reserved for internal use:

- They will show up in CLI show commands and MIB walks output;
- They will show up in the output of **info detail** commands but will never be in the output of **admin save [detail]**.

It may be possible to enter the CLI node of such an object, but it is not possible to change anything. It may also be possible to set the value of one of its objects to the current value with SNMP, but it will never be possible to change any value.

Service Creation Process Overview

Figure 14 displays the overall process to provision core and subscriber services.

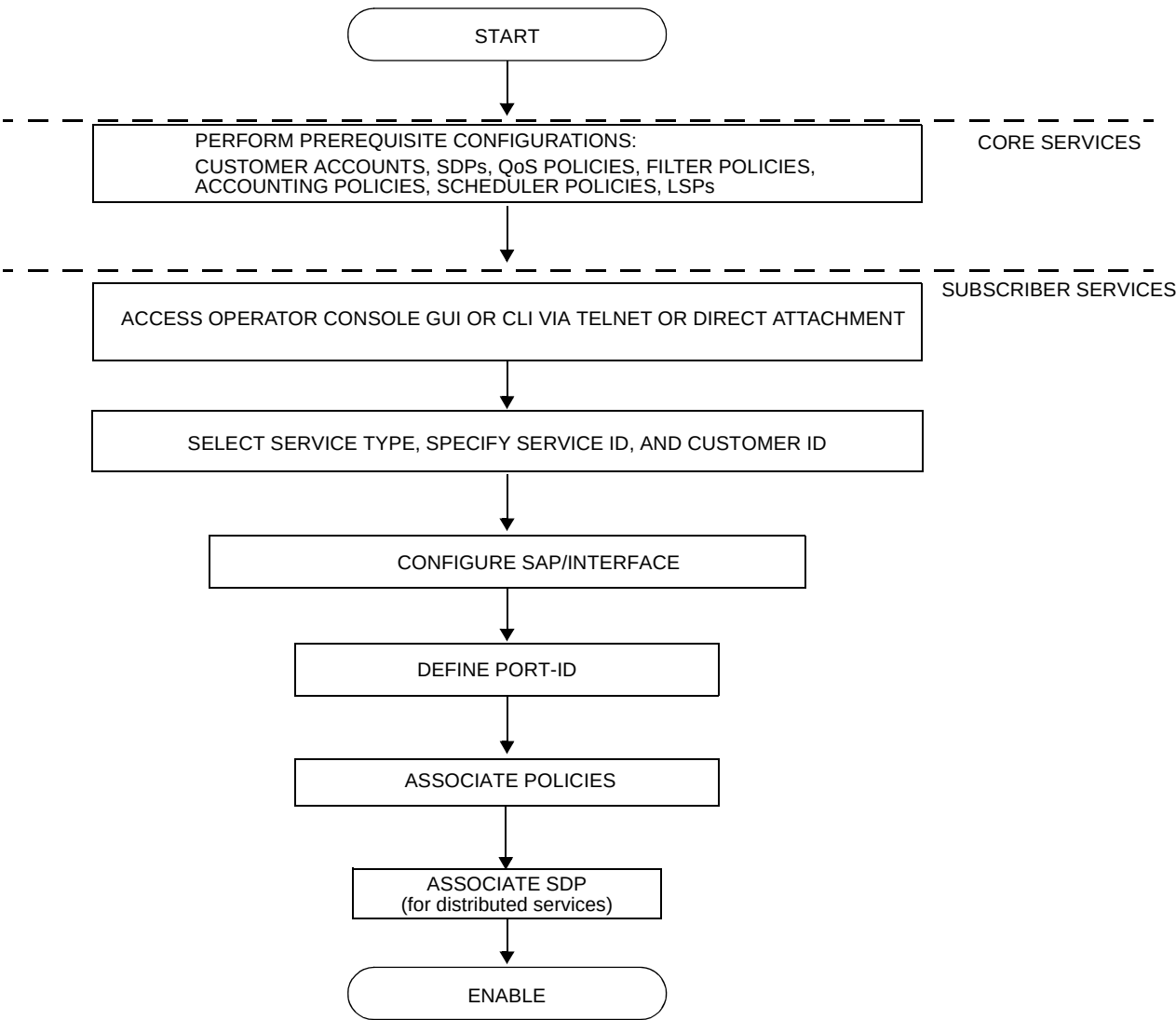


Figure 14: Service Creation and Implementation Flow

Deploying and Provisioning Services

The service model provides a logical and uniform way of constructing connectivity services. The basic steps for deploying and provisioning services can be broken down into three phases.

Phase 1: Core Network Construction

Before the services are provisioned, the following tasks should be completed:

- Build the IP or IP/MPLS core network.
 - Configure routing protocols.
 - Configure MPLS LSPs (if MPLS is used).
 - Construct the core SDP service tunnel mesh for the services.
-

Phase 2: Service Administration

Perform preliminary policy and SDP configurations to control traffic flow, operator access, and to manage fault conditions and alarm messages, the following tasks should be completed:

- Configure group and user access privileges.
 - Build templates for QoS, filter and/or accounting policies needed to support the core services.
-

Phase 3: Service Provisioning

- Provision customer account information.
- If necessary, build any customer-specific QoS, filter or accounting policies.
- Provision the customer services on the SR-Series service edge routers by defining SAPs, binding policies to the SAPs, and then binding the service to appropriate SDPs as necessary. Refer to [Configuring Customers on page 91](#) and [Configuring an SDP on page 94](#).

Configuration Notes

This section describes service configuration caveats.

General

Service provisioning tasks can be logically separated into two main functional areas, core tasks and subscriber tasks and are typically performed prior to provisioning a subscriber service.

Core tasks include the following:

- Create customer accounts
- Create template QoS, filter, scheduler, and accounting policies
- Create SDPs

Subscriber services tasks include the following:

- Create Apipe, Cpipe, Epipe, Fpipe, IES, Ipipe, VPLS or VPRN services.
- Bind SDPs
- Configure interfaces (where required) and SAPs
- Create exclusive QoS and filter policies

Mobile Solutions

In This Section

This section provides an overview of mobile scenarios and configurations.

- [Mobile Radio Access Network \(RAN\) on page 66](#)
- [RAN Aggregation with Microwave Radio Transport on page 74](#)
- [IP Backhaul for CDMA Network Infrastructure on page 76](#)
- [ATM Backhaul for GSM/UMTS Network Infrastructure on page 78](#)
- [Ethernet Backhaul for CDMA/GSM/UMTS Network Infrastructure on page 80](#)
- [Ethernet Evolution of CDMA Networks with IP Backhaul on page 82](#)
- [Ethernet Evolution of GSM/UMTS Networks with ATM/TDM Backhaul on page 83](#)
- [IP Backhaul Physical Interface Features on page 84](#)

Mobile Radio Access Network (RAN)

The RAN represents a limited portion of the carrier network. However, it is estimated that there are more than 2 million base stations deployed worldwide and it is anticipated that these numbers will grow to meet the imminent demand in mobile services. Carriers are experiencing rapid demand for use of high-bandwidth mobile broadband services. This demand is creating pressure on the utility of T1/E1 leased lines for backhauling voice and data traffic to switching centers. This infrastructure may quickly become unable to scale with the traffic growth. Consequently, any mobile network evolution has to consider ongoing support of existing RAN equipment as well as the next-generation, all IP solutions.

The challenge for carriers is to bridge the gap between current 2G, 2.5G and 3G networks and the promise of tomorrow's 4G/AIPN (all IP network) solutions.

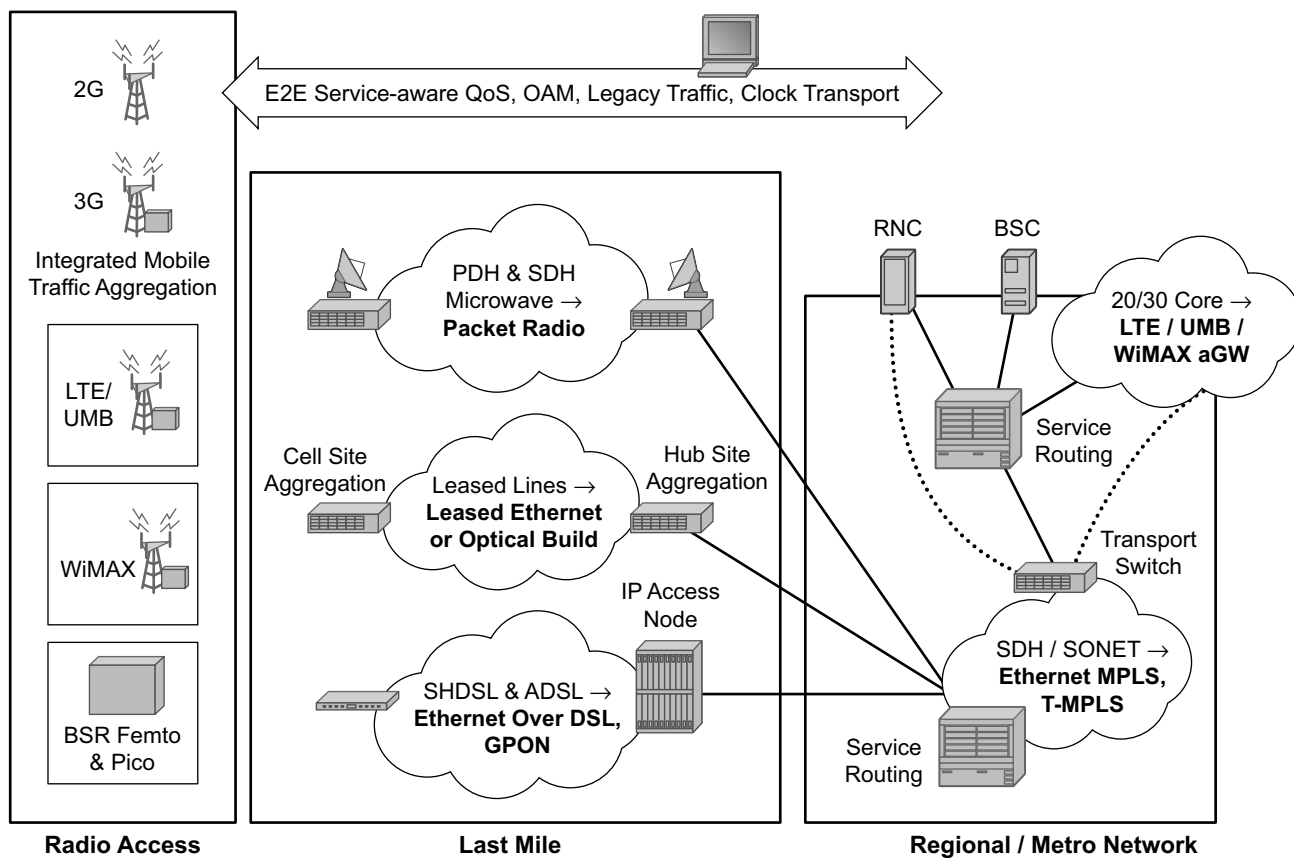
Business challenges include:

- Cost & revenue
- Define supported services
- Interworking multiple technologies
- CDMA2000
- GSM
- WCDMA
- WiMAX (802.16e)
- Leverage installed base

Deployment challenges include:

- Increase bandwidth, reliability & provide service assurance
- Accommodate various transport media & operation of co-located base-stations
- Adapt to variable migration requirements ñ technology roaming

Alcatel-Lucent mobile backhaul solutions address these fundamental requirements through a comprehensive IP transformation architecture, which provides mobile operators with an evolution path to all-IP, regardless of the type of network they deploy. As shown in [Figure 16](#), this solution is based on building blocks that can meet a variety of operator strategies.



OSSG171

Figure 15: Mobile Backhaul Evolution Vision

Mobile Backhaul Terminology

RAN CE — The generic term for mobile radio access network node or site, may include both RAN NC and RAN BS

RAN NC — A RAN network controller.

RAN BS — A RAN base station.

RAN I/F — A non-Ethernet based interface between a RAN CE and GIWF.

GIWF — Generic interworking Function enabling a RAB CE with a RAN I/F to connect to a UNI.

These terms are illustrated in the example configuration in [Figure 16](#):

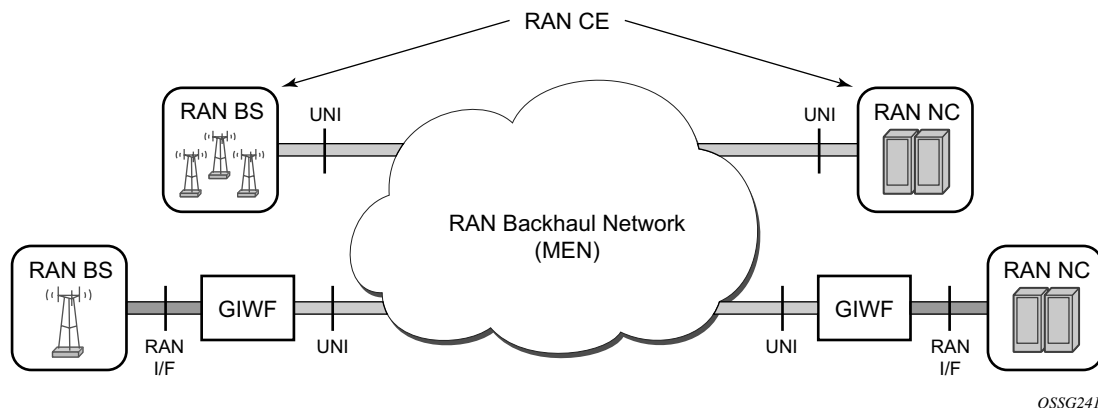


Figure 16: Mobile Backhaul Configuration Example

3G UMTS (Universal Mobile Telecommunications Service) systems comprise two main standards areas, CDMA2000 and W-CDMA (other variants also exist). Although they are incompatible there are investigations into providing interworking. The technologies breakdown as follows:

CDMA — EVDO, also known as CDMA2000, promotes a downstream rate of about 2 megabits per second. However, high traffic utilization can degrade speed and performance so real world speeds might be closer to half this speed.

GSM — EDGE (Enhanced Data Rates for GSM Evolution), promotes data rates of up to 384 kbps (actual speeds reported 70-140 kbps). These networks are susceptible to interference. Next generation GSM technologies include the HSDPA (High Speed Downlink Packet Access), also known as W-CDMA offers speeds of 275—380 kbps (incompatible with CDMA networks).

Data Speeds

A key objective for the 3G initiative is to provide faster data speed for data-intensive applications such as video. In addition, to faster data speeds on a per-user basis, 3G is also makes use of greater overall capacity for users, further motivating a carrier's plan to migrate their networks from 2/2.5G. A 2Mb/s target is a goal of the 3G initiatives, however actual data speeds will vary in accordance with several factors including:

- Number of users in cell/sector
 - Distance of user from cell
 - Moving or stationary user
 - Network capacity and network optimization requirements
 - Synchronous vs. asynchronous operation
-

3G RAN Architecture and Deployment

The UMTS network introduces network elements that function as specified by 3GPP:

- Node-B (base station)
- Radio Network Controller (RNC)
- Media Gateway (MGW)

[Figure 17](#) displays a general overall view of the technology comparisons highlighting the mobile RAN.

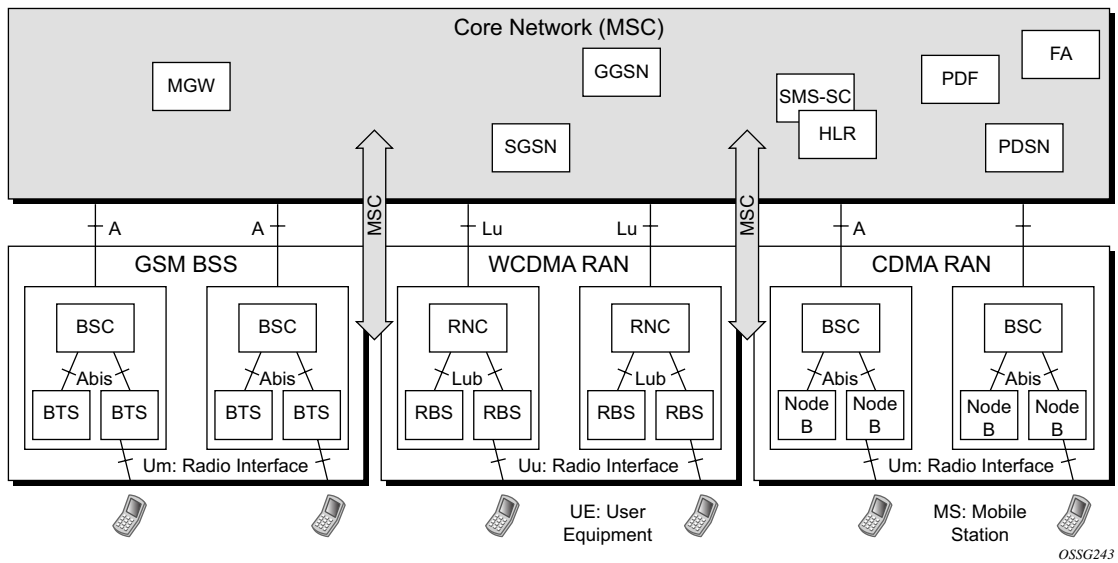


Figure 17: 3G RAN Architecture Example

Migration Strategies

Suggested migration strategies for the mobile solution technologies include:

- [CDMA — UMTS on page 71](#)
 - [GSM — UMTS on page 71](#)
-

CDMA — UMTS

CDMA2000 starts with new channel cards and migrates to a full mobile IP infrastructure requiring new Core Network (CN) infrastructure such as the AAA server and Packet Data Server Node (PDSN).

To support CDMA2000 (1xRTT) Radio Access Network (RAN) to interface with a GSM Core Network impacts the RAN which would require an upgrade of the CDMA base station and BSC. A core network upgrade requirement includes a CDMA PDSN and AAA server.

Some functionality of the serving gateway may be integrated into the MSC MLS or router. The SGW routes and forwards user data packets, while also acting as the mobility anchor for the user plane during inter-eNodeB handovers and as the anchor for mobility between LTE and other 3GPP technologies (terminating interfaces and relaying the traffic between 2G/3G systems and PDN gateway).

eNode-B or eNodeB (eNB) interfaces with the UE. The eNB hosts the PHYsical (PHY), Medium Access Control (MAC), Radio Link Control (RLC), and Packet Data Control Protocol (PDCP) layers that include the functionality of user-plane header-compression and encryption. It also offers Radio Resource Control (RRC) functionality corresponding to the control plane. It performs many functions including radio resource management, admission control, scheduling, enforcement of negotiated UL QoS.

GSM — UMTS

When converting a GSM network to a UMTS network, the first new technology is General Packet Radio Service (GPRS). It is the trigger for 3G services.

From GPRS, operators may change the network directly to UMTS, or invest in an EDGE system. One advantage of EDGE over UMTS is that it requires no new licenses. The frequencies are also re-used and no new antennas are needed.

W-CDMA uses the same core network as GPRS, utilizing existing infrastructure such as the GGSN and SGSN. W-CDMA, however, requires new RAN infrastructure such as the Node B, which replaces the BTS, and the Radio Network Controller (RNC), which replaces the BSC.

Ultimately, the W-CDMA core network will evolve to comprise a full mobile IP infrastructure including Media Gateway (MGW) and Media Gateway Controller (MGC) equipment for VoIP and other new equipment such as the HSS and CSDF.

The functionality of MSC and SGSN changes when going to UMTS. In a GSM system the MSC handles all the circuit switched operations like connecting A- and B-subscriber through the network. SGSN handles all the packet switched operations and transfers all the data in the network. In UMTS, the MGW takes care of all data transfer in both circuit and packet-switched networks. MSC and SGSN control MGW operations. The nodes are renamed to MSC-server and GSN-server.

Network Migration Caveats

CDMA 2000	EVDO offers Ethernet or T1 interfaces at base stations.
GSM	A <i>bis</i> interface is TDM-based and carried over E1/T1 links. Circuit emulation is required for Ethernet transport.
UMTS R5	Has an all-IP access network option. Suitable for carrier Ethernet, depending on base station configuration.
UMTS R99	ATM connections are carried over E1/T1 IMA links. Circuit emulation or pseudowires are required for Ethernet transport.
Mobile Core	Towards IP/Ethernet Split MSC architecture with IP/Ethernet interfaces. IP/Ethernet links between media gateways and MSC servers.

For more information about Circuit Emulation Services and the Mobile Infrastructure, refer to [Circuit Emulation Services \(Cpipe\) on page 185](#).

RAN Aggregation with Microwave Radio Transport

Figure 18 displays a RAN aggregation network deployment example.

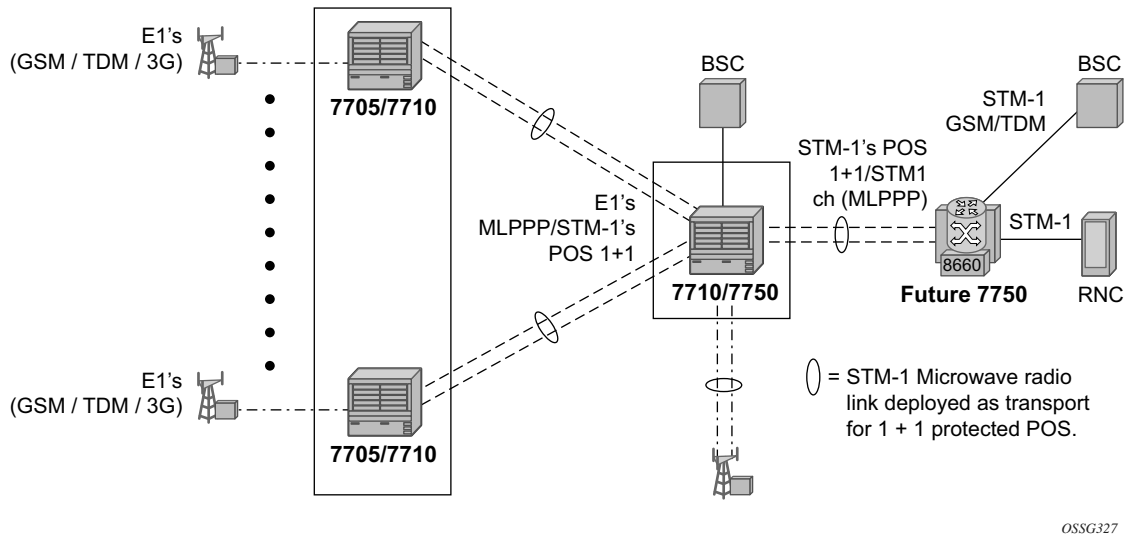


Figure 18: Mobile RAN with Microwave Transport Example

As depicted in Figure 18, some 1+1 APS-protected SDH interfaces require microwave radio transport. The following picture depicts an 1+1 protected links between 2 routers that use Microwave transport. The radio equipment acts as a SONET section/ SDH regenerator section equipment, yet it implements U-APS like processing to provide equipment protection on the local/ remote radio sites respectively.

The active RX line signal (switched independently from TX) is being transmitted over the radio link to the far end radio where the signal gets transmitted on both active and inactive circuits.

The radio reacts on APS triggered failures as detected by the segment termination function: LOS, LOF, manual APS commands, and optionally BER SF/SD. Since the radio does not terminate line, any line signaling (including Kbytes signaling for APS, line alarms like RDI/AIS) are not terminated by the radio and arrive at a far-end router.

Note that the far-end router can either send line alarms based on its active link status or based on physical circuit status (in which case for example, a L-RDI with a valid data will be received on the 77x0).

To facilitate these features, the 7750 SR and 7710 SR performs the following:

1. 1+1 data path (the data is transmitted on both circuits).
2. Active RX circuits are selected based on local conditions only (Kbytes signaling is used since it flows through and reaches the far-end router).
3. Optionally ignores/does not transmit Kbytes.
4. Does not fail ports on L-RDI, as L-RDI may be received on both ports momentarily, as a result of a local radio APS switch or, permanently as a result of a remote router APS switch (with remote radio selecting traffic from the TX line on the same port as failed RX line on the router).
5. For some radio equipment, a radio can cause an APS switch resulting in the far end radio detecting radio alarm and generating L-AIS toward its locally attached router on both circuits. In some cases, that router also detects BER SD/BER SF conditions on both circuits as well. Therefore, to localize failure recovery, the 7750 SR and 7710 SR can optionally debounce those alarms so a remote router does not invoke an APS switch on a local failure condition.

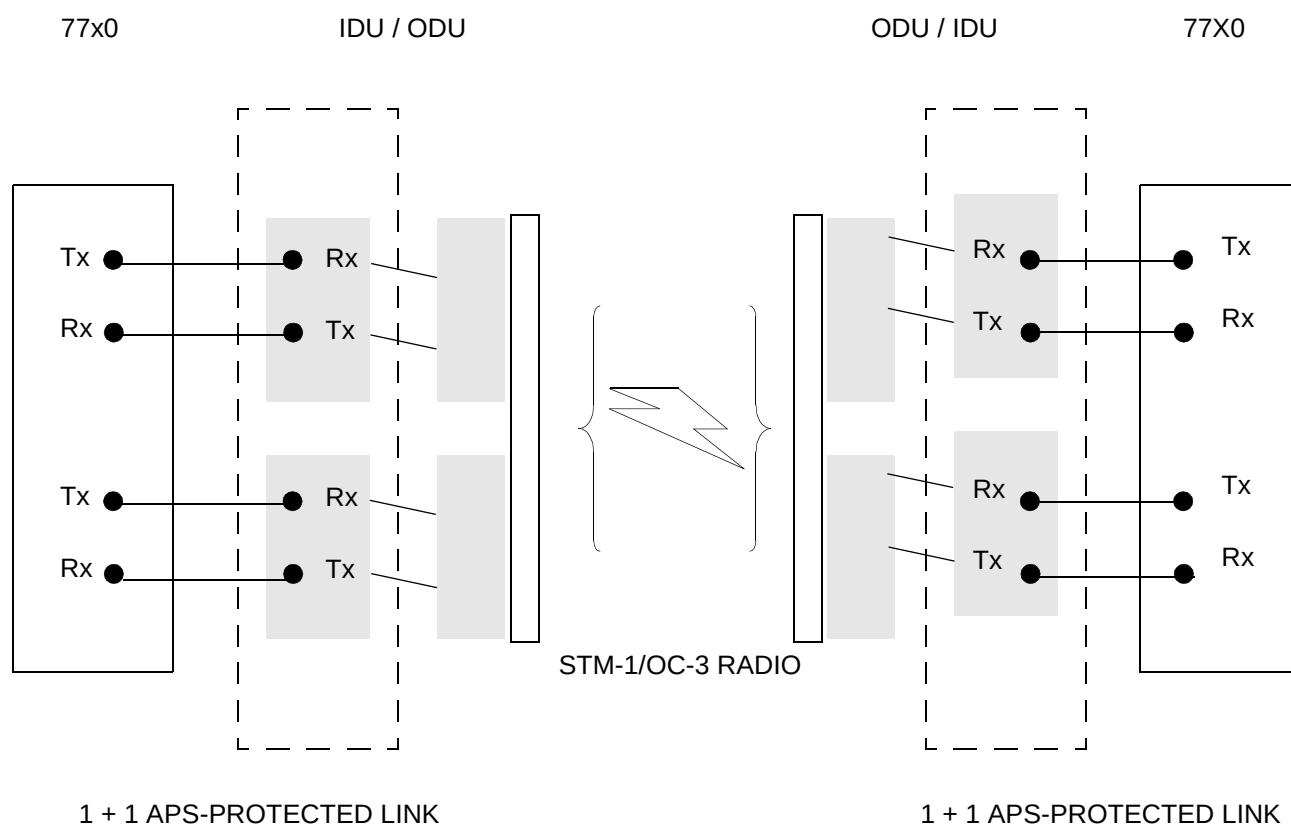


Figure 19: 1+1 U-APS-Protected Microwave SDH Transport

IP Backhaul for CDMA Network Infrastructure

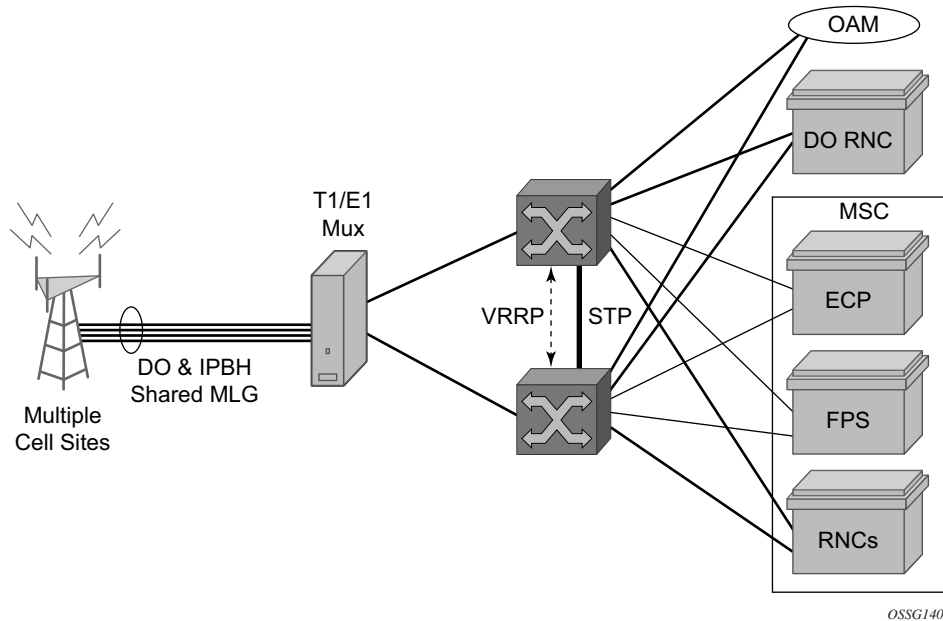


Figure 20: Converged MLS Architecture for IP Backhaul

As shown in [Figure 20](#), the Mobile Switching Center (MSC) components include the Radio Network Controller (RNC), the Flexent Packet Switch (FPS) and the Application Processors (APs). Uplink traffic originates at the Universal Radio Controller (URC) of a OneBTS. This traffic is forwarded to the T-1/E-1 concentrator over discrete T-1s configured in Multi-Link Group (MLG) bundles. The T-1/E-1 Concentrator concatenates the T-1/E-1s on a channelized interface, such as OC-3 or OC-12, to the converged Multi-Layer Switch (MLS). The individual underlying T1s are in unchannelized mode. The converged MLS terminates the MLG T-1/E-1s and forwards the embedded IP packets to the MSC components. The downlink traffic originates at one of the MSC components. If the traffic is from a BHS, it is forwarded to one of the converged MLS acting as the default gateway. If it is from the FMM-AP it is forwarded to its directly connected MLS. From the converged MLS the traffic is forwarded to the T-1/E-1 concentrator as MLG bundles over the channelized interface.

The OneBTS and MSC components use IP packets to transport traffic to one another. The OneBTS URCs, the MSC components and the router are considered IP endpoints for traffic routing and have IP addresses associated with them. The IP addresses for the URCs and routers are manually configured in the routers. The MSC components either derive their IP addresses from a control subnetwork address or are manually provisioned.

VLANs are used to isolate traffic from the MSC components coming into the transport network. Each FPS and RNC VLANs will run VRRP for redundancy in association with the BHS. The VRRP master will retain ownership of the default gateway IP address that the BHS forwards traffic to. A failure of the master will result in the standby taking ownership of the default gateway IP address.

ATM Backhaul for GSM/UMTS Network Infrastructure

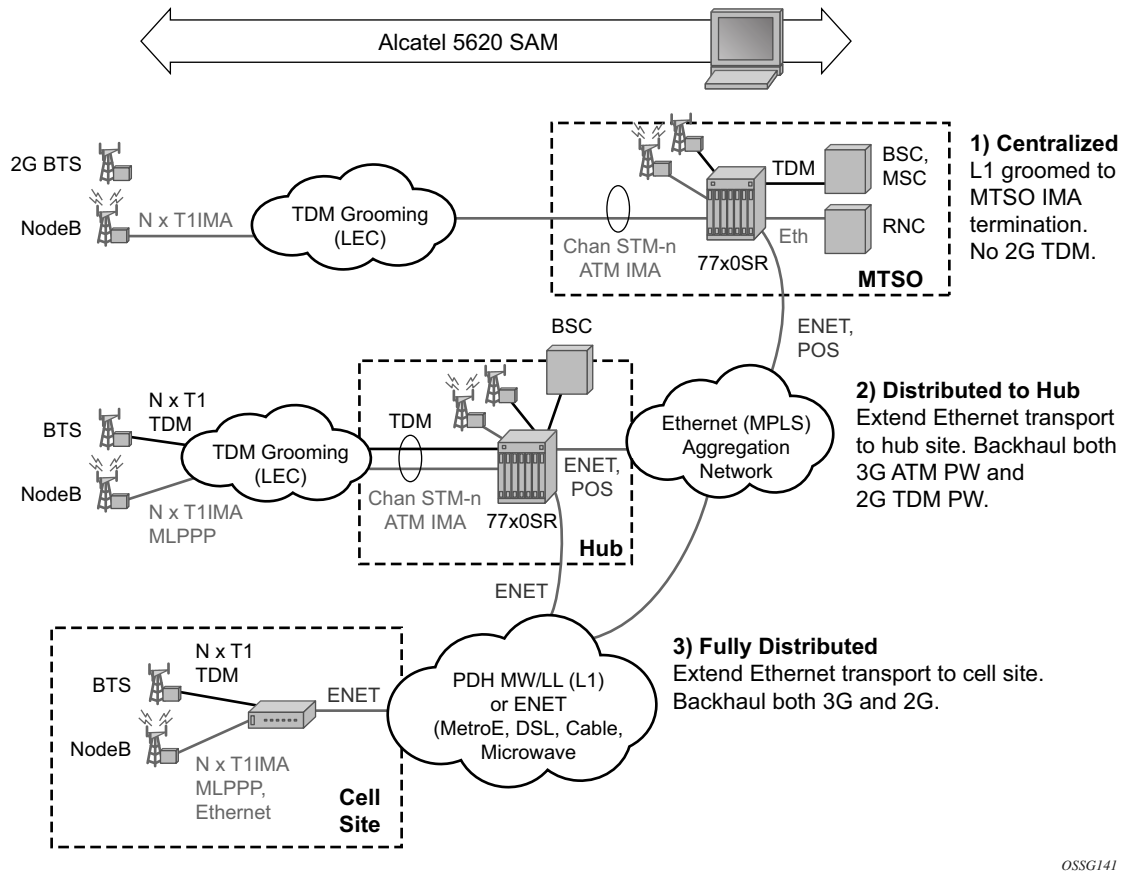


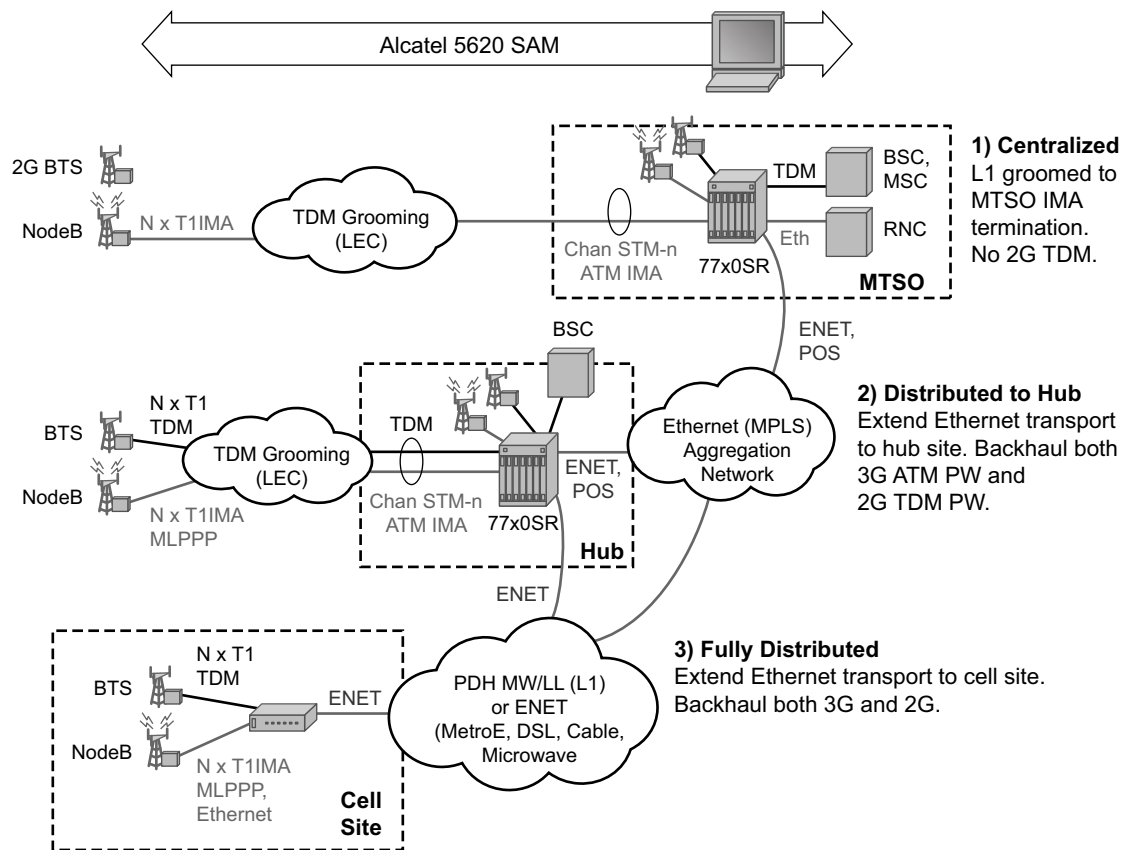
Figure 21: ATM Backhaul for GSM/W-CDMA

As shown at the top of [Figure 21](#), the most common deployment for GSM/W-CDMA mobile RAN aggregation are leased E-1 facilities. 2G traffic is carried directly over these facilities and connected to the Base Station Controller (BSC), typically on a channelized STM-n interface from an SDH multiplexer. In addition, the Node B traffic is carried over E-1 ATM IMA facilities. These are typically terminated on a channelized STM-n interface at the MTSO and aggregated onto a concatenated STM-n ATM interface to the RNC. In this scenario, the 7750/7710-SR routers can be the ATM IMA termination and aggregation platform.

With the continued rollout of High Speed Packet Access (HSPA) technology and the associated increased bandwidth requirements, many mobile service providers are looking for a more cost effective backhaul technology than E-1 PDH. Generally, Ethernet is considered the most cost effective backhaul technology for n*2Mbps connectivity and has the ability to scale into gigabits

per second capacities. Mobile service providers are investigating methods to deploy Ethernet Aggregation Transport Networks (EATNs). To meet the resilience requirements, these connections are typically deployed over MPLS pseudo-wires.

Ethernet Backhaul for CDMA/GSM/UMTS Network Infrastructure



OSSG141

Figure 22: Ethernet backhaul for CDMA/GSM/UMTS

While the previous sections concentrated on the centralized case (1) shown in [Figure 22](#), one of the key value propositions for utilizing service routers in the mobile backhaul RAN aggregation is derived from its seamless ability to migrate to Ethernet/MPLS-based RAN aggregation whenever and wherever the service provider wants. The service provider can choose between any combination of a fully distributed model where Ethernet is used all the way to the cell site or a hub model where Ethernet is used to the hub site and a traditional leased line or microwave is used for the last mile access to the cell site.

For Ethernet backhaul deployments, the service provider has two network architecture options:

- Complete Ethernet transport — The Ethernet transport case is effective and efficient if the current base station supports Ethernet connectivity (or can be upgraded to support Ethernet connectivity) and Ethernet service access is available at all cell sites.
- Pseudowire transport of existing technologies over Ethernet — The pseudowire transport case is effective and efficient when base stations do not support Ethernet connectivity or Ethernet service access is only available at hub sites. Most large mobile service providers can use a combination of the two service architectures for different regions and areas within their network.

Ethernet Evolution of CDMA Networks with IP Backhaul

For existing CDMA solutions customers using IP backhaul, the recommended solution for Ethernet backhaul is the installation of an Ethernet Interface Unit (EIU) at the base station for the fully distributed case. This EIU is based on the DMXplore product. It can terminate the existing MLPPP interfaces and use static routing to deliver this traffic to the Ethernet network port. It can also aggregate other Ethernet traffic at the cell site. There are no special requirements on the EATN that cannot be met with the current 7450-ESS and 7750/7710-SR portfolio although its key differentiators of high availability, fast restoration and stringent QoS are strong value propositions in this application. In some cases, the EIU may aggregate third party base stations through circuit emulation. In these cases, an aggregated circuit emulation capability on the service router in the MSC is required. Therefore, a channelized OC-3 CES capability interoperable with DMXplore is supported for a completely integrated solution.

Alternatively, hub aggregation can be achieved by deploying lower capacity service routers at the hub locations. The same architecture used in the centralized scenario can be deployed at the hub site. A 7710-SR service router fits well for hub aggregation terminating the MLPPP traffic and routing the traffic over the Ethernet ports using IES or IP-VPN services. This can be deployed through lower density CMAs with physical DS-1 links or higher density ASAP MDAs using channelized DS-3/OC-3/OC-12 interfaces depending on the number of BTS sites to be aggregated at the hub site.

In either scenario, the migration to Ethernet backhaul will be gradual. Ethernet backhaul is supported concurrently with IP backhaul to allow a gradual migration. In this case, both IP backhaul and Ethernet backhaul are supported concurrently on a converged 7750-MLS.

Ethernet Evolution of GSM/UMTS Networks with ATM/TDM Backhaul

Some GSM/UMTS configurations using ATM/TDM backhaul can facilitate Ethernet backhaul features with the installation of an Alcatel-Lucent 7705 Service Aggregation Router (SAR) at the base station for the fully distributed case. The 7705-SAR supports TDM pseudowires for 2G BTS traffic and ATM pseudowires for Node B traffic and Ethernet interfaces for HSPA and other local traffic. The Ethernet Aggregation Transport Network (EATN) built using a 7450-ESS and 7750/7710-SR portfolio meets all general requirements as well as features such as high availability, fast restoration and stringent QoS are strong value propositions in this application. In some cases a 7450 ESS installed as part of EATN may require a Sonet interface on a network side based on the existing physical network. When that is the case APS protection is needed to provide high availability on the network side. However, the TDM pseudowires utilized for the 2G transport via circuit emulation must be terminated at the MTSO for TDM connection to the BSC. In these cases, an aggregated circuit emulation capability on the service router in the MTSO is required. Therefore, a channelized OC-3/STM-1 CES capability interoperable with 7705-SAR is supported for a completely integrated solution. Also, the ATM pseudowires utilized for the 3G transport must be terminated at the MTSO for a concatenated OC/STM-n connection to the RNC. Finally, the HSPA traffic can be aggregated at the MTSO on a standard Ethernet interface (typically GigE).

Alternatively, hub aggregation can be achieved by deploying lower capacity service routers or higher capacity cell site aggregators at the hub locations. The TDM and ATM pseudowire aggregation can be deployed at the hub site using Alcatel-Lucent 7705-SARs for physical E-1 connectivity, 7710-SR for channelized STM-n connectivity or a combination of both depending on the number of cell site to be aggregated at the hub site.

In either scenario, the migration to Ethernet backhaul is gradual. Both Ethernet backhaul using pseudo-wires concurrently with centralized SDH/SONET backhaul to allow a gradual migration are supported. Both SDH/SONET backhaul and Ethernet backhaul is supported concurrently on a single 7750-SR.

IP Backhaul Physical Interface Features

The existing ASAP MDAs and Ethernet MDAs provide connectivity to the BTS and MSC.

Fractional DS-1 link members in a MC-MLPPP bundle is supported. Fractional DS-1/E-1 link members are supported with LFI but the bundle contains only one member. The following attributes are supported for the MC-MLPPP with fractional DS-1 link members.

- A single, contiguous channel group less than 24 DS-0s on a DS-1 link is supported on the ASAP MDA within a multi-class MLPPP bundle.
- Fractional E1 links are not supported, non-contiguous DS-0 channel groups are not supported and multiple channel groups on the DS-1 are not supported. The configuration is blocked.
- All channel groups within a given bundle must have the same bandwidth during normal operation although changing individual link bandwidths is supported to allow the bandwidth of the links in the bundle to be changed. Warnings are provided if all links in a bundle are not configured for the same bandwidth.
- All existing CMDA ER/MLS features such as MC-APS, IPCP, MC-MLPPP are supported on FT1 MLPPP bundles. The default ingress and egress MC-MLPPP QoS behavior remains as per a full DS-1 link and the user may have to adjust QoS parameters for lower speed channel group configurations (for example, ingress re-assembly timers).

Interface Encapsulation

PFC and ACFC header compression to minimize the required backhaul bandwidth for DS-1 and E-1 channel groups is supported. PPP channel configuration options support Protocol Field Compression (PFC) per RFC 1661, *The Point-to-Point Protocol (PPP)*, Section 6.5 and Address and Control Field Compression (ACFC) as per Section 6.6. This functionality is supported on all ASAP MDA variants and as well as CMA variants supporting DS-1/E-1 PPP. The configuration can be changed while a member is active in the bundle. When disabled, PPP will reject a request from the peer for PFC or ACFC to match earlier implementations.

The DS-1 channels on the channelized interfaces are deployed using ML-PPP encapsulations supporting 1 to 8 DS-1 channels in the group. As a single MSC can support many BTS sites and each BTS site has one or more ML-PPP Groups (MLG) supported at the site, a very large ML-PPP group density is required. Current deployments support up to 256 MLGs per ChOC-12.

Physical Interfaces

In a pure Ethernet network from BTS to MSC/MTSO, service routers have a wide portfolio of Ethernet physical interface options from 10 Mbps to 10 Gbps supported in the SR OS.

However, in 2G BTS sites, the BTS typically connects to the network over physical DS-1/E-1 TDM links, not Ethernet. The most transparent method to converge DS-1 or E-1 TDM traffic across an Ethernet network is to use circuit emulation (CE). For example, a CE inter-working function (IWF) is performed at the BTS or hub site to convert the digital traffic into packet traffic by literally stuffing the bits into a packet payload and appending headers to identify the destination. However, mobile service provider networks are typically a large star network from the BTS to the MSC/MTSO. Therefore, even if each BTS only has 1-2 E-1s requiring CE IWF, the hundreds of BTS sites homing into a single MSC/MTSO site require a larger capacity CES IWF function at MSC/MTSO to enable a channelized TDM connection to the BSC.

Service Support

The SR OS supports a wide variety of services including IES, IP-VPNs, VPLS and Ethernet, ATM, Frame Relay, IP, and TDM pseudowires.

In Alcatel-Lucent Ethernet backhaul networks, there are three primary BTS site CE IWF devices. Currently, the 7250 SAS can be used for CES over Ethernet or MPLS. In CDMA solution R30, CE IWF on DMXplore (MATS or EIU) can be used. In many GSM/UMTS networks, the 7705 SAR can be used for CE IWF.

When the 7705 SAR is used at the BTS site, there typically can be 500-600 cell sites homing into a single 7750-SR router pair at the MSC. Many of the 7705s can be provisioned with static

pseudowires to allow the network to scale. Also, within parts of the aggregation network, MPLS FRR is used for resilience, requiring dynamic pseudowires. Dynamic to static pseudowire switching is supported. Also supported is the dynamic-to-static pseudowire for Cpipe services.

High Availability

For Ethernet interfaces, multi-chassis link aggregation groups (MC-LAG) can be used for resilient access connectivity to controller equipment at the MSC/MTSO service router. If Ethernet pseudowire is also connected to different PE nodes at the remote end of the connection, redundant pseudowires can be provisioned to allow recovery for any PE node failure. For ATM and CES interfaces, 1+1 APS and multi-chassis APS is supported.

For resilient connection out to the BTS, VRRP can be used in some cases. However, as hundreds of BTS can connect into a single SR, the scale of VRRP instances has increased.

For cases when a 7450-ESS requires SONET interface on the network side due to physical network connection options, APS protection for that interface is required. The following points summarize APS enhancements:

- 1+1 APS is supported on SONET/SDH interfaces supported by the 7450-ESS (no channelization) when operating in network mode.
- APS bi-directional mode only is supported (no uni-directional).
- APS single chassis mode is supported (both working and protecting ports on the same 7450-ESS).

Configuring Global Service Entities with CLI

This section provides information to create subscriber (customer) accounts and configure Service Distribution Points (SDPs) using the command line interface.

Topics include:

- [Service Model Entities on page 87](#)
 - [Configuring Customers on page 91](#)
 - [Configuring Multi-Service-Sites on page 93](#)
 - [Configuring an SDP on page 94](#)
 - [ETH-CFM Features on page 109](#)
 - [Service Management Tasks on page 120](#)
-

Service Model Entities

The Alcatel-Lucent service model uses logical entities to construct a service. The service model contains four main entities to configure a service.

- [Subscribers on page 91](#)
- [Service Distribution Points \(SDPs\) on page 94](#)
- Services:
 - [ATM VLL \(Apipe\) Services on page 180](#)
 - [Circuit Emulation Services \(Cpipe\) on page 185](#)
 - [Ethernet Pipe \(Epipe\) Services on page 195](#)
 - [Frame Relay VLL \(Fpipe\) Services on page 201](#)
 - [IP Interworking VLL \(Ipipe\) Services on page 205](#)
 - [VPLS on page 509](#)
 - [IES on page 881](#)
 - [VPRN on page 1099](#)

- Service Access Points (SAPs)
 - [Ethernet Pipe \(Epipe\) Services on page 195](#)
 - [Apipe SAP on page 245](#)
 - [Fpipe SAP on page 266](#)
 - [VPLS SAP on page 525](#)
 - [IES SAP on page 888](#)
 - [VPRN Interface SAP on page 1115](#)

Basic Configuration

The most basic service configuration must have the following:

- A customer ID
- A service type
- A service ID

An optional service name can also be configured in addition to the service ID. Service names are optional. All services are required to assign a service ID to initially create a service. However, either the service ID or the service name can be used to identify and reference a given service once it is initially created.

- A SAP identifying a port and encapsulation value
- An interface (where required) identifying an IP address, IP subnet, and broadcast address
- For distributed services: an associated SDP

The following example provides an Epipe service configuration displaying the SDP and Epipe service entities. SDP ID 2 was created with the far-end node 10.10.10.104. Epipe ID 6000 was created for customer ID 6 which uses the SDP ID 2.

```
A:ALA-B>config>service# info detail
#-----
...
    sdp 2 gre create
        description "GRE-10.10.10.104"
        far-end 10.10.10.104
        signaling tldp
        no vlan-vc-etype
        keep-alive
        path-mtu 4462
        keep-alive
        shutdown
        hello-time 10
        hold-down-time 10
        max-drop-count 3
        timeout 5
        no message-length
    exit
    no shutdown
exit
...
epipe 6000 customer 6 vpn 6000 create
    service-name "customer-ABC-NW" (R8.0)
    service-mtu 1514
    sap 1/1/2:0 create
        no multi-service-site
        ingress
            no scheduler-policy
            qos 1
        exit
    egress
```

```
        no scheduler-policy
        qos 1
    exit
    no collect-stats
    no accounting-policy
    no shutdown
exit
spoke-sdp 2:6111 create
    ingress
        no vc-label
        no filter
    exit
    egress
        no vc-label
        no filter
    exit
    no shutdown
exit
no shutdown
exit
...
#-----
A:ALA-B>config>service#
```

Common Configuration Tasks

This section provides a brief overview of the tasks that must be performed to configure a customer account and an SDP.

Configuring Customers

The most basic customer account *must* have a customer ID. Optional parameters include:

- Description
 - Contact name
 - Telephone number
 - Multi-service site
-

Customer Information

Use the following CLI syntax to create and input customer information:

CLI Syntax:

```
config>service# customer customer-id create
    contact contact-information
    description description-string
    multi-service-site customer-site-name [create]
    assignment {port port-id | card slot}
    description description-string
    egress
        scheduler-override
            scheduler scheduler-name
            rate pir-rate [cir cir-rate]
            scheduler-policy scheduler-policy-name
    ingress
        scheduler-override
            scheduler scheduler-name
            rate pir-rate [cir cir-rate]
            scheduler-policy scheduler-policy-name
    phone phone-number
```

The following displays a basic customer account configuration.

```
A:ALA-12>config>service# info
-----
...
    customer 5 create
        description "Alcatel Customer"
        contact "Technical Support"
        phone "650 555-5100"
    exit
...
-----
A:A:ALA-12>config>service#
```


Configuring Multi-Service-Sites

Multi-service sites create a virtual scheduler hierarchy and making it available to queues on multiple Service Access Points (SAPs). The **ingress** and **egress scheduler-policy** commands on the SAP are mutually exclusive with the SAP **multi-service-site** command. The multi-service customer site association must be removed from the SAP before local scheduler policies may be applied.

After a multi-service site is created, it must be assigned to a chassis slot or port. Note that the 7750 SR-1 model multi-service site assignment configuration defaults to slot 1.

Use the following CLI syntax to configure customer multi-service sites.

CLI Syntax:

```
config>service> customer customer-id
    multi-service-site customer-site-name
        assignment {port port-id | card slot}
        description description-string
        egress
            agg-rate-limit agg-rate
            scheduler-policy scheduler-policy-name
        ingress
            scheduler-policy scheduler-policy-name
        tod-suite tod-suite-name
```

The following displays a customer's multi-service-site configuration.

```
A:ALA-12>config>service# info
-----
..
    customer 5 create
        multi-service-site "EastCoast" create
            assignment card 4
            ingress
                scheduler-policy "alpha1"
            exit
        exit
        multi-service-site "WestCoast" create
            assignment card 3
            egress
                scheduler-policy "SLA1"
            exit
        exit
        description "Alcatel Customer"
        contact "Technical Support"
        phone "650 555-5100"
    exit
...
-----
A:ALA-12>config>service#
```

Configuring an SDP

The most basic SDP must have the following:

- A locally unique SDP identification (ID) number.
 - The system IP address of the originating and far-end 7750 SR routers.
 - An SDP encapsulation type, either GRE or MPLS.
-

SDP Configuration Tasks

This section provides a brief overview of the tasks that must be performed to configure SDPs and provides the CLI commands.

Consider the following SDP characteristics:

- SDPs can be created as either GRE or MPLS.
- Each distributed service must have an SDP defined for every remote router to provide VLL, VPLS, and VPRN services.
- A distributed service must be bound to an SDP. By default, no SDP is associated with a service. Once an SDP is created, services can be associated to that SDP.
- An SDP is not specific or exclusive to any one service or any type of service. An SDP can have more than one service bound to it.
- The SDP IP address must be a 7750 SR-Series system IP address.
- In order to configure an MPLS SDP, LSPs must be configured first and then the LSP-to-SDP association must be explicitly created.
- In the SDP configuration, automatic ingress and egress labeling (targeted LDP) is enabled by default. Ingress and egress VC labels are signaled over a TLDP connection between two 7750 SR-Series routers.

Note that if signaling is disabled for an SDP, then services using that SDP must configure ingress and egress vc-labels manually.

To configure a basic SDP, perform the following steps:

1. Specify an originating node.
2. Create an SDP ID.
3. Specify an encapsulation type.
4. Specify a far-end node.

Configuring an SDP

Use the following CLI syntax to create an SDP and select an encapsulation type. If you do not specify GRE or MPLS, the default encapsulation type is GRE.

NOTE: When you specify the far-end ip address, you are creating the tunnel. In essence, you are creating the path from Point A to Point B. When you configure a distributed service, you must identify an SDP ID. Use the `show service sdp` command to display the qualifying SDPs.

When specifying MPLS SDP parameters, you must specify an LSP or enable LDP. There cannot be 2 methods of transport in a single SDP. If an LSP name is specified, then RSVP is used for dynamic signaling within the LSP.

LSPs are configured in the **config>router>mpls** context. See the 7750 SR OS MPLS Guide for configuration and command information.

Use the following CLI syntax to create a GRE SDP or an MPLS SDP:

CLI Syntax:

```
config>service>sdp sdp-id [gre | mpls] create
  adv-mtu-override
  description description-string
  far-end ip-address
  keep-alive
    hello-time seconds
    hold-down-time seconds
    max-drop-count count
    message-length octets
    timeout timeout
  no shutdown
    ldp                                     (only for MPLS SDPs)
    lsp lsp-name [lsp-name] (only for MPLS SDPs)
  path-mtu octets
  signaling {off | tldp}
  no shutdown
```

The following displays a GRE SDP, an LSP-signalled MPLS SDP, and an LDP-signalled MPLS SDP configuration.

```
A:ALA-12>config>service# info
-----
...
    sdp 2 create
        description "GRE-10.10.10.104"
        far-end 10.10.10.104
        keep-alive
        shutdown
    exit
    no shutdown
exit
sdp 8 mpls create
    description "MPLS-10.10.10.104"
    far-end 10.10.10.104
    lsp "to-104"
    keep-alive
    shutdown
    exit
    no shutdown
exit
sdp 104 mpls create
    description "MPLS-10.10.10.94"
    far-end 10.10.10.94
    ldp
    keep-alive
    shutdown
    exit
    no shutdown
exit
...
-----
A:ALA-12>config>service#
```

Configuring a Mixed-LSP

Use the following command to configure an SDP with mixed-LSP mode of operation:

```
config>service>sdp mpls>mixed-lsp-mode
```

The **mixed-lsp-mode** keyword indicates to the service manager that it must allow RSVP and LDP LSPs to co-exist in an SDP configuration. The **lsp** and **ldp** commands are allowed concurrently in the SDP configuration. You can configure one or two types of LSPs under the same SDP. Without the new keyword, these commands are mutually exclusive.

The **no** form of this command disables the mixed-LSP mode of operation. The user first has to remove one of the LSP types from the SDP configuration or the command will fail.

The user can also configure how long the service manager must wait before it must revert the SDP to a higher priority LSP type when one becomes available by using the following command:

```
config>service>sdp mpls>mixed-lsp-mode>sdp-revert-time seconds
```

A special value of the timer dictates that the SDP must never revert to another higher priority LSP type unless the currently active LSP type is down:

```
config>service>sdp mpls>mixed-lsp-mode>sdp-revert-time infinite
```

The BGP LSP type will also be allowed. In other words, you will also be able to configure the **bgp-tunnel [bgp-lbl-prd]** command under the SDP concurrently with the **lsp** and **ldp** commands.

Mixed-LSP Mode of Operation

At any given time, the service manager programs only one type of LSP in the IOM that will activate it to forward service packets according to the following priority order:

1. RSVP LSP type. Up to 16 RSVP LSPs can be entered by the user and programmed by the service manager in ingress IOM to load balance service packets. This is the highest priority LSP type.
2. LDP LSP type. One LDP FEC programmed by service manager but ingress IOM can use up to 16 LDP ECMP paths for the FEC to load balance service packets when ECMP is enabled on the node.

The service manager will program the NHLFE(s) for the active LSP type preferring the RSVP LSP type over the LDP LSP type.

If no RSVP LSP is configured or all configured RSVP LSPs go down, the service manager will re-program the IOM with the LDP LSP if available. If not, the SDP goes operationally down.

When a higher priority type LSP becomes available, the service manager reverts back to this LSP at the expiry of the **sdp-revert-time** timer or the failure of the currently active LSP, whichever comes first. The service manager then re-programs the IOM accordingly. If the **infinite** value is configured, then the SDP reverts to the highest priority type LSP only if the currently active LSP failed.

Note however, that LDP uses a tunnel down damp timer which is set to three seconds by default. When the LDP LSP fails, the SDP will revert to the RSVP LSP type after the expiry of this timer. For an immediate switchover this timer must be set to zero. The command for this timer is

```
configure>router>ldp>tunnel-down-damp-time
```

If you change the value of the **sdp-revert-time** timer, it will take effect only at the next use of the timer. Any timer which is outstanding at the time of the change will be restarted with the new value.

If class based forwarding is enabled for this SDP, the forwarding of the packets over the RSVP LSPs will be based on the FC of the packet as in current implementation. When the SDP activates the LDP LSP type, then packets are forwarded over the LDP ECMP paths using the regular hash routine. Similar behavior will be followed when the SDP activates the BGP LSP type in a future release.

Ethernet Connectivity Fault Management (ETH-CFM)

Ethernet Connectivity Fault Management (ETH-CFM) is defined in two similar standards: IEEE 802.1ag and ITU-T Y.1731. They both specify protocols, procedures, and managed objects to support transport fault management, including discovery and verification of the path, detection and isolation of a connectivity fault for each Ethernet service instance. CFM functionalities are supported on SR and ESS platforms.

IEEE 802.1ag can detect:

- Loss of connectivity
- Unidirectional loss
- Loops
- Merging of services

CFM uses Ethernet frames and can be distinguished by its ether-type and special Ethernet multicast addresses. CFM frames are only processed by IEEE MAC bridges. With CFM, interoperability can be achieved between different vendor equipment in the service provider network up to and including customer premises bridges. The following table lists CFM-related acronyms used in this section.

Acronym	Callout
CCM	Continuity check message
CFM	Connectivity fault management
LBM	Loopback message
LBR	Loopback reply
LTM	Linktrace message
LTR	Linktrace reply
ME	Maintenance entity
MA	Maintenance association
MA-ID	Maintenance association identifier
MD	Maintenance domain
MEP	Maintenance association end point
MEP-ID	Maintenance association end point identifier
MHF	MIP half function
MIP	Maintenance domain intermediate point

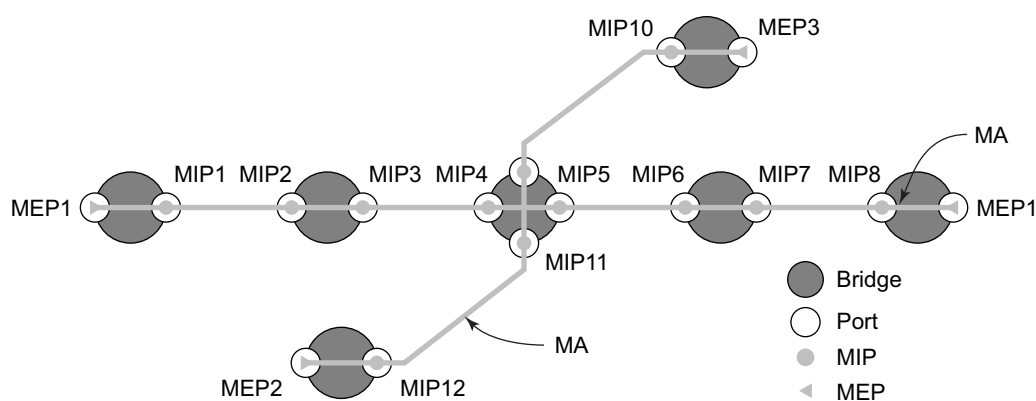
MA, MEP, MIP and MD Levels

Maintenance domain (MD) levels are used to define CFM maintenance domains, maintenance association end points (MEPs) and maintenance domain intermediate points (MIPs) only communicate within the same level. It is carried in the CFM PDU to inform management entities where maintenance association (MA) the CFM PDU belongs. There are 8 levels defined. 0 is the lowest level, 7 is the highest level. The levels are nested, not overlapping. Overlapping is not allowed.

CFM levels include:

- MEP is an actively managed functional component, which implements CFM functionalities.
- Maintenance association Intermediate Point (MIP) is the intermediate point between MEPs.
- MEP and MIP perform different CFM functionalities.

Maintenance association (MA) includes a set of MEPs, each configured with the same MA-ID and MD level, verify the integrity of a single service instance. [Figure 23](#) depicts a high-level view of MEPs and MIPs in a CFM-enabled network. Two MAs are displayed.



OSSG179

Figure 23: MEP and MIP

Figure 24 shows a more detailed view of MEP, MIP and MD levels.

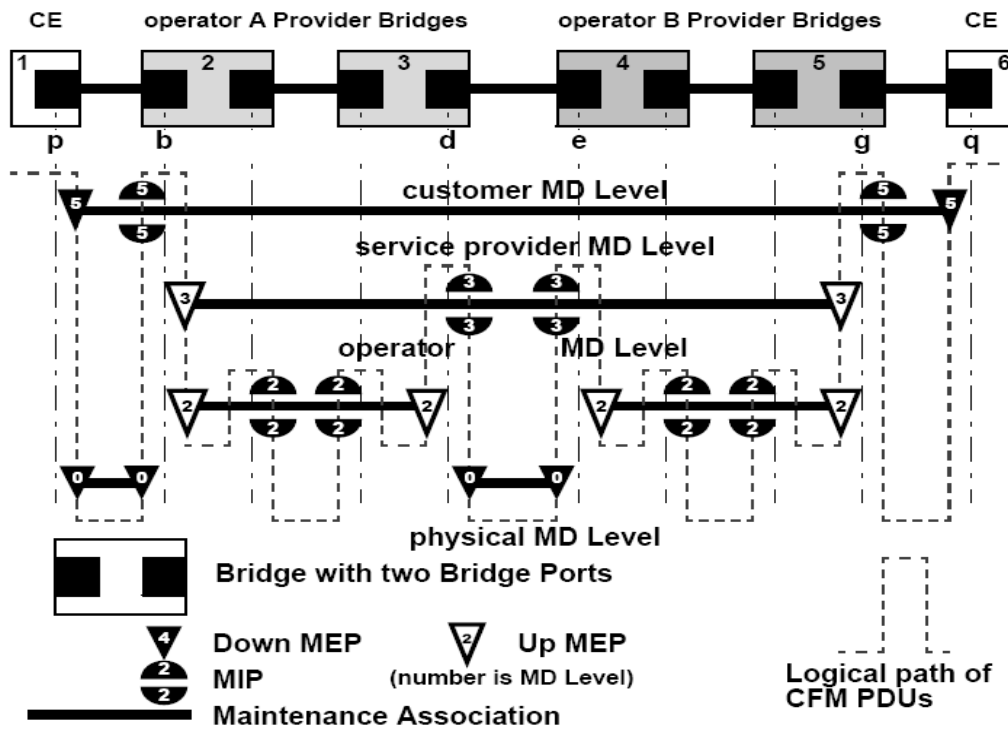


Figure 24: MEP, MIP and MD Levels

Ethernet service OAM can be deployed in the broadband access network.

There are two models, residential and wholesale (Figure 25 and Figure 26).

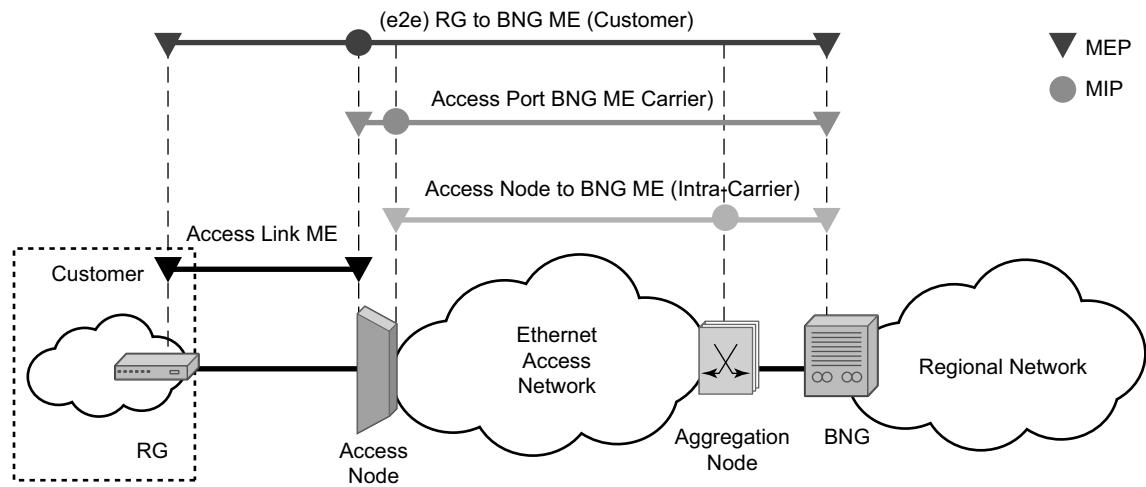


Fig_11

Figure 25: Ethernet OAM Model for Broadband Access - Residential

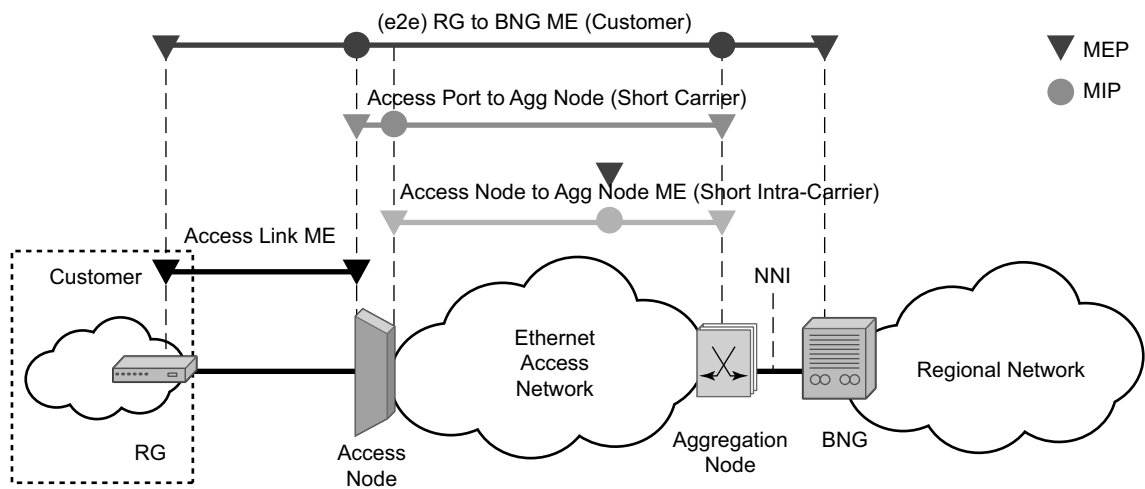


Fig_12

Figure 26: Ethernet OAM Model for Broadband Access - Wholesale

As shown in Figure 25 and Figure 26, the following functions are supported:

- CFM can be enabled or disabled on a SAP or SDP basis.

- Three MD levels, customer, carrier, and intra-carrier, can be configured, modified, or deleted.
- The following MD name formats are supported:
 - None — no MD name
 - DNS name
 - MAC address and 2-octet integer
 - Character string
- MA with MA-ID for each MD level can be configured, modified, or deleted.
 - Each MA is uniquely identified by the MD level, short MA name tuple, which is the MA-ID.
 - The following short MA name formats are supported:
 - Primary VLAN ID (VID)
 - Character string
 - 2-octet integer
 - RFC 2685, *Virtual Private Networks Identifier*
 - Note: When a VID is used as the short MA name, CFM will not support VLAN translation because the MA-ID must match all the MEPs.
 - The default format for a short MA name is an integer. Integer value 0 means the MA is not attached to a VID. This is useful for VPLS services on SR/ESS platforms because the VID is locally significant.
- Up and/or down MEP with an MEP-ID on a SAP and SDP for each MD level can be configured, modified, or deleted. Each MEP is uniquely identified by the MA-ID, MEP-ID tuple.
 - MEP creation on a SAP is allowed only for Ethernet ports (with null, q-tags, qinq encapsulations).
- MIP creation on a SAP and SDP for each MD level can be enabled and disabled. MIP creation is automatic when it is enabled. When MIP creation is disabled for an MD level, the existing MIP is removed.
- MIP creation is not supported on mesh SDP bindings.

Loopback

A loopback message is generated by an MEP to its peer MEP or an MIP. The functions are similar to an IP ping to verify Ethernet connectivity between the nodes.

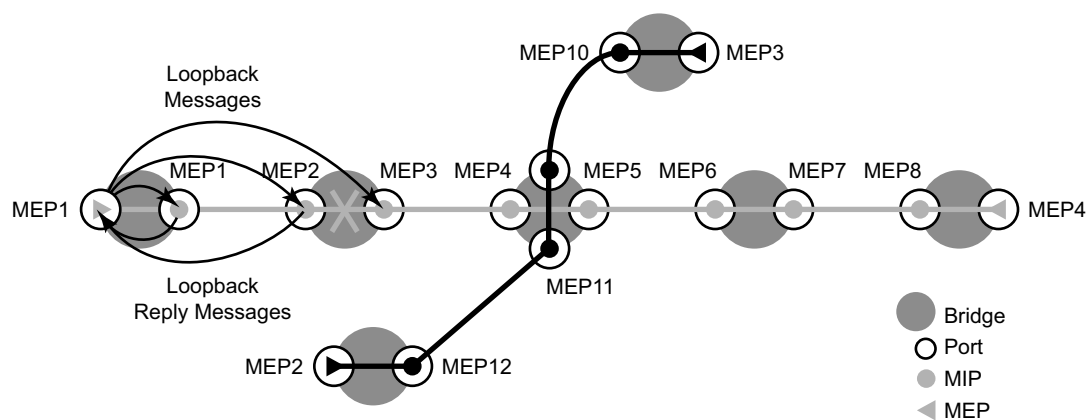


Fig_14

Figure 27: CFM Loopback

The following loopback-related functions are supported:

- Loopback message functionality on an MEP or MIP can be enabled or disabled.
- MEP — Supports generating loopback messages and responding to loopback messages with loopback reply messages.
- MIP — Supports responding to loopback messages with loopback reply messages when loopback messages are targeted to self.
- Displays the loopback test results on the originating MEP.

Linktrace

A linktrace message is originated by an MEP and targeted to a peer MEP in the same MA and within the same MD level (Figure 28). Its function is similar to IP traceroute. Traces a specific MAC address through the service. The peer MEP responds with a linktrace reply message after successful inspection of the linktrace message. The MIPs along the path also process the linktrace message and respond with linktrace replies to the originating MEP if the received linktrace message has a TTL greater than 1 and forward the linktrace message if a look up of the target MAC address in the Layer 2 FIB is successful. The originating MEP shall expect to receive multiple linktrace replies and from processing the linktrace replies, it can put together the route to the target bridge.

A traced MAC address is carried in the payload of the linktrace message. Each MIP and MEP receiving the linktrace message checks whether it has learned the target MAC address. In order to use linktrace the target MAC address must have been learned by the nodes in the network. If so, a linktrace message is sent back to the originating MEP. Also, a MIP forwards the linktrace message out of the port where the target MAC address was learned.

The linktrace message itself has a multicast destination address. On a broadcast LAN, it can be received by multiple nodes connected to that LAN. But, at most, one node will send a reply.

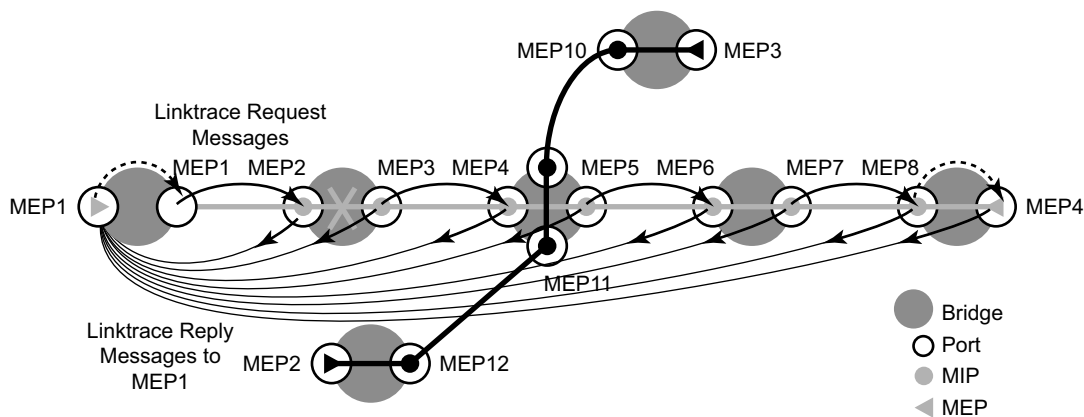


Fig_13

Figure 28: CFM Linktrace

The following linktrace related functions are supported:

- Enables/disables LT functions on an MEP.
- MEP — Supports generating Linktrace Messages and responding with Linktrace Reply messages.
- MIP — Supports responding to linktrace messages with linktrace reply messages when encoded TTL is greater than 1, and forward the linktrace messages accordingly if a lookup of the target MAC address in the Layer 2 FIB is successful.
- Displays linktrace test results on the originating MEP.

Continuity Check (CC)

A Continuity Check Message (CCM) is a multicast frame that is generated by an MEP to its remote MEPs in the same MA. The CCM does not require a reply message. To identify faults, the receiving MEP maintains an MEP database with the MAC addresses of the remote MEPs that it expects to maintain connectivity checking. The MEP database can be provisioned manually or dynamically built via learning. Only static provisioning is supported. When there is no CCM from a monitored remote MEP in a pre-configured period, the local MEP raises an alarm.

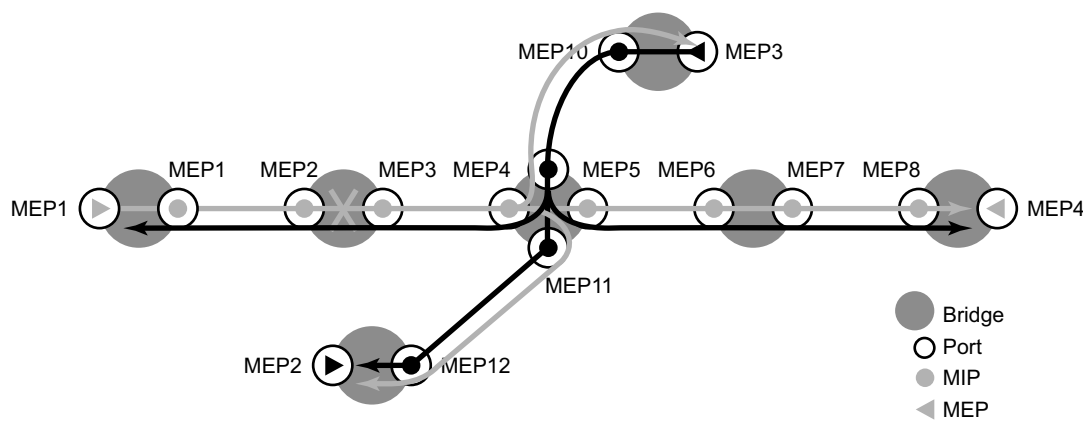


Fig_15

Figure 29: CFM Continuity Check

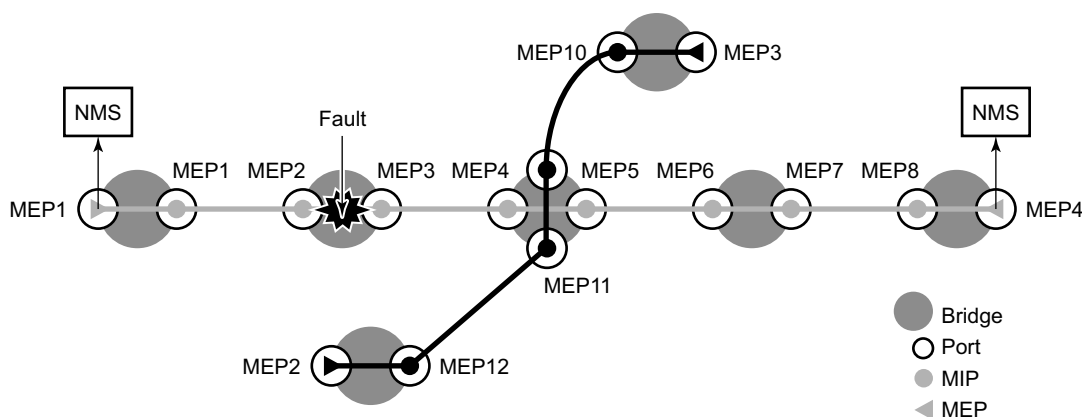


Fig_16

Figure 30: CFM CC Failure Scenario

The following functions are supported:

- Enable and disable CC for an MEP
- Configure and delete the MEP entries in the CC MEP monitoring database manually. It is only required to provision remote MEPs. Local MEPs shall be automatically put into the database when they are created.
- CCM transmit interval in seconds: 0, 1, 10, 60, 600. Default: 10.
- CCM will declare a fault, when:
 - The CCM stops hearing from one of the remote MEPs for 3.5 times CC interval
 - Hears from a MEP with a lower MD level
 - Hears from a MEP that is not in our MA
 - Hears from a MEP that is in the same MA but not in the configured MEP list
 - Hears from a MEP in the same MA with the same MEP id as the receiving MEP
 - The CC interval of the remote MEP does not match the local configured CC interval
 - The remote MEP is declaring a fault
- An alarm is raised and a trap is sent if the defect is greater than or equal to the configured low-priority-defect value.

ETH-CFM Features

Rate Limiting CFM Messages

To mitigate malicious DOS attack through CFM OAM messages, rate limiting of CFM traffic is supported.

MIP Provisioning Without Lower Level MEPs

The system supports MIP provisioning without requiring lower level MEPs on the same SAP/SDP. Network operators can use the default option for mhf-creation for the MA. MIPs then can be provisioned under the SAP or SDP bindings.

Note that level 0 should be used only for a local segment only so OAM traffic for level 0 will not transit through the MIP.

Maintenance Entity Group (MEG) ID

Y.1731 is an ITU-T recommendation that specifies mechanisms required to operate and maintain network and service aspects of the Ethernet layer. Also, it specifies Ethernet OAM frame formats, syntax, and semantics of OAM frame fields. The OAM mechanisms apply to both point-to-point ETH connections and multi-point ETH connectivity. The OAM mechanisms are applicable to environments where the ETH layer is managed by using network management systems and/or operational support systems.

Like 802.1ag MA, Y.1731 Maintenance Entity Group (MEG) uniquely identifies a group of MEs that are associated at the same level in one administrative domain.

The features of maintenance entity group identifiers (MEG IDs) are:

- Each MEG ID must be globally unique
- Where it may be expected that the MEG may be required for path set-up across an inter-operator boundary, the MEG ID must be available to other network operators.
- The MEG ID should not change while the MEG remains in existence.
- The MEG ID should be able to identify the network operator which is responsible for the MEG.

The generic format of MEG IDs specific to the recommendation is shown in [Table 2](#).

Table 2: Generic MEG ID Format

	8	7	6	5	4	3	2	1
1	Reserved (01)							
2	MEG ID format							
3	MEG ID length							
4	MEG ID value							
5								
:								
:								
48								

The MEG ID format type is identified by the MEG ID format field. Specific values of MEG ID format type are defined in [Table 3](#).

[Table 3](#) shows the format that uses the ITU Carrier Code (ICC). ICC is a code assigned to a network operator/service provider, maintained by the ITU-T Telecommunication Standardization Bureau (TSB) as per ITU-T Recommendation M.1400.

Table 3: Y.1731 — MEG ID Format Type

MEG ID Format Type Value	TLV Name
00-31, 64-255	Reserved*
Types specific to this recommendation	
32	ICC-based format
33 — 63	Reserved**

* Reserved for definition by IEEE 802.1

** Reserved for future standardization by ITU-T

The MEG ID value identified in [Table 4](#) consists of 13 characters coded according to ITU-T Recommendation T.50 (International Reference Alphabet, a 7-bit coded character set for information exchange).

It consists of two subfields, the ITU carrier code (ICC) followed by a unique MEG ID code (UMC). The ITU Carrier Code consists of 1-6 left-justified characters, alphabetic, or leading alphabetic with trailing numeric. The UMC code immediately follows the ICC and shall consist of 7 — 12 characters, with trailing NULLs, completing the 13-character MEG ID value. The UMC shall be a matter for the organization to which the ICC has been assigned, provided that uniqueness is guaranteed.

Table 4: ICC-based MEG ID Format

	8	7	6	5	4	3	2	1
1	Reserved (01)							
2	MEG ID format (32)							
3	MEG ID length (13)							
4	0	MEG ID value [1]						
5	0	MEG ID value [2]						
15	0	MEG ID value [12]						
16	0	MEG ID value [13]						
19	Unused (=all-ZEROs)							
20								
47								
48								

ETH-AIS

Ethernet Alarm Indication Signal function (ETH-AIS) is used to suppress alarms at the client (sub) layer following detection of defect conditions at the server (sub) layer. Due to independent restoration capabilities provided within the Spanning Tree Protocol (STP) environments, ETH-AIS is not expected to be applied in the STP environment.

Transmission of frames with ETH-AIS information can be enabled or disabled on a MEP.

Frames with ETH-AIS information can be issued at the client MEG Level by a MEP, including a Server MEP, upon detecting the following conditions:

- Signal failure conditions in the case that ETH-CC is enabled.
- AIS condition in the case that ETH-CC is disabled.

For a point-to-point ETH connection at the client (sub) layer, a client layer MEP can determine that the server (sub) layer entity providing connectivity to its peer MEP has encountered defect condition upon receiving a frame with ETH-AIS information. Alarm suppression is straightforward since a MEP is expected to suppress defect conditions associated only with its peer MEP.

For multipoint ETH connectivity at the client (sub) layer, a client (sub) layer MEP cannot determine the specific server (sub)layer entity that has encountered defect conditions upon receiving a frame with ETH-AIS information. More importantly, it cannot determine the associated subset of its peer MEPs for which it should suppress alarms since the received ETH-AIS information does not contain that information. Therefore, upon reception of a frame with ETH-AIS information, the MEP will suppress alarms for all peer MEPs whether there is still connectivity or not.

Only a MEP, including a Server MEP, is configured to issue frames with ETH-AIS information. Upon detecting a defect condition the MEP can immediately start transmitting periodic frames with ETHAIS information at a configured client MEG Level. A MEP continues to transmit periodic frames with ETH-AIS information until the defect condition is removed. Upon receiving a frame with ETH-AIS information from its server (sub) layer, a client (sub) layer MEP detects AIS condition and suppresses alarms associated with all its peer MEPs. A MEP resumes alarm generation upon detecting defect conditions once AIS condition is cleared.

Specific configuration information required by a MEP to support ETH-AIS is the following:

- Client MEG Level — MEG level at which the most immediate client layer MIPs and MEPs exist.
- ETH-AIS transmission period — Determines transmission periodicity of frames with ETH-AIS information.
- Priority — Identifies the priority of frames with ETH-AIS information.

- Drop Eligibility — Frames with ETH-AIS information are always marked as drop ineligible.

A MIP is transparent to frames with ETH-AIS information and therefore does not require any information to support ETH-AIS functionality.

ETH Test Function

The Ethernet test signal function (ETH-Test) is used to perform one way on-demand in-service or out-of-service diagnostics tests. This includes verifying bandwidth throughput, frame loss, bit errors, etc.

When configured to perform such tests, a MEP inserts frames with ETH-test information with specified throughput, frame size and transmission patterns.

When an in-service ETH-test function is performed, data traffic is not disrupted and the frames with ETH-Test information are transmitted in such a manner that limited part of the service bandwidth is utilized. This rate of transmission for frames with ETH-test information is pre-determined for in-service ETH-test function.

Specific configuration information required by a MEP to support ETH-test is the following:

- MEG level — MEG level at which the MEP exists
- Unicast MAC address of the peer MEP for which ETH-test is intended.
- Data - Optional element whose length and contents are configurable at the MEP. The contents can be a test pattern and an optional checksum. Examples of test patterns include pseudorandom bit sequence (PRBS) ($2^{31}-1$) as specified in sub-clause 5.8/O.150, all “0” pattern, etc. At the transmitting MEP, configuration is required for a test signal generator which is associated with the MEP. At a receiving MEP, configuration is required for a test signal detector which is associated with the MEP.
- Priority — Identifies the priority of frames with ETH-Test information.
- Drop Eligibility — Identifies the eligibility of frames with ETHTest information to be dropped when congestion conditions are encountered.

A MIP is transparent to the frames with ETH-Test information and therefore does not require any configuration information to support ETH-Test functionality.

A MEP inserts frames with ETH-Test information towards a targeted peer MEP. The receiving MEP detects these frames with ETH-Test information and makes the intended measurements.

Time stamping is performed by the CPM P-chip to ensure accuracy on multi-slot chassis.

Performance Monitoring Functions

OAM functions for performance monitoring allow measurement of different performance parameters where such measurements are carried out for error performance. The performance parameters are defined for point-to-point ETH connections. Performance parameters and functions for multipoint ETH connectivity are for further study.

The recommendation covers the following performance parameters, which are based on MEF 10.

- Frame delay — Specified as one-way or round-trip delay for a frame, where frame delay is defined as the time elapsed since the start of transmission of the first bit of the frame by a source node until the reception of the frame by the destination node or the same source node.
- Frame delay variation — A measure of the variations in the frame delay between a pair of service frames, where the service frames belong to the same CoS instance on a point-to-point ETH connection.

Performance parameters are applicable to services frames. Services frames are those frames that conform to an agreed-upon level of bandwidth profile conformance and are associated with a particular CoS identifier. Service frames are admitted at the ingress ETH flow point of a point-to-point ETH connection and should be delivered to the egress ETH flow point. Specification of bandwidth profile conformance is outside the scope of this recommendation.

One-way and two-way ETH-DM (section 8.2 of Y.1731) must be supported

For ETH-DM, the accuracy of the measurement will be in nanoseconds range, +1 or -1 ms in the best case.

Configuring ETH-CFM Parameters

The following example displays an 802.1ag configuration.

```
*A:sr7_A>config>eth-cfm# info
-----
    domain 1 name "1" level 1
      association 1 format string name "1"
        bridge-identifier 50
        exit
        ccm-interval 1
      exit
      association 2 name "1345"
        bridge-identifier 100
        exit
        ccm-interval 60
        remote-mepid 2
        remote-mepid 3
      exit
    exit
-----

*A:sr7_A>config>eth-cfm#

*A:sr7_A>config>service# info
-----
    ies 50 customer 1 vpn 50 create
      description "Default Ies description for service id 50"
      interface "ies-50-9.9.9.1" create
        address 9.9.9.1/24
        sap 2/2/1:20 create
          description "sap-50-9.9.9.1"
          eth-cfm
            mep 1 domain 1 association 1 direction down
              no shutdown
            exit
          exit
        exit
      exit
    exit
    customer 1 create
      description "Default customer"
    exit
  exit

  vpls 100 customer 1 b-vpls create
    stp
      shutdown
    exit
    eth-cfm
      mep 123 domain 1 association 2
        ccm-enable
        no shutdown
      exit
    exit
  no shutdown
```

```
exit
```

The following example displays a Y.1731 configuration.

```
*A:sr7_A>config>eth-cfm# info
```

```
-----
domain 1 format none level 1
  association 1 format icc-based name "1234567890123"
    bridge-identifier 100
    exit
    ccm-interval 1
  exit
exit
```

```
*A:sr7_A>config>service# info
```

```
-----
vpls 100 customer 1 b-vpls create
  stp
    shutdown
  exit
  sap 2/2/1:40 create
    eth-cfm
      mep 1 domain 1 association 1 direction up
        ais-enable
          priority 2
          interval 60
        exit
        eth-test-enable
          test-pattern all-ones crc-enable
        exit
        no shutdown
      exit
    exit
  exit
  no shutdown
exit
```



Note: To be able to transmit and also receive AIS PDUs, a Y.1731 MEP must have ais-enable set. To be able to transmit and also receive ETH-Test PDUs, a Y.1731 MEP must have eth-test-enable set.

Applying ETH-CFM Parameters

Apply ETH-CFM parameters to the following entities.

CLI Syntax: `config>service>epipe>sap`
`eth-cfm`
`mep mep-id domain md-index association ma-index [direction`
`{up | down}]`
`ais-enable`
`client-meg-level [[level [level ...]]`
`interval {1 | 60}`
`priority priority-value`
`ccm-enable`
`ccm-ltm-priority priority`
`eth-test-enable`
`test-pattern {all-zeros | all-ones} [crc-enable]`
`low-priority-defect {allDef | macRemErrXcon | remErrX-`
`con | errXcon | xcon | noXcon}`
`mac-address mac-address`
`[no] shutdown`

CLI Syntax: `config>service>epipe>spoke-sdp`
`eth-cfm`
`mep mep-id domain md-index association ma-index [direction`
`{up | down}]`
`ccm-enable`
`ccm-ltm-priority priority`
`eth-test-enable`
`test-pattern {all-zeros | all-ones} [crc-enable]`
`low-priority-defect {allDef|macRemErrXcon|remErrX-`
`con|errXcon|xcon|noXcon}`
`mac-address mac-address`
`[no] shutdown`

CLI Syntax: `config>service>ies>if>sap`
`eth-cfm`
`mep mep-id domain md-index association ma-index [direction`
`{up | down}]`
`ccm-enable`
`ccm-ltm-priority priority`
`eth-test-enable`
`test-pattern {all-zeros | all-ones} [crc-enable]`
`low-priority-defect {allDef|macRemErrXcon|remErrX-`
`con|errXcon|xcon|noXcon}`
`mac-address mac-address`
`[no] shutdown`

CLI Syntax: config>service>ies>if>spoke-sdp *sdp-id:vc-id*
 eth-cfm
 mep *mep-id* domain *md-index* association *ma-index* [direction {up | down}]
 no mep *mep-id* domain *md-index* association *ma-index*
 [no] ccm-enable
 ccm-ltm-priority *priority*
 eth-test-enable
 test-pattern {all-zeros | all-ones} [crc-enable]
 low-priority-defect {allDef|macRemErrXcon|remErrXcon|errXcon|xcon|noXcon}
 mac-address *mac-address*
 [no] shutdown

CLI Syntax: config>service>vpls>sap
 eth-cfm
 mip
 mep *mep-id* domain *md-index* association *ma-index* [direction {up | down}]
 no mep *mep-id* domain *md-index* association *ma-index*
 ccm-enable
 ccm-ltm-priority *priority*
 eth-test-enable
 test-pattern {all-zeros | all-ones} [crc-enable]
 low-priority-defect {allDef|macRemErrXcon|remErrXcon|errXcon|xcon|noXcon}
 mac-address *mac-address*
 [no] shutdown

CLI Syntax: config>service>vpls>mesh-sdp *sdp-id[:vc-id]* [vc-type {ether | vlan}]
 eth-cfm
 mep *mep-id* domain *md-index* association *ma-index* [direction {up | down}]
 ccm-enable
 ccm-ltm-priority *priority*
 eth-test-enable
 test-pattern {all-zeros | all-ones} [crc-enable]
 low-priority-defect {allDef|macRemErrXcon|remErrXcon|errXcon|xcon|noXcon}
 mac-address *mac-address*
 [no] shutdown

CLI Syntax: config>service>vpls
 spoke-sdp *sdp-id:vc-id* [vc-type {ether | vlan}] [split-horizon-group *group-name*] [no-endpoint]
 spoke-sdp *sdp-id:vc-id* [vc-type {ether | vlan}] [split-horizon-group *group-name*] endpoint *endpoint*
 eth-cfm

```

map mep-id domain md-index association ma-index [direction
{up | down}]
    ccm-enable
    ccm-ltm-priority priority
    eth-test-enable
        test-pattern {all-zeros | all-ones} [crc-enable]
    low-priority-defect {allDef | macRemErrXcon|remErrX-
        con|errXcon|xcon|noXcon}
    mac-address mac-address
    [no] shutdown

```

CLI Syntax: oam

```

eth-cfm linktrace mac-address mep mep-id domain md-index as-
sociation ma-index [ttl ttn-value]

```

```

eth-cfm loopback mac-address mep mep-id domain md-index as-
sociation ma-index [send-count send-count] [size data-size]
[priority priority]

```

```

eth-cfm eth-test <mac-address> mep <mep-id> domain <md-index>
association <ma-index> [priority <priority>] [data-length
<data-length>]

```

```

eth-cfm one-way-delay-test <mac-address> mep <mep-id> domain
<md-index> association <ma-index> [priority <priority>]

```

```

eth-cfm two-way-delay-test <mac-address> mep <mep-id> domain
<md-index> association <ma-index> [priority <priority>]

```

Service Management Tasks

This section discusses the following service management tasks:

- [Modifying Customer Accounts on page 120](#)
 - [Deleting Customers on page 121](#)
 - [Modifying SDPs on page 121](#)
 - [Deleting SDPs on page 122](#)
-

Modifying Customer Accounts

To access a specific customer account, you must specify the customer ID.

To display a list of customer IDs, use the show service customer command.

Enter the parameter (description, contact, phone) and then enter the new information.

CLI Syntax:

```
config>service# customer customer-id create
[no] contact contact-information
[no] description description-string
[no] multi-service-site customer-site-name [create]
    assignment {port port-id | card slot}
    no assignment
[no] description description-string
egress
    scheduler-policy scheduler-policy-name
    no scheduler-policy
ingress
    scheduler-policy scheduler-policy-name
    no scheduler-policy
tod-suite tod-suite-name
[no] phone phone-number
```

Example:

```
config>service# customer 27 create
config>service>customer$ description "Western Division"
config>service>customer# contact "John Dough"
config>service>customer# no phone "(650) 237-5102"
```

Deleting Customers

The no form of the customer command removes a customer ID and all associated information. All service references to the customer must be shut down and deleted before a customer account can be deleted.

CLI Syntax: `config>service# no customer customer-id`

Example:

```
config>service# epipe 5 customer 27 shutdown
config>service# epipe 9 customer 27 shutdown
config>service# no epipe 5
config>service# no epipe 9
config>service# no customer 27
```

Modifying SDPs

To access a specific SDP, you must specify the SDP ID. To display a list of SDPs, use the show service sdp command. Enter the parameter, such as description, far-end, and lsp, and then enter the new information.

NOTE: Once created, you cannot modify the SDP encapsulation type.

CLI Syntax: `config>service# sdp sdp-id`

Example:

```
config>service# sdp 79
config>service>sdp# description "Path-to-107"
config>service>sdp# shutdown
config>service>sdp# far-end "10.10.10.107"
config>service>sdp# path-mtu 1503
config>service>sdp# no shutdown
```

Deleting SDPs

The no form of the **sdp** command removes an SDP ID and all associated information. Before an SDP can be deleted, the SDP must be shutdown and removed (unbound) from all customer services where it is applied.

CLI Syntax: `config>service# no sdp 79`

Example:

```
config>service# epipe 5 spoke-sdp 79:5
config>service>epipe>sdp# shutdown
config>service>epipe>sdp# exit
config>service>epipe# exit
config>service# no sdp 79
```

Global Services Command Reference

Command Hierarchies

- [Customer Commands on page 123](#)
- [Pseudowire Template Commands on page 125](#)
- [SDP Commands on page 127](#)
- [SAP Commands on page 128](#)
- [ETH-CFM Configuration Commands on page 128](#)
- [Egress Multicast Group Commands on page 611](#)
- [Provider Edge Discovery Policy Commands on page 612](#)
- [Show Commands on page 129](#)

Customer Commands

```

config
  — service
    — [no] customer customer-id
      — contact contact-information
      — no contact
      — description description-string
      — no description
      — multi-service-site customer-site-name
      — no multi-service-site customer-site-name
        — assignment {port port-id | card slot-number}
        — no assignment
        — description description-string
        — no description
        — egress
          — agg-rate-limit agg-rate [queue-frame-based-accounting]
          — no agg-rate-limit
          — [no] scheduler-override
            — [no] scheduler scheduler-name
              — rate pir-rate [cir cir-rate]
              — no rate
            — scheduler-policy scheduler-policy-name
            — no scheduler-policy
        — ingress
          — [no] scheduler-override
            — [no] scheduler scheduler-name
              — rate pir-rate [cir cir-rate]
              — no rate

```

```

— scheduler-policy scheduler-policy-name
— no scheduler-policy
— tod-suite tod-suite-name
— no tod-suite
— [no] phone phone-number
— mrp
— [no] mrp-policy policy-name
— description description-string
— no description
— scope {exclusive | template}
— no scope
— default-action {block | allow}
— [no] entry entry-id
— description description-string
— no description
— [no] match
— [no] isid value | from value to higher-value
— action {block | allow | end-station}
— no action
— copy mrp-policy source-name to dest-name
— renum old-entry-id to new-entry-id

```


Pseudowire Template Commands

```

config
— service
— [no] pw-template sdp-template-id
— accounting-policy acct-policy-id
— no accounting-policy
— [no] collect-stats
— [no] control-word
— [no] control-word
— [no] disable-learning
— [no] discard-unknown-source
— egress
— filter ip ip-filter-id
— filter ipv6 ipv6-filter-id
— filter mac mac-filter-id
— no filter [ip ip-filter-id] [mac mac-filter-id] [ipv6 ipv6-filter-id]
— mfib-allowed-mda-destinations
— [no] mda mda-id
— [no] hash-label
— [no] force-vlan-vc-forwarding
— igmp-snooping
— [no] fast-leave
— import policy-name
— no import
— last-member-query-interval 1/10 seconds
— no last-member-query-interval
— max-num-groups max-num-groups
— no max-num-groups
— query-interval seconds
— no query-interval
— query-response-interval seconds
— no query-response-interval
— robust-count robust-count
— no robust-count
— [no] send-queries
— version version
— no version
— ingress
— filter ip ip-filter-id
— filter ipv6 ipv6-filter-id
— filter mac mac-filter-id
— no filter [ip ip-filter-id] [mac mac-filter-id] [ipv6 ipv6-filter-id]
— vc-label ingress-vc-label
— no vc-label
— limit-mac-move {blockable | non-blockable}
— no limit-mac-move
— [no] mac-pinning
— max-nbr-mac-addr table-size
— no max-nbr-mac-addr
— split-horizon-group group-name [residential-group]
— no split-horizon-group

```

- **description** *description-string*
- **no description**
- **restrict-protected-src** [**alarm-only**]
- **no restrict-protected-src**
- [**no**] **restrict-unprotected-dst**
- **vc-type** {**ether** | **vlan**}
- **vlan-vc-tag** *0..4094*
- **no vlan-vc-tag**

SDP Commands

```

config
— service
— sdp sdp-id [gre | mpls]
— no sdp sdp-id
— accounting-policy acct-policy-id
— no accounting-policy
— [no] adv-mtu-override
— [no] bgp-tunnel
— booking-factor percentage
— no booking-factor
— class-forwarding [default-lsp lsp-name]
— no class-forwarding
— [no] enforce-diffserv-lsp-fc
— fc {be | l2 | af | l1 | h2 | ef | h1 | nc} lsp lsp-name
— no fc {be | l2 | af | l1 | h2 | ef | h1 | nc}
— multicast-lsp lsp-name
— no multicast-lsp
— [no] shutdown
— [no] collect-stats
— description description-string
— no description
— far-end ip-address
— no far-end
— keep-alive
— hello-time seconds
— no hello-time
— hold-down-time seconds
— no hold-down-time
— max-drop-count count
— no max-drop-count
— message-length octets
— no message-length
— [no] shutdown
— timeout timeout
— no timeout
— [no] ldp
— [no] lsp lsp-name
— metric metric
— no metric
— [no] mixed-lsp-mode
— [no] sdp-revert-time seconds | infinite
— network-domain network-domain-name
— no network-domain
— path-mtu octets
— no path-mtu
— pbb-etype [0x0600..0xffff]
— no pbb-etype
— [no] shutdown
— signaling [off | tl dp|bgp]
— vlan-vc-etype 0x0600..0xffff

```

SAP Commands

```

config
— service
    — apipe
        — sap sap-id [create] [no-endpoint]
        — sap sap-id [create] endpoint endpoint-name
        — no sap sap-id
    — epipe
        — sap sap-id [create] [no-endpoint]
        — sap sap-id [create] endpoint endpoint-name
        — no sap sap-id
    — fpipe
        — sap sap-id [create] [no-endpoint]
        — sap sap-id [create] endpoint endpoint-name
        — no sap sap-id
    — ies
        — sap sap-id [create]
        — no sap sap-id
    — ipipe
        — sap sap-id [create] [no-endpoint]
        — sap sap-id [create] endpoint endpoint-name
        — no sap sap-id
    — vpls
        — sap sap-id [split-horizon-group group-name] [create]
        — no sap sap-id
    — vprn
        — sap sap-id [create]
        — no sap sap-id

```

ETH-CFM Configuration Commands

```

config
— eth-cfm
    — domain md-index [format {dns | mac | none | string}] name md-name level level
    — domain md-index
    — no domain md-index
        — association ma-index [format {icc-based | integer | string | vid | vpn-id}] name ma-name
        — association ma-index
        — no association ma-index
            — [no] bridge-identifier bridge-id
                — mhf-creation {none | explicit}
                — no mhf-creation
                — vlan vlan-id
                — no vlan
            — ccm-interval {10ms | 100ms | 1 | 10 | 60 | 600}
            — no ccm-interval
            — [no] remote-mepid mep-id

```

Show Commands

```

show
— service
— customer [customer-id] [site customer-site-name]
— isid-using [ISID]
— l2-route-table [detail] [bgp-ad] [multi-homing] [bgp-vpls]
— l2-route-table [msap]
— l2-route-table [sap sap-id] [vlan-transation | anti-spoof]
— l2-route-table app-profile app-profile name
— l2-route-table authentication-policy policy-name [msap]
— l2-route-table encap-type encap-type
— l2-route-table eth-tunnel [tunnel-id eth-tunnel-id]
— l2-route-table ingress|egress atm-td-profile td-profile-id
— l2-route-table ingress|egress filter filter-id
— l2-route-table ingress|egress qos-polify qos-polify-id [msap]
— l2-route-table interface ip-address|ip-int-name [msap]
— l2-route-table mc-ring peer ip-address ring sync-tag
— sdp [sdp-id | far-end ip-addr] [detail | keep-alive-history]
— sdp-using [sdp-id[:vc-id] | far-end ip-address]
— service-using [epipe] [ies] [vpls] [vprn] [mirror] [b-vpls] [i-vpls] [m-vpls] [apipe] [fpipe]
  [ipipe] [sdp sdp-id] [customer customer-id]
— eth-cfm
— eth-tunnel {aps|status}
— eth-tunnel tunnel-index [path path-index] [detail]
— eth-tunnel
  — association [ma-index] [detail]
  — cfm-stack-table [port [port-id [vlan vlan-id]]] [sdp sdp-id[:vc-id]] [level 0..7] [direction up |
    down]
  — domain [md-index] [association ma-index | all-associations] [detail]
  — mep mep-id domain md-index association ma-index [loopback] [linktrace]
  — mep mep-id domain md-index association ma-index remote-mepid mep-id | all-remote-
    mepids
  — mep mep-id domain md-index association ma-index eth-test-results [remote-peer mac-
    address]
  — mep mep-id domain md-index association ma-index one-way-delay-test [remote-peer mac-
    address]
  — mep mep-id domain md-index association ma-index two-way-delay-test [remote-peer mac-
    address]
  — mip
  — sdp [sdp-id | far-end ip-address] [detail | keep-alive-history]

```

Global Service Configuration Commands

Generic Commands

shutdown

Syntax	[no] shutdown
Context	config>eth-cfm>mep config>service>sdp config>service>sdp>class-forwarding config>service>sdp>keep-alive config>service>sdp>forwarding-class
Description	This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they may be deleted. Services are created in the administratively down (shutdown) state. When a no shutdown command is entered, the service becomes administratively up and then tries to enter the operationally up state. Default administrative states for services and service entities is described below in Special Cases. The no form of this command places the entity into an administratively enabled state.
Special Cases	Service Admin State — Bindings to an SDP within the service will be put into the out-of-service state when the service is shutdown. While the service is shutdown, all customer packets are dropped and counted as discards for billing and debugging purposes. SDP (global) — When an SDP is shutdown at the global service level, all bindings to that SDP are put into the out-of-service state and the SDP itself is put into the administratively and operationally down states. Packets that would normally be transmitted using this SDP binding will be discarded and counted as dropped packets. SDP (service level) — Shutting down an SDP within a service only affects traffic on that service from entering or being received from the SDP. The SDP itself may still be operationally up for other services. SDP Keepalives — Enables SDP connectivity monitoring keepalive messages for the SDP ID. Default state is disabled (shutdown) in which case the operational state of the SDP-ID is not affected by the keepalive message state.

description

Syntax	description <i>description-string</i> no description
Context	config>service>customer config>service>customer>multi-service-site config>service>pw-template config>service>pw-template>split-horizon-group config>service>sdp
Description	This command creates a text description stored in the configuration file for a configuration context. The description command associates a text string with a configuration context to help identify the content in the configuration file. The no form of this command removes the string from the configuration.
Default	No description associated with the configuration context.
Parameters	<i>string</i> — The description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

Customer Management Commands

customer

Syntax	customer <i>customer-id</i> [create] no customer <i>customer-id</i>
Context	config>service
Description	This command creates a customer ID and customer context used to associate information with a particular customer. Services can later be associated with this customer at the service level. Each <i>customer-id</i> must be unique. The <i>create</i> keyword must follow each new customer <i>customer-id</i> entry. Enter an existing customer <i>customer-id</i> (without the <i>create</i> keyword) to edit the customer's parameters. Default customer 1 always exists on the system and cannot be deleted. The no form of this command removes a <i>customer-id</i> and all associated information. Before removing a <i>customer-id</i>, all references to that customer in all services must be deleted or changed to a different customer ID.
Parameters	<i>customer-id</i> — Specifies the ID number to be associated with the customer, expressed as an integer. Values 1 — 2147483647

contact

Syntax	contact <i>contact-information</i> no contact <i>contact-information</i>
Context	config>service>customer
Description	This command allows you to configure contact information for a customer. Include any customer-related contact information such as a technician's name or account contract name.
Default	No contact information is associated with the <i>customer-id</i>. The no form of this command removes the contact information from the customer ID.
Parameters	<i>contact-information</i> — The customer contact information entered as an ASCII character string up to 80 characters in length. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Any printable, seven bit ASCII characters may be used within the string.

multi-service-site

Syntax	multi-service-site <i>customer-site-name</i> [create] no multi-service-site <i>customer-site-name</i>
Context	config>service>customer
Description	This command creates a new customer site or edits an existing customer site with the <i>customer-site-name</i> parameter. A customer site is an anchor point to create an ingress and egress virtual scheduler hierarchy. When a site is created, it must be assigned to a chassis slot or port with the exception of the 7750 SR-1 in which the slot is set to 1. When scheduler policies are defined for ingress and egress, the scheduler names contained in each policy are created according to the parameters defined in the policy. Multi-service customer sites exist for the sole purpose of creating a virtual scheduler hierarchy and making it available to queues on multiple Service Access Points (SAPs). The scheduler policy association with the customer site normally prevents the scheduler policy from being deleted until after the scheduler policy is removed from the customer site. The multi-service-site object will generate a log message indicating that the association was deleted due to scheduler policy removal. When the multi-service customer site is created, an ingress and egress scheduler policy association does not exist. This does not prevent the site from being assigned to a chassis slot or prevent service SAP assignment. After the site has been created, the ingress and egress scheduler policy associations can be assigned or removed at any time.
Default	None — Each customer site must be explicitly created.
Parameters	<i>customer-site-name</i> — Each customer site must have a unique name within the context of the customer. If <i>customer-site-name</i> already exists for the customer ID, the CLI context changes to that site name for the purpose of editing the site scheduler policies or assignment. Any modifications made to an existing site will affect all SAPs associated with the site. Changing a scheduler policy association may cause new schedulers to be created and existing queues on the SAPs to no longer be orphaned. Existing schedulers on the site may cease to exist, causing queues relying on that scheduler to be orphaned. If the <i>customer-site-name</i> does not exist, it is assumed that an attempt is being made to create a site of that name in the customer ID context. The success of the command execution depends on the following: • The maximum number of customer sites defined for the chassis has not been met. • The <i>customer-site-name</i> is valid. • The create keyword is included in the command line syntax (if the system requires it). When the maximum number of customer sites has been exceeded a configuration error occurs; the command will not execute and the CLI context will not change. If the <i>customer-site-name</i> is invalid, a syntax error occurs; the command will not execute and the CLI context will not change. Values Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

phone

Syntax	[no] phone <i>string</i>
Context	config>service>customer <i>customer-id</i>
Description	This command adds telephone number information for a customer ID.
Default	none The no form of this command removes the phone number value from the customer ID.
Parameters	<i>string</i> — The customer phone number entered as an ASCII string string up to 80 characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Any printable, seven bit ASCII characters may be used within the string.

mrp

Syntax	mrp
Context	config>service
Description	This command configures an MRP.

mrp-policy

Syntax	[no] mrp-policy <i>policy-name</i>
Context	config>service>mrp
Description	This command enables the context for a MRP policy. The mrp-policy specifies either a forward or a drop action for the Group BMAC attributes associated with the ISIDs specified in the match criteria. The mrp-policy can be applied to multiple BVPLS services as long as the scope of the policy is template. Any changes made to the existing policy, using any of the sub-commands, will be applied immediately to all services where this policy is applied. For this reason, when many changes are required on a mrp-policy, it is recommended that the policy be copied to a work area. That work-in-progress policy can be modified until complete and then written over the original mrp-policy. Use the config mrp-policy copy command to maintain policies in this manner. The no form of the command deletes the mrp-policy. A mrp policy cannot be deleted until it is removed from all the SAPs or SDPs where it is applied.
Default	no mrp-policy is defined
Parameters	<i>policy-name</i> — Specifies the redirect policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. create — 1.Keyword; required when first creating the configuration context. Once the context is created, it is possible to navigate into the context without the create keyword.

scope

Syntax	scope {exclusive template} no scope
Context	config>service>mrp>mrp-policy
Description	This command configures the filter policy scope as exclusive or template. If the scope of the policy is template and is applied to one or more services, the scope cannot be changed. The no form of the command sets the scope of the policy to the default of template.
Default	template
Parameters	exclusive — When the scope of a policy is defined as exclusive, the policy can only be applied to a single entity (SAP or SDP). Attempting to assign the policy to a second entity will result in an error message. If the policy is removed from the entity, it will become available for assignment to another entity. template — When the scope of a policy is defined as template, the policy can be applied to multiple SAPs or network ports.

default-action

Syntax	default-action {block allow}
Context	config>service>mrp>mrp-policy
Description	This command specifies the action to be applied to the MMRP attributes (Group BMACs) whose ISIDs do not match the specified criteria in all of the entries of the mrp-policy. When multiple default-action commands are entered, the last command will overwrite the previous command.
Default	default-action-allow
Parameters	block — Specifies that all MMRP attributes will not be declared or registered unless there is a specific mrp-policy entry which causes them to be allowed on this SAP/SDP. allow — Specifies that all MMRP attributes will be declared and registered unless there is a specific mrp-policy entry which causes them to be blocked on this SAP/SDP.

entry

Syntax	[no] entry entry-id
Context	config>service>mrp>mrp-policy
Description	This command creates or edits an mrp-policy entry. Multiple entries can be created using unique entry-id numbers within the policy. The implementation exits the policy on the first match found and executes the actions in accordance with the accompanying action command. For this reason, entries must be sequenced correctly from most to least explicit. An entry may not have any match criteria defined (in which case, everything matches) but must have at least the keyword action for it to be

considered complete. Entries without the action keyword will be considered incomplete and hence will be rendered inactive.

The no form of the command removes the specified entry from the mrp-policy. Entries removed from the mrp-policy are immediately removed from all services where the policy is applied.

The no form of the command removes the specified entry-id.

Default	none
Parameters	<i>entry-id</i> — An entry-id uniquely identifies a match criteria and the corresponding action. It is recommended that multiple entries be given entry-ids in staggered increments. This allows users to insert a new entry in an existing policy without requiring renumbering of all the existing entries. Values 1-65535 create — Keyword; required when first creating the configuration context. Once the context is created, one can navigate into the context without the create keyword.

match

Syntax	[no] match
Context	config>service>mrp>mrp-policy>entry
Description	This command creates the context for entering/editing match criteria for the mrp-policy entry. When the match criteria have been satisfied the action associated with the match criteria is executed. In the current implementation just one match criteria (ISID based) is possible in the entry associated with the mrp-policy. Only one match statement can be entered per entry. The no form of the command removes the match criteria for the entry-id.

isid

Syntax	[no] isid value from value to higher-value
Context	config>service>mrp>mrp-policy>entry>match
Description	This command configures an ISID value or a range of ISID values to be matched by the mrp-policy parent when looking at the related MMRP attributes (Group BMACs). The pbb-etype value for the related SAP (inherited from the ethernet port configuration) or for the related SDP binding (inherited from SDP configuration) will be used to identify the ISID tag. Multiple isid statements are allowed under a match node. The following rules govern the usage of multiple isid statements: - overlapping values are allowed: - isid from 1 to 10 - isid from 5 to 15 - isid 16

- the minimum and maximum values from overlapping ranges are considered and displayed. The above entries will be equivalent with “isid from 1 to 16” statement.
- there is no consistency check with the content of isid statements from other entries. The entries will be evaluated in the order of their IDs and the first match will cause the implementation to execute the associated action for that entry and then to exit the mrp-policy.
- If there are no isid statements under a match criteria but the mac-filter type is isid the following behaviors apply for different actions:
 - For end-station – it treats any ISID value as no match and goes to next entry or default action which must be “block” in this case
 - For allow – it treats any ISID value as a match and allows it
 - For block – it treats any ISID value as a match and blocks it

The **no** form of the command can be used in two ways:

no isid - removes all the previous statements under one match node

no isid value | from value to higher-value - removes a specific ISID value or range. Must match a previously used positive statement: for example if the command “isid 16 to 100” was used using “no isid 16 to 50” will not work but “no isid 16 to 100 will be successful.

Default	no isid
Parameters	<i>value or higher-value</i> — Specifies the ISID value in 24 bits. When just one present identifies a particular ISID to be used for matching.
Values	0..16777215
	from value to higher-value — Identifies a range of ISIDs to be used as matching criteria.

action

Syntax	action {block allow end-station} no action
Context	config>service>mrp>mrp-policy>entry
Description	This command specifies the action to be applied to the MMRP attributes (Group BMACs) whose ISIDs match the specified ISID criteria in the related entry. The action keyword must be entered for the entry to be active. Any filter entry without the action keyword will be considered incomplete and will be inactive. If neither keyword is specified (no action is used), this is considered a No-Op policy entry used to explicitly set an entry inactive without modifying match criteria or removing the entry itself. Multiple action statements entered will overwrite previous actions parameters when defined. To remove a parameter, use the no form of the action command with the specified parameter. The no form of the command removes the specified action statement. The entry is considered incomplete and hence rendered inactive without the action keyword.
Default	no action
Parameters	block — Specifies that the matching MMRP attributes will not be declared or registered on this SAP/SDP.

allow — Specifies that the matching MMRP attributes will be declared and registered on this SAP/SDP.

end-station — Specifies that an end-station emulation is present on this SAP/SDP for the MMRP attributes related with matching ISIDs. Equivalent action with the block keyword on that SAP/SDP— the attributes associated with the matching ISIDs do not get declared or registered on the SAP/SDP. The matching attributes on the other hand are mapped as static MMRP entries on the SAP/SDP which implicitly instantiates in the data plane as a MFIB entry associated with that SAP/SDP for the related Group BMAC. For the other SAPs/SDPs in the BVPLS with MRP enabled (no shutdown) this means permanent declaration of the matching attributes, same as in the case when the IVPLS instances associated with these ISIDs were locally configured.

If an mrp-policy has end-station action in one entry, the only default action allowed in the policy is block. Also no other actions are allowed to be configured in other entry configured under the policy.

This policy will apply even if the MRP is shutdown on the local SAP/SDP or for the whole BVPLS to allow for manual creation of MMRP entries in the data plane. Specifically the following rules apply:

If service vpls mrp shutdown then MMRP on all SAP/SDPs is shutdown - MRP PDUs pass-through transparently

If service vpls mrp no shutdown and endstation statement (even with no ISID values in the related match statement) is used in a mrp-policy applied to SAP/SDP - no declaration is sent on SAP/SDP. The provisioned ISIDs in the match statement are registered on that SAP/SDP and are propagated on all the other MRP enabled endpoints.

copy

Syntax	copy mrp-policy <i>source-name</i> to <i>dest-name</i>
Context	config>service>mrp
Description	This command copies existing mrp-policy list entries for a specific policy name to another policy name. The copy command is a configuration level maintenance tool used to create new mrp-policy using existing mrp-policy. An error will occur if the destination policy name exists.
Parameters	mrp-policy — Indicates that source-name and dest-name are MRP policy names. <i>source-name</i> — Identifies the source mrp-policy from which the copy command will attempt to copy. The mrp-policy with this name must exist for the command to be successful. <i>dest-name</i> — Identifies the destination mrp-policy to which the copy command will attempt to copy. If the mrp-policy with dest-name exist within the system an error message is generated.

renum

Syntax	renum <i>old-entry-id</i> to <i>new-entry-id</i>
Context	config>service>mrp>mrp-policy

Description	This command renumbers existing MRP policy entries to properly sequence policy entries. This may be required in some cases since the implementation exits when the first match is found and executes the actions according to the accompanying action command. This requires that entries be sequenced correctly from most to least explicit.
Parameters	<i>old-entry-id</i> — Specifies the entry number of an existing entry. Values 1-65535 <i>new-entry-id</i> — Specifies the new entry number to be assigned to the old entry. If the new entry exists, an error message is generated.

assignment

Syntax	assignment { port <i>port-id</i> card <i>slot-number</i> }																								
	no assignment																								
Context	config>service>customer>multi-service-site																								
Description	This command assigns a multi-service customer site to a specific chassis slot, port, or channel. This allows the system to allocate the resources necessary to create the virtual schedulers defined in the ingress and egress scheduler policies as they are specified. This also verifies that each SAP assigned to the site exists within the context of the proper customer ID and that the SAP was configured on the proper slot, port, or channel. The assignment must be given prior to any SAP associations with the site. The no form of the command removes the port, channel, or slot assignment. If the customer site has not yet been assigned, the command has no effect and returns without any warnings or messages.																								
Default	None																								
Parameters	port <i>port-id</i> — The port keyword is used to assign the multi-service customer site to the port-id or port-id.channel-id given. When the multi-service customer site has been assigned to a specific port or channel, all SAPs associated with this customer site must be on a service owned by the customer and created on the defined port or channel. The defined port or channel must already have been pre-provisioned on the system but need not be installed when the customer site assignment is made. Syntax: <i>port-id</i>[:encap-val] Values <table> <tr> <td>port-id</td><td><i>slot/mda/port</i>[.<i>channel</i>]</td></tr> <tr> <td>aps-id</td><td><i>aps-group-id</i>[.<i>channel</i>]</td></tr> <tr> <td></td><td><i>aps</i> keyword</td></tr> <tr> <td></td><td><i>group-id</i> 1 — 64</td></tr> <tr> <td>bundle-type-slot/mda.bundle-num</td><td>bundle keyword</td></tr> <tr> <td></td><td><i>type</i> ima, ppp</td></tr> <tr> <td></td><td><i>bundle-num</i> 1 — 256</td></tr> <tr> <td>bpggrp-id:</td><td>bpggrp-type-bpggrp-num</td></tr> <tr> <td></td><td>bpggrp keyword</td></tr> <tr> <td></td><td><i>type</i> ima</td></tr> <tr> <td></td><td><i>bpggrp-num</i> 1 — 1280</td></tr> <tr> <td>ccag-id</td><td>- ccag-<id>.<path-id>[cc-type]</td></tr> </table>	port-id	<i>slot/mda/port</i> [. <i>channel</i>]	aps-id	<i>aps-group-id</i> [. <i>channel</i>]		<i>aps</i> keyword		<i>group-id</i> 1 — 64	bundle-type-slot/mda.bundle-num	bundle keyword		<i>type</i> ima, ppp		<i>bundle-num</i> 1 — 256	bpggrp-id:	bpggrp-type-bpggrp-num		bpggrp keyword		<i>type</i> ima		<i>bpggrp-num</i> 1 — 1280	ccag-id	- ccag-<id>.<path-id>[cc-type]
port-id	<i>slot/mda/port</i> [. <i>channel</i>]																								
aps-id	<i>aps-group-id</i> [. <i>channel</i>]																								
	<i>aps</i> keyword																								
	<i>group-id</i> 1 — 64																								
bundle-type-slot/mda.bundle-num	bundle keyword																								
	<i>type</i> ima, ppp																								
	<i>bundle-num</i> 1 — 256																								
bpggrp-id:	bpggrp-type-bpggrp-num																								
	bpggrp keyword																								
	<i>type</i> ima																								
	<i>bpggrp-num</i> 1 — 1280																								
ccag-id	- ccag-<id>.<path-id>[cc-type]																								

	ccag	keyword
	id	1 — 8
	path-id	a, b
	cc-type	[.sap-net .net-sap]
lag-id	lag-id	
	lag	keyword
	id	1 — 200

card *slot-number* — The **card** keyword is used to assign the multi-service customer site to the slot-number given. When the multi-service customer site has been assigned to a specific slot in the chassis, all SAPs associated with this customer site must be on a service owned by the customer and created on the defined chassis slot. The defined slot must already have been pre-provisioned on the system but need not be installed when the customer site assignment is made.

Values Any pre-provisioned slot number for the chassis type that allows SAP creation
slot-number 1 — 10

ingress

Syntax	ingress
Context	config>service>customer>multi-service-site
Description	This command enables the context to configure the ingress node associate an existing scheduler policy name with the customer site. The ingress node is an entity to associate commands that complement the association.

egress

Syntax	egress
Context	config>service>customer>multi-service-site
Description	This command enables the context to configure the egress node associate an existing scheduler policy name with the customer site. The egress node is an entity to associate commands that complement the association.

agg-rate-limit

Syntax	agg-rate-limit {max kilobits-per-second} [queue-frame-based-accounting] no agg-rate-limit
Context	config>service>customer>multi-service-site>egress
Description	This command defines a maximum total rate for all egress queues on a service SAP or multi-service site. The agg-rate-limit command is mutually exclusive with the egress scheduler policy. When an egress scheduler policy is defined, the agg-rate-limit command will fail. If the agg-rate-limit command is specified, at attempt to bind a scheduler-policy to the SAP or multi-service site will fail.

A multi-service site must have a port scope defined that ensures all queues associated with the site are on the same port or channel. If the scope is not set to a port, the `agg-rate-limit` command will fail. Once an `agg-rate-limit` has been assigned to a multi-service site, the scope cannot be changed to card level.

A port scheduler policy must be applied on the egress port or channel the SAP or multi-service site are bound to in order for the defined `agg-rate-limit` to take effect. The egress port scheduler enforces the aggregate queue rate as it distributes its bandwidth at the various port priority levels. The port scheduler stops offering bandwidth to member queues once it has detected that the aggregate rate limit has been reached.

If a port scheduler is not defined on the egress port, the queues are allowed to operate based on their own bandwidth parameters.

The optional `queue-frame-based-accounting` keyword allows the service queues within the SAPs to operate in the frame based accounting mode.

Once egress frame based accounting is enabled on a SAP or Multi-Service Site, all queues associated with the SAP or SAPs will have their rate and CIR values interpreted as frame based values. When shaping, the queues will include the 12 byte Inter-Frame Gap (IFG) and 8 byte preamble for each packet scheduled out the queue. The profiling CIR threshold will also include the 20 byte frame encapsulation overhead. Statistics associated with the queue will also include the frame encapsulation overhead within the octet counters.

The `queue-frame-based-accounting` keyword does not change the behavior of the `agg-rate-limit` rate value. Since `agg-rate-limit` is always associated with egress port based scheduling and egress port based scheduling is dependant on frame based operation, the `agg-rate-limit` rate is always interpreted as a frame based value.

The **no** form of the command removes the aggregate rate limit from the SAP or multi-service site.

Parameters

{max | kilobits-per-second} — The `max` keyword and `kilobits-per-second` parameter are mutually exclusive. Either `max` or a value for `kilobits-per-second` must follow the `agg-rate-limit` command.

max — The `max` keyword specifies that the egress aggregate rate limit for the SAP or the Multi-Service Site is unlimited. Scheduling for the service queues will only be governed by the individual queue parameters and any congestion on the port relative to each queues scheduling priority.

kilobits-per-second — The `kilobits-per-second` parameter defines an actual egress aggregate rate to which all queues associated with the SAP or Multi-Service Site will be limited. The value must be defined as an integer and is representative of increments of 1000 bits per second.

Values 1 to 40000000

Default max

queue-frame-based-accounting — This keyword enables frame based accounting on all queues associated with the SAP or Multi-Service Site. If frame based accounting is required when an aggregate limit is not necessary, the `max` keyword should precede the `queue-frame-based-accounting` keyword. If frame based accounting must be disabled, execute `agg-rate-limit` without the `queue-frame-based-accounting` keyword present.

Default Frame based accounting is disabled by default

scheduler-override

Syntax	[no] scheduler-override
Context	config>service>customer>multi-service-site>ingress config>service>customer>multi-service-site>egress
Description	This command specifies the set of attributes whose values have been overridden via management on this virtual scheduler. Clearing a given flag will return the corresponding overridden attribute to the value defined on the SAP's ingress scheduler policy.

scheduler

Syntax	[no] scheduler <i>scheduler-name</i>
Context	config>service>customer>multi-service-site>ingress>sched-override config>service>customer>multi-service-site>egress>sched-override
Description	This command can be used to override specific attributes of the specified scheduler name. A scheduler defines bandwidth controls that limit each child (other schedulers and queues) associated with the scheduler. Scheduler objects are created within the hierarchical tiers of the policy. It is assumed that each scheduler created will have queues or other schedulers defined as child associations. The scheduler can be a child (take bandwidth from a scheduler in a higher tier, except for schedulers created in tier 1). A total of 32 schedulers can be created within a single scheduler policy with no restriction on the distribution between the tiers. Each scheduler must have a unique name within the context of the scheduler policy; however the same name can be reused in multiple scheduler policies. If <i>scheduler-name</i> already exists within the policy tier level (regardless of the inclusion of the keyword create), the context changes to that scheduler name for the purpose of editing the scheduler parameters. Modifications made to an existing scheduler are executed on all instantiated schedulers created through association with the policy of the edited scheduler. This can cause queues or schedulers to become orphaned (invalid parent association) and adversely affect the ability of the system to enforce service level agreements (SLAs). If the <i>scheduler-name</i> exists within the policy on a different tier (regardless of the inclusion of the keyword create), an error occurs and the current CLI context will not change. If the <i>scheduler-name</i> does not exist in this or another tier within the scheduler policy, it is assumed that an attempt is being made to create a scheduler of that name. The success of the command execution is dependent on the following: 1. The maximum number of schedulers has not been configured. 2. The provided <i>scheduler-name</i> is valid. 3. The create keyword is entered with the command if the system is configured to require it (enabled in the environment create command). When the maximum number of schedulers has been exceeded on the policy, a configuration error occurs and the command will not execute, nor will the CLI context change. If the provided scheduler-name is invalid according to the criteria below, a name syntax error will occur, the command will not execute, and the CLI context will not change.

Parameters	<i>scheduler-name</i> — The name of the scheduler. Values Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Default None. Each scheduler must be explicitly created. <i>create</i> — This optional keyword explicitly specifies that it is acceptable to create a scheduler with the given <i>scheduler-name</i>. If the create keyword is omitted, scheduler-name is not created when the system environment variable <i>create</i> is set to true. This safeguard is meant to avoid accidental creation of system objects (such as schedulers) while attempting to edit an object with a mistyped name or ID. The keyword has no effect when the object already exists.

rate

Syntax	rate <i>pir-rate</i> [cir <i>cir-rate</i>] no rate
Context	config>service>customer>multi-service-site>ingress>sched-override>scheduler config>service>customer>multi-service-site>egress>sched-override>scheduler
Description	This command can be used to override specific attributes of the specified scheduler rate. The rate command defines the maximum bandwidth that the scheduler can offer its child queues or schedulers. The maximum rate is limited to the amount of bandwidth the scheduler can receive from its parent scheduler. If the scheduler has no parent, the maximum rate is assumed to be the amount available to the scheduler. When a parent is associated with the scheduler, the CIR parameter provides the scheduler's amount of bandwidth to be considered during the parent schedulers 'within CIR' distribution phase. The actual operating rate of the scheduler is limited by bandwidth constraints other than its maximum rate. The scheduler's parent scheduler may not have the available bandwidth to meet the scheduler's needs or the bandwidth available to the parent scheduler could be allocated to other child schedulers or child queues on the parent based on higher priority. The children of the scheduler may not need the maximum rate available to the scheduler due to insufficient offered load or limits to their own maximum rates. When a scheduler is defined without specifying a rate, the default rate is max. If the scheduler is a root scheduler (no parent defined), the default maximum rate must be changed to an explicit value. Without this explicit value, the scheduler will assume that an infinite amount of bandwidth is available and allow all child queues and schedulers to operate at their maximum rates. The no form of this command returns all queues created with this <i>queue-id</i> by association with the QoS policy to the default PIR and CIR parameters.
Parameters	<i>pir-rate</i> — The pir parameter accepts a step multiplier value that specifies the multiplier used to determine the PIR rate at which the queue will operate. A value of 0 to 100000000 or the keyword max or sum is accepted. Any other value will result in an error without modifying the current PIR rate. To calculate the actual PIR rate, the rate described by the queue's rate is multiplied by the <i>pir-rate</i>.

The SAP ingress context for PIR is independent of the defined forwarding class (fc) for the queue. The default **pir** and definable range is identical for each class. The PIR in effect for a queue defines the maximum rate at which the queue will be allowed to forward packets in a given second, thus shaping the queue's output.

The PIR parameter for SAP ingress queues do not have a negate (**no**) function. To return the queues PIR rate to the default value, that value must be specified as the PIR value.

Values 1 — 100000000, **max**

Default **max**

cir *cir-rate* — The **cir** parameter accepts a step-multiplier value that specifies the multiplier used to determine the CIR rate at which the queue will operate. A value of 0 to 100000000 or the keyword **max** or **sum** are accepted. Any other value will result in an error without modifying the current CIR rate.

To calculate the actual CIR rate, the rate described by the **rate pir** *pir-rate* is multiplied by the *cir* *cir-rate*. If the **cir** is set to max, then the CIR rate is set to infinity.

The SAP ingress context for CIR is dependent on the defined forwarding class (fc) for the queue. The default CIR and definable range is different for each class. The CIR in effect for a queue defines both its profile (in or out) marking level as well as the relative importance compared to other queues for scheduling purposes during congestion periods.

Values 0 — 100000000, **max**, **sum**

Default **sum**

scheduler-policy

Syntax	scheduler-policy <i>scheduler-policy-name</i> no scheduler-policy
Context	config>service>customer>multi-service-site>ingress config>service>customer>multi-service-site>egress
Description	This command applies an existing scheduler policy to an ingress or egress scheduler used by SAP queues associated with this multi-service customer site. The schedulers defined in the scheduler policy can only be created once the customer site has been appropriately assigned to a chassis port, channel or slot. Scheduler policies are defined in the config>qos>scheduler-policy <i>scheduler-policy-name</i> context. The no form of this command removes the configured ingress or egress scheduler policy from the multi-service customer site. When the policy is removed, the schedulers created due to the policy are removed also making them unavailable for the ingress SAP queues associated with the customer site. Queues that lose their parent scheduler association are deemed to be orphaned and are no longer subject to a virtual scheduler. The SAPs that have ingress queues reliant on the removed schedulers enter into an operational state depicting the orphaned status of one or more queues. When the no scheduler-policy command is executed, the customer site ingress or egress node will not contain an applied scheduler policy. <i>scheduler-policy-name</i>: — The <i>scheduler-policy-name</i> parameter applies an existing scheduler policy that was created in the config>qos>scheduler-policy <i>scheduler-policy-name</i> context to create the hierarchy of ingress or egress virtual schedulers. The scheduler names defined within the

policy are created and made available to any ingress or egress queues created on associated SAPs.

Values Any existing valid scheduler policy name.

tod-suite

Syntax	tod-suite <i>tod-suite-name</i> no tod-suite
Context	config>service>cust>multi-service-site
Description	This command applies a time-based policy (filter or QoS policy) to the multiservice site. The suite name must already exist in the config>cron context.
Default	no tod-suite
Parameters	<i>tod-suite-name</i> — Specifies collection of policies (ACLs, QoS) including time-ranges. Only the scheduler-policy part of the tod-suite is taken into account. The suite can be applied to more than one multi-service-site.

SDP Commands

pw-template

Syntax	[no] pw-template sdp-template-id
Context	config>service
Description	This command configures an SDP template.
Parameters	<i>sdp-template-id</i> — Specifies a number used to uniquely identify a template for the creation of a Service Distribution Point (SDP. The value 0 is used as the null ID.
Values	0, 1 — 2147483647

sdp

Syntax	sdp sdp-id [gre mpls] [create] no sdp sdp-id
Context	config>service
Description	This command creates or edits a Service Distribution Point (SDP). SDPs must be explicitly configured. An SDP is a logical mechanism that ties a far-end 7750 SR to a particular service without having to specifically define far end SAPs. Each SDP represents a method to reach a 7750 SR router. One method is IP Generic Router Encapsulation (GRE) which has no state in the core of the network. GRE does not specify a specific path to the 7750 SR. A GRE-based SDP uses the underlying IGP routing table to find the best next hop to the far end 7750 SR. The other method is Multi-Protocol Label Switching (MPLS) encapsulation. A 7750 SR supports both signaled and non-signaled Label Switched Paths (LSPs) through the network. Non-signaled paths are defined at each hop through the network. Signaled paths are communicated via protocol from end to end using Resource ReserVation Protocol (RSVP). Paths may be manually defined or a constraint-based routing protocol (such as OSPF-TE or CSPF) can be used to determine the best path with specific constraints. SDPs are created and then bound to services. Many services may be bound to a single SDP. The operational and administrative state of the SDP controls the state of the SDP binding to the service. If <i>sdp-id</i> does not exist, a new SDP is created. When creating an SDP, either the gre or the mpls keyword must be specified. SDPs are created in the admin down state (shutdown) and the no shutdown command must be executed once all relevant parameters are defined and before the SDP can be used. If <i>sdp-id</i> exists, the current CLI context is changed to that SDP for editing and modification. For editing an existing SDP, neither the gre nor the mpls keyword is specified. If a keyword is specified

for an existing *sdp-id*, an error is generated and the context of the CLI will not be changed to the specified *sdp-id*.

The **no** form of this command deletes the specified SDP. Before an SDP can be deleted, it must be administratively down (shutdown) and not bound to any services. If the specified SDP is bound to a service, the **no sdp** command will fail generating an error message specifying the first bound service found during the deletion process. If the specified *sdp-id* does not exist an error will be generated.

Default	none
Parameters	<i>sdp-id</i> — The SDP identifier. Values 1 — 17407 gre — Specifies the SDP will use GRE to reach the far-end 7750 SR. Only one GRE SDP can be created to a given destination device. Multiple GRE SDPs to a single destination serve no purpose as the path taken to reach the far end is determined by the IGP which will be the same for all SDPs to a given destination and there is no bandwidth reservation in GRE tunnels. mpls — Specifies the SDP will use MPLS encapsulation and one or more LSP tunnels to reach the far-end device. Multiple MPLS SDPs may be created to a given destination device . Multiple MPLS SDPs to a single destination device are helpful when they use divergent paths.

accounting-policy

Syntax	accounting-policy <i>acct-policy-id</i> no accounting-policy
Context	config>service>pw-template config>service>sdp
Description	This command creates the accounting policy context that can be applied to an SDP. An accounting policy must be defined before it can be associated with a SDP. If the <i>policy-id</i> does not exist, an error message is generated. A maximum of one accounting policy can be associated with a SDP at one time. Accounting policies are configured in the config>log context. The no form of this command removes the accounting policy association from the SDP, and the accounting policy reverts to the default.
Default	Default accounting policy.
Parameters	<i>acct-policy-id</i> — Enter the accounting <i>policy-id</i> as configured in the config>log>accounting-policy context. Values 1 — 99

bgp-tunnel

Syntax	[no] bgp-tunnel
Context	config>service>sdp

Description	This command allows the use of BGP route tunnels available in the tunnel table to reach SDP far-end nodes. Use of BGP route tunnels are only available with MPLS-SDP. Only one of the transport methods is allowed per SDP - LDP, RSVP-LSP or BGP-Tunnel (BGP-Tunnel is not supported on multi-mode LSP) The no form of the command disables resolving BGP route tunnel LSP for SDP far-end.
Default	no bgp-tunnel (BGP tunnel route to SDP far-end is disabled)

booking-factor

Syntax	booking-factor <i>percentage</i> no booking-factor
Context	config>service>sdp
Description	This command specifies the booking factor applied against the maximum SDP available bandwidth by the VLL CAC feature. The service manager keeps track of the available bandwidth for each SDP. The maximum value is the sum of the bandwidths of all constituent LSPs in the SDP. The SDP available bandwidth is adjusted by the user configured booking factor. A value of 0 means no VLL can be admitted into the SDP. The no form of the command reverts to the default value.
Parameters	<i>percentage</i> — Specifies the percentage of the SDP maximum available bandwidth for VLL call admission. When the value of this parameter is set to zero (0), no new VLL spoke SDP bindings with non-zero bandwidth are permitted with this SDP. Overbooking, >100% is allowed. Values 0 — 1000 %
Default	100%

collect-stats

Syntax	[no] collect-stats
Context	config>service>pw-template config>service>sdp
Description	This command enables accounting and statistical data collection for either the SDP. When applying accounting policies the data, by default, is collected in the appropriate records and written to the designated billing file. When the no collect-stats command is issued the statistics are still accumulated by the IOM cards. However, the CPU will not obtain the results and write them to the billing file. If a subsequent collect-stats command is issued then the counters written to the billing file include all the traffic while the no collect-stats command was in effect.
Default	collect-stats

control-word

Syntax	[no] control-word
Description	config>service>pw-template
Description	This command enables the use of the control word on pseudowire packets in VPLS and enables the use of the control word individually on each mesh-sdp or spoke-sdp. By default, the control word is disabled. When the control word is enabled, all VPLS packets, including the BPDU frames, are encapsulated with the control word when sent over the pseudowire. The T-LDP control plane behavior is the same as in the implementation of control word for VLL services. The configuration for the two directions of the Ethernet pseudowire should match. The no form of the command reverts the mesh SDP or spoke-sdp to the default behavior of not using the control word.
Default	no control-word

disable-aging

Syntax	[no] disable-aging
Context	config>service>pw-template
Description	This command disables MAC address aging across a service. The no form of this command enables aging.
Default	no disable-aging

disable-learning

Syntax	[no] disable-learning
Context	config>service>pw-template
Description	This command enables learning of new MAC addresses. This parameter is mainly used in conjunction with the discard-unknown command. The no form of this command enables learning of MAC addresses.
Default	no disable-learning (Normal MAC learning is enabled)

discard-unknown-source

Syntax	[no] discard-unknown-source
Context	config>service>pw-template

Description	When this command is enabled, packets received with an unknown source MAC address will be dropped only if the maximum number of MAC addresses have been reached. When disabled, the packets are forwarded based on the destination MAC addresses. The no form of this command causes packets with an unknown source MAC addresses to be forwarded by destination MAC addresses.
Default	no discard-unknown

egress

Syntax	egress
Context	config>service>pw-template
Description	This command enables the context to configure spoke SDP binding egress filter parameters.

ingress

Syntax	ingress
Context	config>service>pw-template
Description	This command enables the context to configure spoke SDP binding ingress filter parameters.

filter

Syntax	filter ip <i>ip-filter-id</i> filter ipv6 <i>ipv6-filter-id</i> filter mac <i>mac-filter-id</i> no filter [ip <i>ip-filter-id</i>] [mac <i>mac-filter-id</i>] [ipv6 <i>ipv6-filter-id</i>]
Context	config>service>pw-template>egress config>service>pw-template>ingress
Description	This command associates an IP filter policy or MAC filter policy on egress or ingress. Filter policies control the forwarding and dropping of packets based on IP or MAC matching criteria. There are two types of filter policies: IP and MAC. Only one type may be applied to a SAP at a time. The filter command is used to associate a filter policy with a specified filter ID with an ingress or egress SAP. The filter ID must already be defined before the filter command is executed. If the filter policy does not exist, the operation will fail and an error message returned. The no form of this command removes any configured filter ID association with the SAP or IP interface. The filter ID itself is not removed from the system unless the scope of the created filter is set to local. To avoid deletion of the filter ID and only break the association with the service object, use scope command within the filter definition to change the scope to local or global. The default scope of a filter is local.

Parameters	ip <i>ip-filter-id</i> — Specifies IP filter policy. The filter ID must already exist within the created IP filters. Values 1 — 65535 ipv6 <i>ipv6-filter-id</i> — Specifies the IPv6 filter policy. The filter ID must already exist within the created IPv6 filters. Values 1 — 65535 mac <i>mac-filter-id</i> — Specifies the MAC filter policy. The specified filter ID must already exist within the created MAC filters. The filter policy must already exist within the created MAC filters. Values 1 — 65535

hash-label

Syntax	[no] hash-label
Context	config>service>pw-template
Description	This command enables the use of the hash label on a VLL, VPLS, or VPRN service bound to LDP or RSVP SDP as well as to a VPRN service using the autobind mode with the with the ldp, rsvp-te, or mpls options. This feature is not supported on a service bound to a GRE SDP or for a VPRN service using the autobind mode with the gre option.. When this feature is enabled, the ingress data path is modified such that the result of the hash on the packet header is communicated to the egress data path for use as the value of the label field of the hash label. The egress data path appends the hash label at the bottom of the stack (BoS) and sets the S-bit to 1 to indicate that. In order to allow for applications whereby the egress LER infers the presence of the Hash Label implicitly from the value of the label, the Most Significant Bit (MSB) of the result of the hash is set before copying into the Hash Label. This means that the value of the hash label will always be in the range [524,288 - 1,048,575] and will not overlap with the signaled/static LSP and signaled/static service label ranges. This also guarantees that the hash label will not match a value in the reserved label range. The (unmodified) result of the hash continues to be used for the purpose of ECMP and LAG spraying of packets locally on the ingress LER. Note however that for VLL services, the result of the hash is overwritten and the ECMP and LAG spraying will be based on service-id when ingress SAP shared queuing is not enabled. However, the hash label will still reflect the result of the hash such that an LSR can use it to perform fine grained load balancing of VLL pseudowire packets. Packets that are generated in CPM and forwarded labeled within the context of a service (for example, OAM packets) must also include a Hash Label at the BoS and set the S-bit accordingly. The TTL of the Hash Label is set to a value of 1. The no form of this command disables the use of the hash label.
Default	no hash-label

force-vlan-vc-forwarding

Syntax	[no] force-vlan-vc-forwarding
Context	config>service>pw-template
Description	This command forces vc-vlan-type forwarding in the data path for spoke and mesh SDPs that have either vc-type. This command is not allowed on vlan-vc-type SDPs. The no version of this command sets default behavior.
Default	per default this feature is disabled

vc-label

Syntax	[no] vc-label <i>vc-label</i>
Context	config>service>pw-template>ingress
Description	This command configures the ingress VC label.
Parameters	<i>vc-label</i> — A VC ingress value that indicates a specific connection. Values 2048 — 18431

limit-mac-move

Syntax	limit-mac-move [blockable non-blockable] no limit-mac-move
Context	config>service>pw-template
Description	This command indicates whether or not the mac-move agent will limit the MAC re-learn (move) rate.
Default	blockable
Parameters	blockable — The agent will monitor the MAC re-learn rate, and it will block it when the re-learn rate is exceeded. non-blockable — When specified, a SAP will not be blocked, and another blockable SAP will be blocked instead.

mac-pinning

Syntax	[no] mac-pinning
Context	config>service>pw-template
Description	Enabling this command will disable re-learning of MAC addresses on other SAPs within the service. The MAC address will remain attached to a given SAP for duration of its age-timer.

The age of the MAC address entry in the FIB is set by the age timer. If **mac-aging** is disabled on a given VPLS service, any MAC address learned on a SAP/SDP with **mac-pinning** enabled will remain in the FIB on this SAP/SDP forever. Every event that would otherwise result in re-learning will be logged (MAC address; original-SAP; new-SAP).

Note that MAC addresses learned during DHCP address assignment (DHCP snooping enabled) are not impacted by this command. MAC-pinning for such addresses is implicit.

Default When a SAP or spoke SDP is part of a Residential Split Horizon Group (RSHG), MAC pinning is activated at creation of the SAP. Otherwise MAC pinning is not enabled by default.

max-nbr-mac-addr

Syntax	max-nbr-mac-addr <i>table-size</i> no max-nbr-mac-addr
Context	config>service>pw-template
Description	This command specifies the maximum number of FDB entries for both learned and static MAC addresses for this SAP or spoke SDP. When the configured limit has been reached, and discard-unknown-source has been enabled for this SAP or spoke SDP (see discard-unknown-source on page 150), packets with unknown source MAC addresses will be discarded. The no form of the command restores the global MAC learning limitations for the SAP or spoke SDP.
Default	no max-nbr-mac-addr
Parameters	<i>table-size</i> — Specifies the maximum number of learned and static entries allowed in the FDB of this service. Values 1 — 196607 Chassis-mode C limit: 511999

mfib-allowed-mda-destinations

Syntax	mfib-allowed-mda-destinations
Context	config>service>pw-template>egress
Description	This command enables the context to configure MFIB-allowed MDA destinations. The allowed-mda-destinations node and the corresponding mda command are used on spoke and mesh SDP bindings to provide a list of MDA destinations in the chassis that are allowed as destinations for multicast streams represented by [* ,g] and [s,g] multicast flooding records on the VPLS service. The MDA list only applies to IP multicast forwarding when IGMP snooping is enabled on the VPLS service. The MDA list has no effect on normal VPLS flooding such as broadcast, L2 multicast, unknown destinations or non-snooped IP multicast. At the IGMP snooping level, a spoke or mesh SDP binding is included in the flooding domain for an IP multicast stream when it has either been defined as a multicast router port, received a IGMP query through the binding or has been associated with the multicast stream through an IGMP request by a

host over the binding. Due to the dynamic nature of the way that a spoke or mesh SDP binding is associated with one or more egress network IP interfaces, the system treats the binding as appearing on all network ports. This causes all possible network destinations in the switch fabric to be included in the multicast streams flooding domain. The MDA destination list provides a simple mechanism that narrows the IP multicast switch fabric destinations for the spoke or mesh SDP binding.

If no MDAs are defined within the allowed-mda-destinations node, the system operates normally and will forward IP multicast flooded packets associated with the spoke or mesh SDP binding to all switch fabric taps containing network IP interfaces.

The MDA inclusion list should include all MDAs that the SDP binding may attempt to forward through. A simple way to ensure that an MDA that is not included in the list is not being used by the binding is to define the SDP the binding is associated with as MPLS and use an RSVP-TE LSP with a strict egress hop. The MDA associated with the IP interface defined as the strict egress hop should be present in the inclusion list.

If the inclusion list does not currently contain the MDA that the binding is forwarding through, the multicast packets will not reach the destination represented by the binding. By default, the MDA inclusion list is empty.

If an MDA is removed from the list, the MDA is automatically removed from the flooding domain of any snooped IP multicast streams associated with a destination on the MDA unless the MDA was the last MDA on the inclusion list. Once the inclusion list is empty, all MDAs are eligible for snooped IP multicast flooding for streams associated with the SDP binding.

mda

Syntax	[no] mda mda-id
Context	config>service>pw-template>egress>mfib-mda
Description	This command specifies an MFIB-allowed MDA destination for an SDP binding configured in the system.
Parameters	<i>mda-id</i> — Specifies an MFIB-allowed MDA destination.
Values	1, 2

igmp-snooping

Syntax	igmp-snooping
Context	config>service>pw-template
Description	This command enables the Internet Group Management Protocol (IGMP) snooping context.
Default	none

fast-leave

Syntax	[no] fast-leave

Context	config>service>pw-template>igmp-snooping
Description	This command enables fast leave. When IGMP fast leave processing is enabled, the SR-Series will immediately remove a SAP or SDP from the IP multicast group when it detects an IGMP 'leave' on that SAP or SDP. Fast leave processing allows the switch to remove a SAP or SDP that sends a 'leave' from the forwarding table without first sending out group-specific queries to the SAP or SDP, and thus speeds up the process of changing channels ('zapping'). Fast leave should only be enabled when there is a single receiver present on the SAP or SDP. When fast leave is enabled, the configured last-member-query-interval value is ignored.
Default	no fast-leave

import

Syntax	import <i>policy-name</i> no import
Context	config>service>pw-template>igmp-snooping
Description	This command specifies the import routing policy to be used for IGMP packets. Only a single policy can be imported at a time. The no form of the command removes the policy association.
Default	no import — No import policy is specified.
Parameters	<i>policy-name</i> — The import policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Routing policies are configured in the config>router>policy-options context The router policy must be defined before it can be imported.

last-member-query-interval

Syntax	last-member-query-interval <i>tenths-of-seconds</i> no last-member-query-interval
Context	config>service>pw-template>igmp-snooping
Description	This command configures the maximum response time used in group-specific queries sent in response to 'leave' messages, and is also the amount of time between 2 consecutive group-specific queries. This value may be tuned to modify the leave latency of the network. A reduced value results in reduced time to detect the loss of the last member of a group. The configured last-member-query-interval is ignored when fast-leave is enabled on the SAP or SDP.
Default	10
Parameters	<i>tenths of seconds</i> — Specifies the frequency, in tenths of seconds, at which query messages are sent.

Values 1 — 50

max-num-groups

Syntax	max-num-groups <i>count</i> no max-num-groups
Context	config>service>pw-template>igmp-snooping
Description	This command defines the maximum number of multicast groups that can be joined. If the SR-Series receives an IGMP join message that would exceed the configured number of groups, the request is ignored.
Default	no max-num-groups
Parameters	<i>count</i> — Specifies the maximum number of groups that can be joined. Values 1 — 1000

query-interval

Syntax	query-interval <i>seconds</i> no query-interval
Context	config>service>pw-template>igmp-snooping
Description	This command configures the IGMP query interval. If the send-queries command is enabled, this parameter specifies the interval between two consecutive general queries sent by the system on this SAP or SDP. The configured query-interval must be greater than the configured query-response-interval. If send-queries is not enabled on this SAP or SDP, the configured query-interval value is ignored.
Default	125
Parameters	<i>seconds</i> — The time interval, in seconds, that the router transmits general host-query messages. Values 2 — 1024

query-response-interval

Syntax	query-response-interval <i>seconds</i>
Context	config>service>pw-template>igmp-snooping
Description	This command configures the IGMP query response interval. If the send-queries command is enabled, this parameter specifies the maximum response time advertised in IGMPv2/v3 queries. The configured query-response-interval must be smaller than the configured query-interval.

If send-queries is not enabled on this SAP or SDP, the configured query-response-interval value is ignored.

Default 10

Parameters *seconds* — Specifies the length of time to wait to receive a response to the host-query message from the host.

Values 1 — 1023

robust-count

Syntax **robust-count** *robust-count*
no robust-count

Context config>service>pw-template>igmp-snooping

Description If the **send-queries** command is enabled, this parameter allows tuning for the expected packet loss. The robust-count variable allows tuning for the expected packet loss on a subnet and is comparable to a retry count.

If send-queries is not enabled, this parameter will be ignored.

Default 2

Parameters *robust-count* — Specifies the robust count for the SAP or SDP.

Values 2 — 7

send-queries

Syntax [**no**] **send-queries**

Context config>service>pw-template>igmp-snooping

Description This command specifies whether to send IGMP general query messages.

When send-queries is configured, all type of queries generate ourselves are of the configured version. If a report of a version higher than the configured version is received, the report will get dropped and a new wrong version counter will get incremented.

If send-queries is not configured, the version command has no effect. The version used on that SAP/SDP will be the version of the querier. This implies that, for example, when we have a v2 querier, we will never send out a v3 group or group-source specific query when a host wants to leave a certain group.

Default no send-queries

version

Syntax **version** *version*

no version

Context	config>service>pw-template>igmp-snooping
Description	This command specifies the version of IGMP. This object can be used to configure a router capable of running either value. For IGMP to function correctly, all routers on a LAN must be configured to run the same version of IGMP on that LAN. When the send-query command is configured, all type of queries generate ourselves are of the configured version. If a report of a version higher than the configured version is received, the report gets dropped and a new “wrong version” counter is incremented. If the send-query command is not configured, the version command has no effect. The version used on that SAP or SDP will be the version of the querier. This implies that, for example, when there is a v2 querier, a v3 group or group-source specific query when a host wants to leave a certain group will never be sent.
Parameters	<i>version</i> — Specify the IGMP version. Values 1, 2, 3

split-horizon-group

Syntax	[no] split-horizon-group [<i>group-name</i>] [<i>residential-group</i>]
Context	config>service>pw-template
Description	This command creates a new split horizon group (SGH). Comparing a “residential” SGH and a “regular” SHG is that a residential SHG: • Has different defaults for the SAP/SDP that belong to this group (ARP reply agent enabled (SAP only), MAC pinning enabled). These can be disabled in the configuration. • Does not allow enabling spanning tree (STP) on a SAP. It is allowed on an SDP. • Does not allow for downstream broadcast (broadcast / unknown unicast) on a SAP. It is allowed on an SDP. • On a SAP, downstream multicast is only allowed when IGMP is enabled (for which an MFIB state exists; only IP multicast); on a SDP, downstream mcast is allowed. When the feature was initially introduced, residential SHGs were also using ingress shared queuing by default to increase SAP scaling. A residential SAP (SAP that belongs to a RSHG) is used to scale the number of SAPs in a single VPLS instance. While for regular SAPs, there is a limit of 127 SAPs/VPLS, for residential SAPs, scaling can be performed up to 4K SAPs/VPLS (there is no need for multicast replication on residential SAPs). Therefore, residential SAPs are useful in residential aggregation environments (for example, triple play networks) with a VLAN/subscriber model. The no form of the command removes the group name from the configuration.
Parameters	<i>group-name</i> — Specifies the name of the split horizon group to which the SDP belongs. <i>residential-group</i> — Defines a split horizon group as a residential split horizon group (RSHG). Doing so entails that:

- SAPs which are members of this Residential Split Horizon Group will have:
 - Double-pass queuing at ingress as default setting (can be disabled)
 - STP disabled (cannot be enabled)
 - ARP reply agent enabled per default (can be disabled)
 - MAC pinning enabled per default (can be disabled)
 - Downstream Broadcast packets are discarded thus also blocking the unknown, flooded traffic
 - Downstream Multicast packets are allowed when IGMP snooping is enabled
- Spoke SDPs which are members of this Residential Split Horizon Group will have:
 - Downstream multicast traffic supported
 - Double-pass queuing is not applicable
 - STP is disabled (can be enabled)
 - ARP reply agent is not applicable (dhcp-lease-states are not supported on spoke SDPs)
 - MAC pinning enabled per default (can be disabled)

Default A split horizon group is by default not created as a residential-group.

restrict-protected-src

Syntax	restrict-protected-src <i>alarm-only</i> no restrict-protected-src
Context	config>service>pw-template>split-horizon-group
Description	This command indicates how the agent will handle relearn requests for protected MAC addresses. While enabled all packets entering the configured SAP, or any SAP that is part of the configured split horizon group (SHG) will be verified not to contain a protected source MAC address. If the packet is found to contain such an address the packet will be discarded, a trap will be generated and the SAP will be made operationally down. The SAP must be shutdown and enabled (no shutdown) for this state to be cleared. Notice that the use of restrict-protected-src under the SAP is designed only to allow this capability for SAPs that are not part of a SHG. If a SAP is part of a SHG that has restrict-protected-src enabled the SAP will be restricted.
Default	no restrict-protected-src

restrict-unprotected-dst

Syntax	restrict-unprotected-dst <i>alarm-only</i> no restrict-unprotected-dst
Context	config>service>pw-template>split-horizon-group
Description	This command indicates how the system will forward packets destined to an unprotected MAC address. While enabled all packets entering the configured SAP will be verified to contain a protected destination MAC address. If the packet is found to contain a non-protected destination MAC, it will be discarded. Detecting a non-protected destination MAC on the SAP will not cause the SAP to be placed in the operationally down state.

If a MAC is defined with a static address, after that MAC was already learned by the system on a restricted SAP, the system will bring the SAP to an operationally down state, flush the MAC and generate a trap.

If the destination MAC address of a packet entering a restricted SAP with **restrict-unprotected-dst** enabled, and if it is not a protected MAC, the packet will be discarded.

If the destination MAC address is unknown, even if the packet is entering a restricted SAP, with **restrict-unprotected-dst** enabled, it will be flooded.

You can specify a static MAC in the **mac-protect** list. This action fails if the static MAC is defined under a restricted SAP. If the MAC is protected first, the system does not allow it to be added as static under a restricted SAP.

Default no restrict-unprotected-dst

vc-type

Syntax	vc-type {ether vlan}
Context	config>service>pw-template
Description	This command overrides the default VC type signaled for the binding to the far end SDP. The VC type is a 15 bit-quantity containing a value which represents the type of VC. The actual signaling of the VC type depends on the signaling parameter defined for the SDP. If signaling is disabled, the vc-type command can still be used to define the dot1q value expected by the far-end provider equipment. A change of the bindings VC type causes the binding to signal the new VC type to the far end when signaling is enabled. VC types are derived according to IETF <i>draft-martini-l2circuit-trans-mps</i>. • The VC type value for Ethernet is 0x0005. • The VC type value for an Ethernet VLAN is 0x0004.
Parameters	ether — Defines the VC type as Ethernet. The ethernet and vlan keywords are mutually exclusive. When the VC type is not defined then the default is Ethernet for spoke SDP bindings. Defining Ethernet is the same as executing no vc-type and restores the default VC type for the spoke SDP binding. (hex 5) vlan — Defines the VC type as VLAN. The ethernet and vlan keywords are mutually exclusive. When the VC type is not defined then the default is Ethernet for spoke SDP bindings.

vlan-vc-tag

Syntax	vlan-vc-tag 0..4094 no vlan-vc-tag [0..4094]
Context	config>service>pw-template
Description	This command specifies an explicit dot1q value used when encapsulating to the SDP far end. When signaling is enabled between the near and far end, the configured dot1q tag can be overridden by a received TLV specifying the dot1q value expected by the far end. This signaled value must be stored

as the remote signaled dot1q value for the binding. The provisioned local dot1q tag must be stored as the administrative dot1q value for the binding.

When the dot1q tag is not defined, the default value of zero is stored as the administrative dot1q value. Setting the value to zero is equivalent to not specifying the value.

The **no** form of this command disables the command

Default	no vlan-vc-tag
Parameters	0..4094 — Specifies a valid VLAN identifier to bind an 802.1Q VLAN tag ID.

adv-mtu-override

Syntax	[no] adv-mtu-override
Context	config>service>sdp
Description	This command overrides the advertised VC-type MTU. When enabled, the router signals a VC MTU equal to the service MTU (includes the Layer 2 header). Under normal operations it will advertise the service MTU minus the Layer 2 header. In the receive direction, it will accept either one. The no form of the command disables the VC-type MTU override.
Default	no adv-mtu-override

class-forwarding

Syntax	class-forwarding [default-lsp <i>lsp-name</i>] no class-forwarding
Context	config>service>sdp
Description	This command enables the forwarding of a service packet over the SDP based on the class of service of the packet. Specifically, the packet is forwarded on the RSVP LSP or static LSP whose forwarding class matches that of the packet. The user maps the system forwarding classes to LSPs using the config>service>sdp>class-forwarding>fc command. If there is no LSP that matches the packet's forwarding class, the default LSP is used. If the packet is a VPLS multicast/broadcast packet and the user did not explicitly specify the LSP to use under the config>service>sdp>class-forwarding>multicast-lsp context, then the default LSP is used. VLL service packets are forwarded based on their forwarding class only if shared queuing is enabled on the ingress SAP. Shared queuing must be enabled on the VLL ingress SAP if class-forwarding is enabled on the SDP the service is bound to. Otherwise, the VLL packets will be forwarded to the LSP which is the result of hashing the VLL service ID. Since there are eight entries in the ECMP table for an SDP, one LSP ID for each forwarding class, the resulting load balancing of VLL service ID is weighted by the number of times an LSP appears on that table. For instance, if there are eight LSPs, the result of the hashing will be similar to when class based forwarding is disabled on the SDP. If there are fewer LSPs, then the LSPs which were mapped to more than one forwarding class, including the default LSP, will have proportionally more VLL services forwarding to them. Class-based forwarding is not supported on a spoke SDP used for termination on an IES or VPRN service. All packets are forwarded over the default LSP.

The **no** form of the command deletes the configuration and the SDP reverts back to forwarding service packets based on the hash algorithm used for LAG and ECMP.

Default	no class-forwarding — Packets of a service bound to this SDP will be forwarded based on the hash algorithm used for LAG and ECMP.
Parameters	default-lsp <i>lsp-name</i> — Specifies the default LSP for the SDP. This LSP name must exist and must have been associated with this SDP using the <i>lsp-name</i> configured in the config>service>sdp>lsp context. The default LSP is used to forward packets when there is no available LSP which matches the packet's forwarding class. This could be because the LSP associated with the packet's forwarding class is down, or that the user did not configure a mapping of the packet's forwarding class to an LSP using the config>service>sdp>class-forwarding>fc command. The default LSP is also used to forward VPLS service multicast/broadcast packets in the absence of a user configuration indicating an explicit association to one of the SDP LSPs. Note that when the default LSP is down, the SDP is also brought down. The user will not be able to enter the class-forwarding node if the default LSP was not previously specified. In other words the class-forwarding for this SDP will remain shutdown.

enforce-diffserv-lsp-fc

Syntax	[no] enforce-diffserv-lsp-fc
Context	config>service>sdp>class-forwarding
Description	This command enables checking by RSVP that a Forwarding Class (FC) mapping to an LSP under the SDP configuration is compatible with the Diff-Serv Class Type (CT) configuration for this LSP. When the user enables this option, the service manager enquires with RSVP if the FC is supported by the LSP. RSVP checks if the FC maps to the CT of the LSP, for example, the default class-type value or the class-type value entered at the LSP configuration level. If RSVP did not validate the FC, then the service manager will return an error and the check has failed. In this case, packets matching this FC will be forwarded over the default LSP. Any addition of an LSP to an SDP that will not satisfy the FC check will also be rejected. The service manager does not validate the default-lsp FC-to-CT mapping. Whether or not the FC is validated, the default-lsp will always end up being used in this case. RSVP will not allow the user to change the CT of the LSP until no SDP with class-based forwarding enabled and the enforce-diffserv-lsp-fc option enabled is using this LSP. All other SDPs using this LSP are not concerned by this rule. The SDP will continue to enforce the mapping of a single LSP per FC. However, when enforce-diffserv-lsp-fc enabled, RSVP will also enforce the use of a single CT per FC as per the user configured mapping in RSVP. If class-forwarding is enabled but enforce-diffserv-lsp-fc is disabled, forwarding of the service packets will continue to be based on the user entered mapping of FC to LSP name without further validation as per the existing implementation. The CT of the LSP does not matter in this case. If class-forwarding is not enabled on the SDP, forwarding of the service packets will continue to be based on the ECMP/LAG hash routine. The CT of the LSP does not matter in this case.

The **no** form of this command reverts to the default value which is to use the user entered mapping of FC to LSP name.

Default no enforce-diffserv-lsp-fc

far-end

Syntax **far-end** *ip-address*
no far-end

Context config>service>sdp

Description This command configures the system IP address of the far-end destination 7750 SR router for the Service Distribution Point (SDP) that is the termination point for a service.

The far-end IP address must be explicitly configured. The destination IP address must be a 7750 SR system IP address.

If the SDP uses GRE for the destination encapsulation, the *ip-address* is checked against other GRE SDPs to verify uniqueness. If the *ip-address* is not unique within the configured GRE SDPs, an error is generated and the *ip-address* is not associated with the SDP. The local device may not know whether the *ip-address* is actually a system IP interface address on the far end device.

If the SDP uses MPLS encapsulation, the **far-end** *ip-address* is used to check LSP names when added to the SDP. If the “to IP address” defined within the LSP configuration does not exactly match the SDP **far-end** *ip-address*, the LSP will not be added to the SDP and an error will be generated.

An SDP cannot be administratively enabled until a **far-end** *ip-address* is defined. The SDP is operational when it is administratively enabled (**no shutdown**) and the **far-end** *ip-address* is contained in the IGP routing table as a host route. OSPF ABRs should not summarize host routes between areas. This can cause SDPs to become operationally down. Static host routes (direct and indirect) can be defined in the local device to alleviate this issue.

The **no** form of this command removes the currently configured destination IP address for the SDP. The *ip-address* parameter is not specified and will generate an error if used in the **no far-end** command. The SDP must be administratively disabled using the **config service sdp shutdown** command before the **no far-end** command can be executed. Removing the far end IP address will cause all *lsp-name* associations with the SDP to be removed.

Default none

Parameters *ip-address* — The system address of the far-end 7750 SR for the SDP in dotted decimal notation.

fc

Syntax **fc** {**be** | **l2** | **af** | **l1** | **h2** | **ef** | **h1** | **nc**} **lsp** *lsp-name*
no fc {**be** | **l2** | **af** | **l1** | **h2** | **ef** | **h1** | **nc**}

Context config>service>sdp>forwarding-class

Description This command makes an explicit association between a forwarding class and an LSP. The LSP name must exist and must have been associated with this SDP using the command config>service>sdp>lsp. Multiple forwarding classes can be associated with the same LSP. However, a forwarding class can

only be associated with a single LSP in a given SDP. All subclasses will be assigned to the same LSP as the parent forwarding class.

Default	none
Parameters	lsp <i>lsp-name</i> — Specifies the RSVP or static LSP to use to forward service packets which are classified into the specified forwarding class.

multicast-lsp

Syntax	multicast-lsp <i>lsp-name</i> no multicast-lsp
Context	config>service>sdp>forwarding-class
Description	This command specifies the RSVP or static LSP in this SDP to use to forward VPLS multicast and broadcast packets. The LSP name must exist and must have been associated with this SDP using the command config>service>sdp>lsp. In the absence of an explicit configuration by the user, the default LSP is used.
Default	default-lsp-name

ldp

Syntax	[no] ldp
Context	config>service>sdp
Description	This command enables LDP-signaled LSP's on MPLS-encapsulated SDPs. In MPLS SDP configurations <i>either</i> one LSP can be specified <i>or</i> LDP can be enabled. The SDP ldp and lsp commands are mutually exclusive. If an LSP is specified on an MPLS SDP, then LDP cannot be enabled on the SDP. To enable LDP on the SDP when an LSP is already specified, the LSP must be removed from the configuration using the no lsp lsp-name command. Alternatively, if LDP is already enabled on an MPLS SDP, then an LSP cannot be specified on the SDP. To specify an LSP on the SDP, the LDP must be disabled. The LSP must have already been created in the config>router>mpls context with a valid far-end IP address.
Default	no ldp (disabled)

lsp

Syntax	lsp <i>lsp-name</i> no lsp <i>lsp-name</i>
Context	config>service>sdp

Description	This command creates associations between one or more label switched paths (LSPs) and an Multi-Protocol Label Switching (MPLS) Service Distribution Point (SDP). This command is implemented <i>only</i> on MPLS-type encapsulated SDPs. In MPLS SDP configurations <i>either</i> one LSP can be specified <i>or</i> LDP can be enabled. The SDP ldp and lsp commands are mutually exclusive. If an LSP is specified on an MPLS SDP, then LDP cannot be enabled on the SDP. To enable LDP on the SDP when an LSP is already specified, the LSP must be removed from the configuration using the no lsp lsp-name command. Alternatively, if LDP is already enabled on an MPLS SDP, then an LSP cannot be specified on the SDP. To specify an LSP on the SDP, the LDP must be disabled. The LSP must have already been created in the config>router>mpls context. with a valid far-end IP address. RSVP must be enabled. Each LSP has a preference value defined that is derived from its active path or the LSP itself. When multiple LSPs are defined on an SDP, the LSP with the highest preference will be used for packets transmitted to the far-end device. If no LSP is associated with an MPLS SDP, the SDP cannot enter the operationally up state. The SDP can be administratively enabled (no shutdown) with no LSP associations. The <i>lsp-name</i> may be shutdown, causing the association with the SDP to be operationally down (the LSP will not be used by the SDP). LSP SDPs also require that the TLDP signaling is specified and the SDP Keepalive parameter must be enabled and and not timed out. Up to 16 LSP names can be entered on a single command line. The no form of this command deletes one or more LSP associations from an SDP. If the <i>lsp-name</i> does not exist as an association or as a configured LSP, no error is returned. An <i>lsp-name</i> must be removed from all SDP associations before the <i>lsp-name</i> can be deleted from the system. The SDP must be administratively disabled (shutdown) before the last <i>lsp-name</i> association with the SDP is deleted.
Default	none
Parameters	<i>lsp-name</i> — The name of the LSP to associate with the SDP. An LSP name is case sensitive and is limited to 32 ASCII 7-bit printable characters with no spaces. If an exact match of <i>lsp-name</i> does not already exist as a defined LSP, an error message is generated. If the <i>lsp-name</i> does exist and the LSP to IP address matches the SDP far-end IP address, the association is created.

metric

Syntax	metric <i>metric</i> no metric
Context	config>service>sdp
Description	This command specifies the metric to be used within the tunnel table manager for decision making purposes. When multiple SDPs going to the same destination exist, this value is used as a tie-breaker by tunnel table manager users such as MP-BGP to select the route with the lower value.
Parameters	<i>metric</i> — Specifies the SDP metric. Values 0 — 65535

mixed-lsp-mode

Syntax	[no] mixed-lsp-mode
Context	config>service>sdp
Description	This command enables the use by an SDP of the mixed-LSP mode of operation. The mixed-lsp-mode keyword allows both RSVP and LDP LSPs to be configured on a single SDP. Only one transport type is active with RSVP LSPs having a higher priority than LDP LSPs. At any given time, the service manager programs only one type of LSP in the IOM which will activate it to forward service packets according to the following priority order: 2. RSVP LSP type. Up to 16 RSVP LSPs can be entered by the user and programmed by the service manager in ingress IOM to load balance service packets. This is the highest priority LSP type. 3. LDP LSP type. One LDP FEC programmed by the service manager but ingress IOM can use up to 16 LDP ECMP paths for the FEC to load balance service packets when ECMP is enabled on the node. The service manager will program the NHLFE(s) for the active LSP type preferring the RSVP LSP type over the LDP LSP type. If no RSVP LSP is configured or all configured RSVP LSPs go down, the service manager will re-program the IOM with the LDP LSP if available. If not, the SDP goes operationally down. When a higher priority type LSP becomes available, the service manager reverts back to this LSP at the expiry of the sdp-revert-time timer or the failure of the currently active LSP, whichever comes first. The service manager then re-programs the IOM accordingly. If the infinite value is configured, then the SDP reverts to the highest priority type LSP only if the currently active LSP failed. Note however that LDP uses a tunnel down damp timer that is set to three seconds by default. When the LDP LSP fails, the SDP will revert to the RSVP LSP type after the expiration of this timer. For an immediate switchover this timer must be set to zero. The command for this timer is configure>router>ldp>tunnel-down-damp-time. If the user changes the value of the sdp-revert-time timer, it will take effect only at the next use of the timer. Any pre-existing timer at the time of the change will be restarted with the new value. If class-based forwarding is enabled for this SDP, the forwarding of the packets over the RSVP LSPs will be based on the FC of the packet as in the current implementation. When the SDP activates the LDP LSP type, packets are forwarded over the LDP ECMP paths using the regular hash routine. The no form of this command disables the mixed-LSP mode of operation. The user first has to remove one of the LSP types from the SDP configuration or the command will fail.
Default	no mixed-lsp-mode

sdp-revert-time

Syntax	sdp-revert-time <i>seconds</i> infinite no sdp-revert-time
Context	config>service>sdp>mixed-lsp-mode

Description	This command configures the delay period the SDP must wait before it reverts to a higher priority LSP type when one becomes available. The no option resets the timer to the default value of 0. This means the SDP reverts immediately to a higher priority LSP type when one becomes available.
Default	0
Parameters	<i>seconds</i> — Specifies the delay period, in seconds, that the SDP must wait before it reverts to a higher priority LSP type when one becomes available. A value of zero means the SDP reverts immediately to a higher priority LSP type when one becomes available. Values 0 — 600 seconds infinite — This keyword forces the SDP to never revert to another higher priority LSP type unless the currently active LSP type is down..

signaling

Syntax	signaling {off tldp bgp}
Context	config>service>sdp
Description	This command specifies the signaling protocol used to obtain the ingress and egress pseudowire labels in frames transmitted and received on the SDP. When signaling is <i>off</i> then labels are manually configured when the SDP is bound to a service. The signalling value can only be changed while the administrative status of the SDP is down. Additionally, the signaling can only be changed on an SDP if that SDP is not in use by BGP-AD or BGP-VPLS. BGP signaling can only be enabled if that SDP does not already have pseudowires signaled over it. Also, BGP signaling is not supported with mixed mode LSP SDPs. The no form of this command is not applicable. To modify the signaling configuration, the SDP must be administratively shut down and then the signaling parameter can be modified and re-enabled.
Default	tldp
Parameters	<i>off</i> — Ingress and egress signal auto-labeling is not enabled. If this parameter is selected, then each service using the specified SDP must manually configure VPN labels. This configuration is independent of the SDP's transport type, GRE, MPLS (RSVP or LDP). <i>tldp</i> — Ingress and egress pseudowire signaling using T-LDP is enabled. Default value used when BGP AD automatically instantiates the SDP. <i>bgp</i> — Ingress and egress pseudowire signaling using BGP is enabled. Default value used when BGP VPLS automatically instantiates the SDP.

path-mtu

Syntax	path-mtu bytes no path-mtu
Context	config>service>sdp

Description	This command configures the Maximum Transmission Unit (MTU) in bytes that the Service Distribution Point (SDP) can transmit to the far-end device router without packet dropping or IP fragmentation overriding the SDP-type default path-mtu. The default SDP-type path-mtu can be overridden on a per SDP basis. Dynamic maintenance protocols on the SDP like RSVP may override this setting. If the physical mtu on an egress interface or PoS channel indicates the next hop on an SDP path cannot support the current path-mtu, the operational path-mtu on that SDP will be modified to a value that can be transmitted without fragmentation. The no form of this command removes any path-mtu defined on the SDP and the SDP will use the system default for the SDP type.
Default	The default path-mtu defined on the system for the type of SDP is used.

network-domain

Syntax	network-domain <i>network-domain-name</i> no network-domain
Context	config>service>sdp
Description	This command assigns a given SDP to a given network-domain. The network-domain is then taken into account during sap-ingress queue allocation for VPLS SAP. The network-domain association can only be done in a base-routing context. Associating a network domain with an loop-back or system interface will be rejected. Associating a network-domain with an interface that has no physical port specified will be accepted, but will have no effect as long as a corresponding port, or LAG, is defined. The association of network-domain with loopback interface is not possible. A single SDP can only be associated with a single network-domain.
Default	per default “default” network domain is assigned

pbb-etype

Syntax	pbb-etype [0x0600..0xffff] no pbb-etype
Context	configure>service>sdp
Default	0x88E7
Description	This command configures the Ethertype used for PBB. Values 0x0600..0xffff: 1536 — 65535 (accepted in decimal or hex)

vlan-vc-etype

Syntax	vlan-vc-etype <i>0x0600..0xffff</i> no vlan-vc-etype [<i>0x0600..0xffff</i>]
Context	config>service>sdp
Description	This command configures the VLAN VC EtherType. The no form of this command returns the value to the default.
Default	no vlan-vc-etype
Parameters	<i>0x0600..0xffff</i> — Specifies a valid VLAN etype identifier.

SDP Keepalive Commands

keep-alive

Syntax	keepalive
Context	config>service>sdp
Description	Context for configuring SDP connectivity monitoring keepalive messages for the SDP ID. SDP-ID keepalive messages use SDP Echo Request and Reply messages to monitor SDP connectivity. The operating state of the SDP is affected by the keepalive state on the SDP-ID. SDP Echo Request messages are only sent when the SDP-ID is completely configured and administratively up. If the SDP-ID is administratively down, keepalives for that SDP-ID are disabled. SDP Echo Requests (when sent for keepalive messages) are always sent with the <i>originator-sdp-id</i>. All SDP-ID keepalive SDP Echo Replies are sent using generic IP/GRE OAM encapsulation. When a keepalive response is received that indicates an error condition, the SDP ID will immediately be brought operationally down. Once a response is received that indicates the error has cleared and the hold-down-time interval has expired, the SDP ID will be eligible to be put into the operationally up state. If no other condition prevents the operational change, the SDP ID will enter the operational state. A set of event counters track the number of keepalive requests sent, the size of the message sent, non-error replies received and error replies received. A keepalive state value is kept indicating the last response event. A keepalive state timestamp value is kept indicating the time of the last event. With each keepalive event change, a log message is generated indicating the event type and the timestamp value. The table below describes keepalive interpretation of SDP Echo Reply response conditions and the effect on the SDP ID operational status.

Result of Request	Stored Response State	Operational State
keepalive request timeout without reply	Request Timeout	Down
keepalive request not sent due to non-existent <i>orig-sdp-id</i> ^a	Orig-SDP Non-Existent	Down
keepalive request not sent due to administratively down <i>orig-sdp-id</i>	Orig-SDP Admin-Down	Down
keepalive reply received, invalid origination-id	Far End: Originator-ID Invalid	Down
keepalive reply received, invalid responder-id	Far End: Responder-ID Error	Down
keepalive reply received, No Error	Success	Up (If no other condition prevents)

- a. This condition should not occur.

hello-time

Syntax	hello-time <i>seconds</i> no hello-time
Context	config>service>sdp>keep-alive
Description	Configures the time period between SDP keepalive messages on the SDP-ID for the SDP connectivity monitoring messages. The no form of this command reverts the hello-time <i>seconds</i> value to the default setting.
Default	hello-time 10 — 10 seconds between keepalive messages <i>seconds</i> — The time period in seconds between SDP keepalive messages, expressed as a decimal integer. Values 1 — 3600

hold-down-time

Syntax	hold-down-time <i>seconds</i> no hold-down-time
Context	config>service>sdp>keep-alive
Description	Configures the minimum time period the SDP will remain in the operationally down state in response to SDP keepalive monitoring. This parameter can be used to prevent the SDP operational state from “flapping” by rapidly transitioning between the operationally up and operationally down states based on keepalive messages. When an SDP keepalive response is received that indicates an error condition or the max-drop-count keepalive messages receive no reply, the <i>sdp-id</i> will immediately be brought operationally down. If a keepalive response is received that indicates the error has cleared, the <i>sdp-id</i> will be eligible to be put into the operationally up state only after the hold-down-time interval has expired. The no form of this command reverts the hold-down-time <i>seconds</i> value to the default setting.
Default	hold-down-time 10 — The SDP is operationally down for 10 seconds after an SDP keepalive error.
Parameters	<i>seconds</i> — The time in seconds, expressed as a decimal integer, the <i>sdp-id</i> will remain in the operationally down state before it is eligible to enter the operationally up state. A value of 0 indicates that no hold-down-time will be enforced for <i>sdp-id</i> . Values 0 — 3600

max-drop-count

Syntax	max-drop-count <i>count</i> no max-drop-count
Context	config>service>sdp>keep-alive
Description	This command configures the number of consecutive SDP keepalive failed request attempts or remote replies that can be missed after which the SDP is operationally downed. If the max-drop-count consecutive keepalive request messages cannot be sent or no replies are received, the SDP-ID will be brought operationally down by the keepalive SDP monitoring. The no form of this command reverts the max-drop-count <i>count</i> value to the default settings.
Default	max-drop-count 3
Parameters	<i>count</i> — The number of consecutive SDP keepalive requests that are failed to be sent or replies missed, expressed as a decimal integer. Values 1 — 5

message-length

Syntax	message-length <i>octets</i> no message-length
Context	config>service>sdp>keep-alive
Description	This command configures the SDP monitoring keepalive request message length transmitted. The no form of this command reverts the message-length <i>octets</i> value to the default setting.
Default	0 — The message length should be equal to the SDP's operating path MTU as configured in the path-mtu command. If the default size is overridden, the actual size used will be the smaller of the operational SDP-ID Path MTU and the size specified. <i>octets</i> — The size of the keepalive request messages in octets, expressed as a decimal integer. The size keyword overrides the default keepalive message size. Values 40 — 9198

timeout

Syntax	timeout <i>timeout</i> no timeout
Context	config>service>sdp>keep-alive
Description	This command configures the time interval that the SDP waits before tearing down the session.
Default	5
Parameters	<i>timeout</i> — The timeout time, in seconds. Values 1 — 10

ETH-CFM Configuration Commands

eth-cfm

Syntax	eth-cfm
Context	config
Description	This command enables the context to configure 802.1ag CFM parameters.

domain

Syntax	domain <i>md-index</i> [format { dns mac none string }] name <i>md-name</i> level <i>level</i> domain <i>md-index</i> no domain <i>md-index</i>										
Context	config>eth-cfm										
Description	This command configures Connectivity Fault Management domain parameters. The no form of the command removes the MD index parameters from the configuration.										
Parameters	<i>md-index</i> — Specifies the Maintenance Domain (MD) index value. Values 1 — 4294967295 format { dns mac string } — Specifies a value that represents the type (format). Values <table><tr><td>dns:</td><td>Specifies the DNS name format.</td></tr><tr><td>mac:</td><td>X:X:X:X:X-X-u X: [0..FF]h u: [0..65535]d</td></tr><tr><td>none:</td><td>The dot1ag MA is actually an Y.1731 MEG.</td></tr><tr><td>string</td><td>Specifies an ASCII string.</td></tr></table> Default string name <i>md-name</i> — Specifies a generic Maintenance Domain (MD) name. Values 1 — 43 characters level <i>level</i> — Specifies the integer identifying the maintenance domain level (MD Level). Higher numbers correspond to higher maintenance domains, those with the greatest physical reach, with the highest values for customers' CFM packets. Lower numbers correspond to lower maintenance domains, those with more limited physical reach, with the lowest values for single bridges or physical links. Values 0 — 7			dns:	Specifies the DNS name format.	mac:	X:X:X:X:X-X-u X: [0..FF]h u: [0..65535]d	none:	The dot1ag MA is actually an Y.1731 MEG.	string	Specifies an ASCII string.
dns:	Specifies the DNS name format.										
mac:	X:X:X:X:X-X-u X: [0..FF]h u: [0..65535]d										
none:	The dot1ag MA is actually an Y.1731 MEG.										
string	Specifies an ASCII string.										

association

Syntax	association <i>ma-index</i> [format { icc-based integer string vid vpn-id }] name <i>ma-name</i> association <i>ma-index</i> no association <i>ma-index</i>										
Context	config>eth-cfm>domain										
Description	This command configures the Maintenance Association (MA) for the domain. <i>ma-index</i> — Specifies the MA index value. Values 1 — 4294967295 format { icc-based integer string vid vpn-id } — Specifies a value that represents the type (format). Values <table> <tr> <td>icc-based:</td><td>The dot1ag MA is actually an Y.1731 MEG.</td></tr> <tr> <td>integer:</td><td>0 — 65535 (integer value 0 means the MA is not attached to a VID.)</td></tr> <tr> <td>string:</td><td>raw ascii</td></tr> <tr> <td>vid:</td><td>0 — 4095</td></tr> <tr> <td>vpn-id:</td><td>RFC-2685, <i>Virtual Private Networks Identifier</i> xxx:xxxx, where x is a value between 00 and FF. for example 00164D:AABBCCDD</td></tr> </table> Default integer name <i>ma-name</i> — Specifies the part of the maintenance association identifier which is unique within the maintenance domain name. Values 1 — 45 characters	icc-based:	The dot1ag MA is actually an Y.1731 MEG.	integer:	0 — 65535 (integer value 0 means the MA is not attached to a VID.)	string:	raw ascii	vid:	0 — 4095	vpn-id:	RFC-2685, <i>Virtual Private Networks Identifier</i> xxx:xxxx, where x is a value between 00 and FF. for example 00164D:AABBCCDD
icc-based:	The dot1ag MA is actually an Y.1731 MEG.										
integer:	0 — 65535 (integer value 0 means the MA is not attached to a VID.)										
string:	raw ascii										
vid:	0 — 4095										
vpn-id:	RFC-2685, <i>Virtual Private Networks Identifier</i> xxx:xxxx, where x is a value between 00 and FF. for example 00164D:AABBCCDD										

bridge-identifier

Syntax	[no] bridge-identifier <i>bridge-id</i>
Context	config>eth-cfm>domain>association
Description	This command configures the service ID for the domain association. The value should be configured to match the <i>service-id</i> of the service where MEPs for this association will be created. Note that there is no verification that the service with a matching <i>service-id</i> exists.
Parameters	<i>bridge-id</i> — Specifies the bridge ID for the domain association. Values 1 — 2147483647

mhf-creation

Syntax	mhf-creation { none explicit } no mhf-creation
Context	config>eth-cfm>domain>association>bridge-identifier
Description	This command determines whether to allow automatic MIP creation for the MA.
Default	none
Parameters	none — Specifies that no MHFs can be created for this VID. explicit — Specifies that MHFs can be created for this VID only on bridge ports through which this VID can pass, and only if a MEP is created at some lower MA level. There must be at least one lower level MEP provisioned on the same SAP or SDP.

vlan

Syntax	vlan <i>vlan-id</i> no vlan
Context	config>eth-cfm>domain>association>bridge-identifier
Description	This command configures the bridge-identifier primary VLAN ID. Note that it is informational only, and no verification is done to ensure MEPs on this association are on the configured VLAN.
Parameters	<i>vlan-id</i> — Specifies a VLAN ID monitored by MA. Values 0 — 4094

ccm-interval

Syntax	ccm-interval { 10ms 100ms 1 10 60 600 } no ccm-interval
Context	config>eth-cfm>domain>association
Description	This command configures the CCM transmission interval for all MEPs in the association. The no form of the command reverts the value to the default.
Default	10 seconds
Parameters	interval — Specifies the interval between CCM transmissions to be used by all MEPs in the MA. Values 10 milliseconds, 100 milliseconds, 1 second, 10 seconds, 60 seconds, 600 seconds

remote-mepid

Syntax	[no] remote-mepid <i>mep-id</i>

Context	config>eth-cfm>domain>association
Description	This command configures the remote maintenance association end point MEP identifier.
Parameters	<i>mep-id</i> — Maintenance association end point identifier of a remote MEP whose information from the MEP database is to be returned.
Values	1 — 8191

VLL Services

In This Chapter

This section provides information about Virtual Leased Line (VLL) services and implementation notes.

Topics in this section include:

- [ATM VLL \(Apipe\) Services on page 180](#)
- [Circuit Emulation Services \(Cpipe\) on page 185](#)
- [Ethernet Pipe \(Epipe\) Services on page 195](#)
- [Frame Relay VLL \(Fpipe\) Services on page 201](#)
- [IP Interworking VLL \(Ipipe\) Services on page 205](#)
- [Pseudowire Switching on page 213](#)
- [Pseudowire Redundancy on page 222](#)
- [VLL Using G.8031 Protected Ethernet Tunnels on page 233](#)

ATM VLL (Apipe) Services

This section provides information about the Apipe service and implementation notes.

Topics in this section include:

- [ATM VLL For End-to-End ATM Service on page 180](#)
- [ATM Virtual Trunk Over IP/MPLS Packet-Switched Network on page 182](#)
- [Common Configuration Tasks on page 241](#)
 - [Configuring VLL Components on page 242](#)
 - [Creating an Apipe Service on page 242](#)
- [Service Management Tasks on page 285](#)

ATM VLL For End-to-End ATM Service

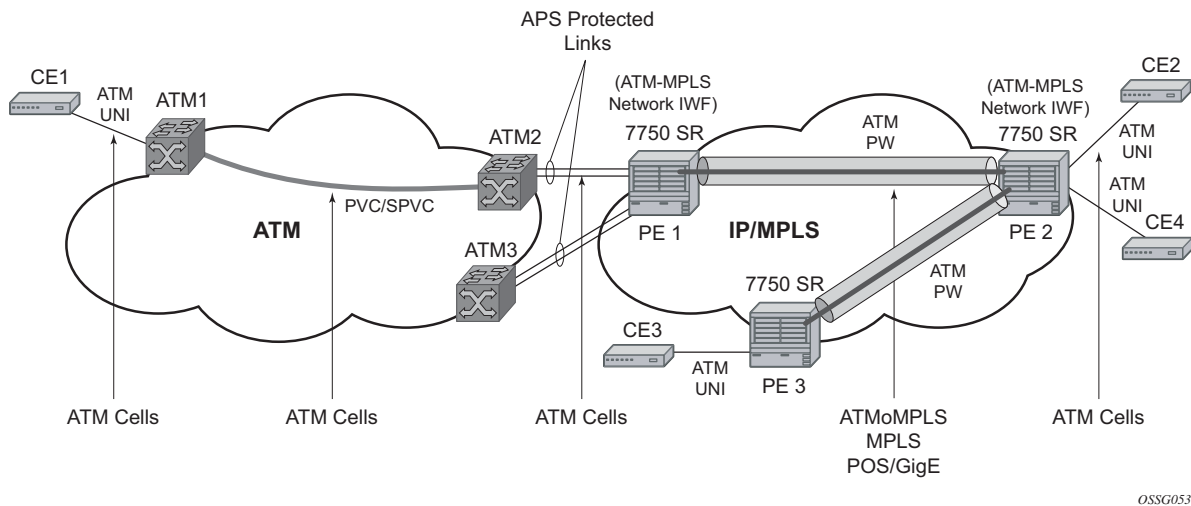


Figure 31: ATM VLL for End-to-End ATM Service

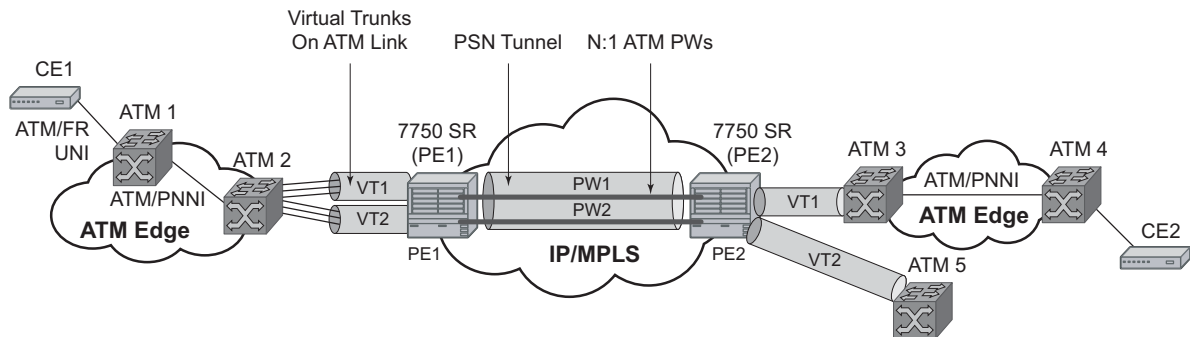
ATM VLLs (Apipe) provide a point-to-point ATM service between users connected to 7750 SR nodes on an IP/MPLS network. Users are either directly connected to a 7750 PE or through an ATM access network. In both cases, an ATM PVC (for example, a virtual channel (VC) or a virtual path (VP)) is configured on the 7750 PE. This feature supports local cross-connecting when users are attached to the same 7750 PE node. VPI/VCI translation is supported in the ATM VLL.

PE1, PE2, and PE3 receive standard UNI/NNI cells on the ATM Service Access Point (SAP) that are then encapsulated into a pseudowire packet using the N:1 cell mode encapsulation or AAL5

SDU mode encapsulation according to draft-ietf-pwe3-atm-encap-xx.txt, *Encapsulation Methods for Transport of ATM Over MPLS Networks*. When using N:1 cell mode encapsulation, cell concatenation into a pseudowire packet is supported. In this application, the setup of both VC and VP level connections are supported.

The ATM pseudowire is initiated using Targeted LDP (TLDP) signaling as specified in draft-ietf-pwe3-control-protocol-xx.txt, *Pseudowire Setup and Maintenance using LDP*. The SDP can be an MPLS or a GRE type.

ATM Virtual Trunk Over IP/MPLS Packet-Switched Network



OSSG054

Figure 32: VT Application Example

ATM virtual trunk (VT) implements a transparent trunking of user and control traffic between two ATM switches over an ATM pseudowire. Figure 32 depicts ATM 2 and ATM 3 switches that appear as if they are directly connected over an ATM link. Control traffic includes PNNI signaling and routing traffic.

The virtual trunk (VT) SAP on a 7750 PE is identified by a tuple (port, VPI-range) meaning that all cells arriving on the specified port within the specified VPI range are fed into a single ATM pseudowire for transport across the IP/MPLS network. Note that a user can configure the whole ATM port as a VT and does not need to specify a VPI range. No VPI/VCI translation is performed on ingress or egress. Cell order is maintained within a VT. Note that, as a special case, the two ATM ports could be on the same PE node.

By carrying all cells from all VPIs making up the VT in one pseudowire, a solution is provided that is both robust, for example no black holes on some VPIs but not others, as well as operationally efficient since the entire VT can be managed as a single entity from the Network Manager (single point for configuration, status, alarms, statistics, etc.).

ATM virtual trunks use PWE3 N:1 ATM cell mode encapsulation to provide a cell-mode transport, supporting all AAL types, over the MPLS network. Cell concatenation on a pseudowire packet is supported. The SDP can be of an MPLS or a GRE type.

The ATM pseudowire is initiated using Targeted LDP (TLDP) signaling (defined in draft-ietf-pwe3-control-protocol-xx.txt, *Pseudowire Setup and Maintenance using LDP*). In this application, there is no ATM signaling on the 7750 gateway nodes since both endpoints of the MPLS network are configured by the network operator. ATM signaling between the ATM nodes is passed transparently over the VT (along with user traffic) from one ATM port on a 7750 PE to another ATM port on a remote (or the same) 7750 SR PE.

Traffic Management Support

Ingress Network Classification

Classification is based on the EXP value of the pseudowire label and EXP-to-FC mapping is determined by the network ingress QoS policy.

Ingress Queuing and Shaping on the IOM

Each SAP of an ATM VLL has an associated single ingress service queue on the IOM. The default QoS policy configures this queue to have CIR=0 and PIR=line rate. Other QoS policies can be applied if they specify a single service queue. Applying a non-default QoS policy allows the CIR/PIR of the incoming traffic to be controlled, regardless of whether ATM policing is configured, and provides queuing and shaping to smooth traffic flows on the ingress of the network.

Egress Queuing and Shaping on the IOM

Each SAP of an ATM VLL has a single associated egress service queue on the IOM. The default QoS policy configures this queue to have CIR=0 and PIR=line rate. Other QoS policies can be applied if they specify a single service queue. Applying a non-default QoS policy allows the CIR/PIR of the outgoing traffic to be controlled, regardless of whether ATM shaping is configured.

Egress Shaping/Scheduling

Each SAP of an ATM VLL has an egress ATM traffic descriptor associated with it. The default traffic descriptor has service category UBR with zero MIR, resulting in endpoints associated with this descriptor being scheduled at the lowest priority on the ATM MDA. Egress traffic may be shaped or scheduled, depending on the configuration of the egress ATM traffic descriptor associated with the SAP. [Table 5](#) provides details of how the different service categories and shaping settings affect egress transmission rates.

Shaping applies to CBR, rtVBR and nrtVBR service categories and results in cells being transmitted in such a way as to satisfy a downstream ATM UPC function. In particular, the transmission rate will be limited (in the case of CBR, there is a hard limit of PIR, while rtVBR/nrtVBR will transmit at SIR with short (constrained by MBS) bursts of up to PIR), and the inter-cell gap will also be controlled.

Service category UBR and rtVBR are scheduled on the WRR scheduler with the configured rates (MIR for UBR+) determining the weight applied to the flow. Weights are between 1 and 255 and are determined by a formula applied to the configured rate. UBR flows (for example, those with

no MIR) receive a weight of 1 and the maximum weight of 255 is reached by flows with configured rates of around 8 Mbps. Scheduling does not apply a limit to the transmission rate; the available port bandwidth is shared out by the scheduler according to the weight, so if other flows are quiescent, a given flow may burst up to port bandwidth.

Shaping and scheduling of egress ATM VLL traffic is performed entirely at the ATM layer and is therefore not forwarding-class-aware. If the offered rate is greater than can be transmitted towards the customer (either because the shaping rate limits transmission or because the SAP does not receive sufficient servicing in the weighed round-robin used for scheduled SAPs), the per-VC queue will back up and this will trigger the congestion control mechanisms in the MDA queues or in the IOM service egress queues associated with the SAP. For AAL5 SDU VLLs, these discards occur at the AAL5 SDU level. For N-to-1 VLLs, these discards occur at the level of the cell or a block of cells when cell concatenation is enabled.

Table 5: Behavior and Relative Priorities

Flow type	Transmission rate	Priority
shaped CBR	Limited to configured PIR	Strict priority over all other traffic
shaped rtVBR	Limited to configured SIR, but with bursts up to PIR within MBS	Strict priority over all but shaped CBR
shaped nrtVBR	Limited to configured SIR, but with bursts up to PIR within MBS	Strict priority over all scheduled traffic
scheduled nrtVBR	Weighted share (according to SIR) of port bandwidth remaining after shaped traffic has been exhausted	In the same WRR scheduler as UBR+ and UBR
scheduled UBR+	Weighted share (according to MIR) of port bandwidth remaining after shaped traffic has been exhausted	In the same WRR scheduler as nrtVBR and UBR
scheduled UBR	Weighted share (with weight of 1) of port bandwidth remaining after shaped traffic has been exhausted	In the same WRR scheduler as nrtVBR and UBR+

Circuit Emulation Services (Cpipe)

Mobile Infrastructure

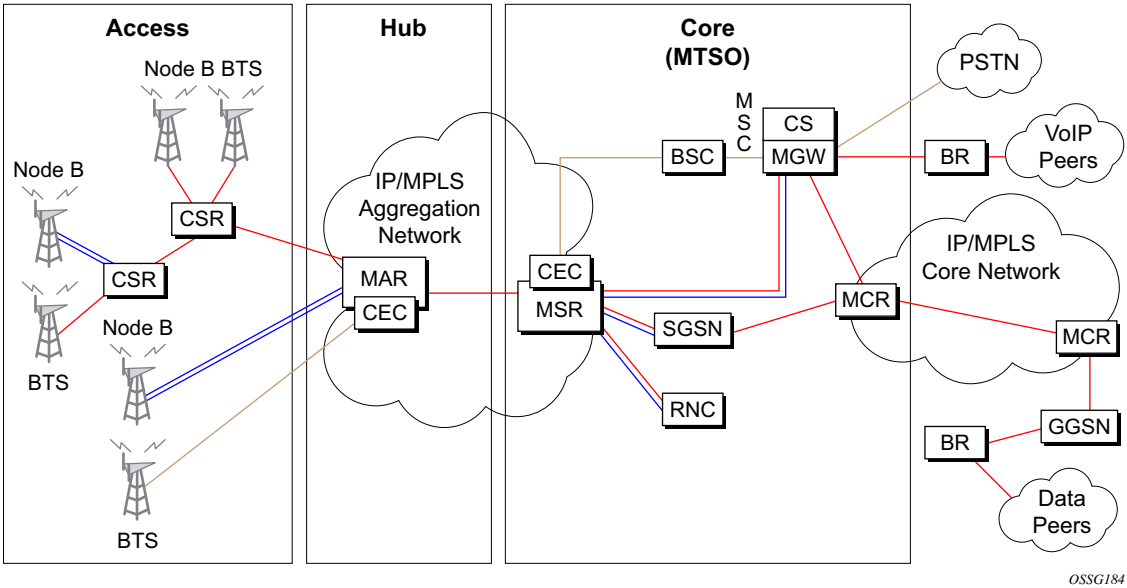


Figure 33: Mobile Infrastructure

Table 6: Mobile Infrastructure Definitions

Cellsite Backhaul Type	CSR Role	Transport Acronyms
Microwave	Circuit emulation	CSR: Cellsite Service Router
xDSL	ATM IMA termination into pseudowire	MAR: Mobile Aggregation Router
Fiber, dark or light	Ethernet VLL switching	MSR: Mobile Service Router
ATM, ATM IMA	IP/MPLS aggregation	CEC: Circuit Emulation Concentrator
Leased line		MCR: Mobile Core Router

Table 6: Mobile Infrastructure Definitions (Continued)

Cellsite Backhaul Type	CSR Role	Transport Acronyms
BR: Border Router		

Packet infrastructure is required within 2G, 2.5G and 3G mobile networks to handle SMS messaging, web browsing and emerging applications such as streaming video, gaming and video on demand. Within existing 2.5G and 3G mobile networks, ATM is defined as the transport protocol. Within existing 2G networks, TDM is defined as the transport protocol. Due to the relatively low bit rate of existing handsets, most cell sites use 2-10 DS1s or E1s to transport traffic. When using ATM over multiple DS1/E1 links, Inverse Multiplexing over ATM (IMA) is very effective for aggregating the available bandwidth for maximum statistical gain and providing automatic resilience in the case of a link failure. Also, multiple DS1s or E1s are required to transport the 2G voice traffic.

Typically, low cost devices are used at the many cell sites to transport multiple DS1 or E1 using ATM/IMA and TDM over an Ethernet/MPLS infrastructure. In Alcatel-Lucent applications, the circuit emulation would currently be performed using the 7250 SAS. This could be performed by the 7505 SAR or DMXplore at the cell site. However, a large number of cell sites aggregate into a single switching center. Book-ending 7250 SAS nodes would require a very large number of systems at the switching center ([Figure 33](#)). Therefore, a channelized OC3/STM1 solution is much more efficient at the switching center. Due to the lower capacity requirements for mobile network infrastructure, the 7710 SR is well positioned for these applications. However, some customers will have scaling and deployment time frame requirements that necessitate the use of the 7750 SR. With the introduction of a channelized OC3/STM1 CES CMA/MDA in the 7710 SR and 7750 SR, Alcatel-Lucent can provide a converged, flexible solution for IP/MPLS infrastructures for 2G/2.5G/3G mobile networks supporting both the CES (by CES CMA/MDA) and ATM/IMA transported traffic (by the ASAP MDA).

Circuit Emulation Services

Two modes of circuit emulation are supported, unstructured and structured. Unstructured mode is supported for DS1 and E1 channels per RFC 4553, *Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)*. Structured mode is supported for n*64 kbps circuits as per RFC 5086, *Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)*. In addition, DS1, E1 and n*64 kbps circuits are supported (per MEF8). TDM circuits are optionally encapsulated in MPLS or Ethernet as per the referenced standards in the following figures.

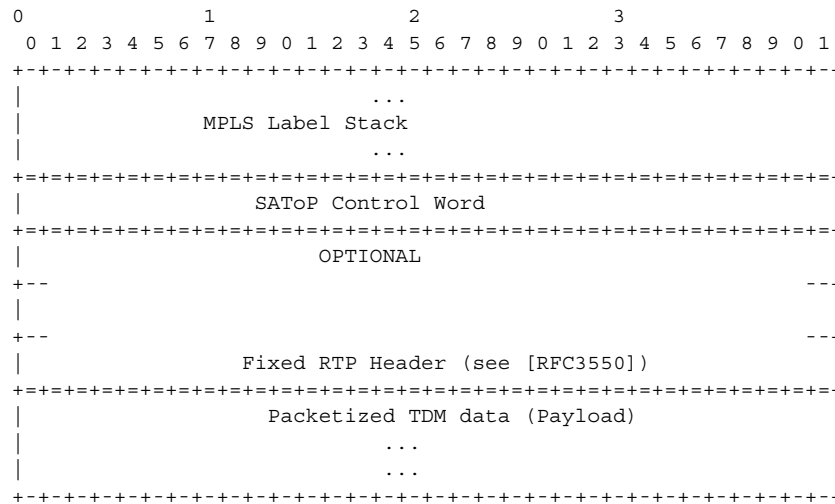


Figure 34: RFC 4553 [SAToP] MPLS PSN Encapsulation

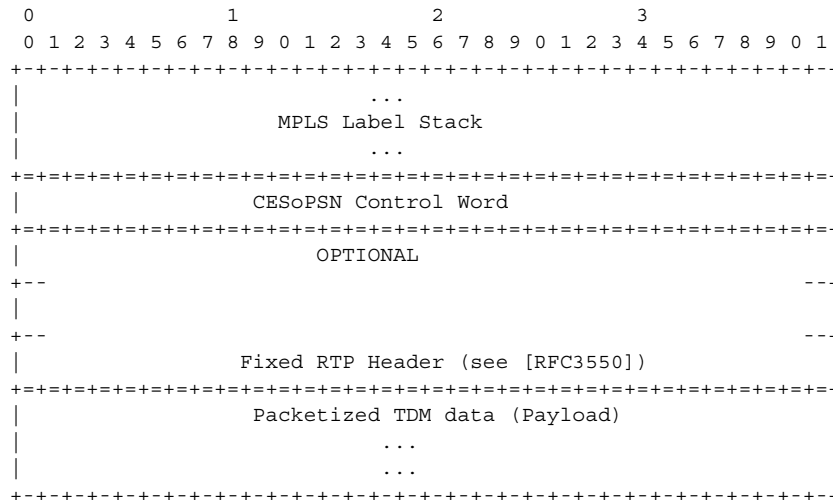


Figure 35: CESoPSN Packet Format for an MPLS PSN

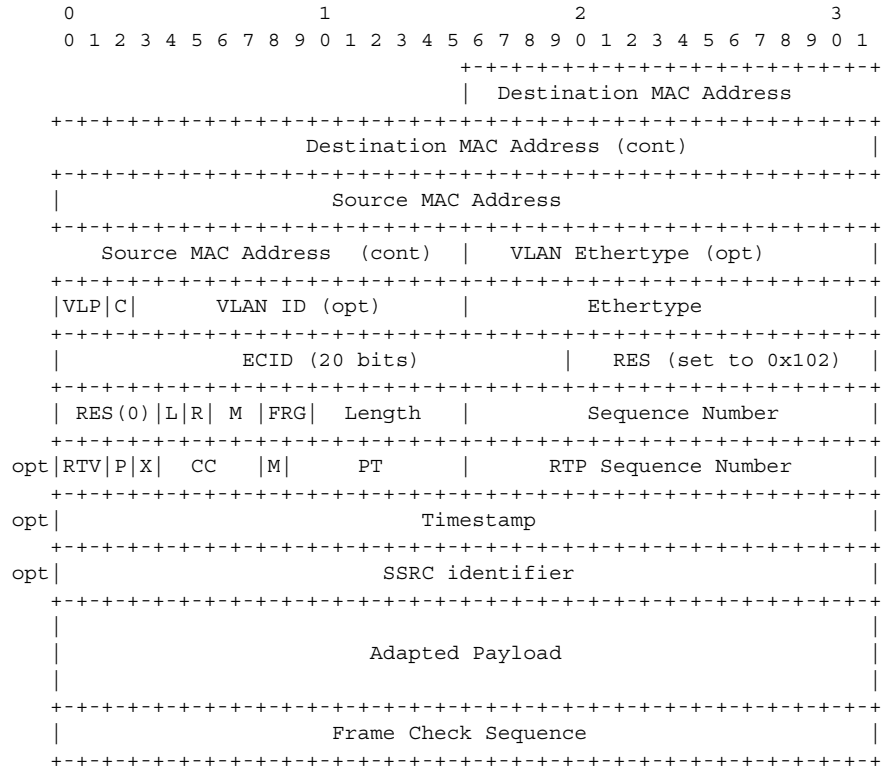


Figure 36: MEF8 PSN Encapsulation

Circuit Emulation Parameters

Circuit Emulation Modes

All channels on the CES CMA/MDA are supported as circuits to be emulated across the packet network. Structure aware mode is supported for n*64 kbps channel groups in DS1 and E1 carriers. Fragmentation is not supported for circuit emulation packets (structured or unstructured).

For DS1 and E1 unstructured circuits, the framing can be set to unframed. When channel group 1 is created on an unframed DS1 or E1, it is automatically configured to contain all 24 or 32 channels respectively.

N*64 kbps circuit emulation supports basic and Channel Associated Signaling (CAS) options for timeslots 1-31 (channels 2-32) on E1 carriers and channels 1-24 on DS1 carriers. CAS in-band is supported, therefore no separate pseudowire support for CAS is provided. CAS option can be enabled or disabled for all channel groups on a given DS1 or E1. If CAS operation is enabled, timeslot 16 (channel 17) cannot be included in the channel group on E1 carriers. CCS operation is not supported.

Absolute Mode Option

For all circuit emulation channels except those with differential clock sources, RTP headers in absolute mode can be optionally enabled (off by default). For circuit emulation channels which use differential clock sources, this configuration is blocked. All channel groups on a given DS1 or E1 can be configured for the same mode of operation.

When enabled for absolute mode operation, an RTP header will be inserted. On transmit, the CES IWF will insert an incrementing (by 1 for each packet) timestamp into the packets. All other fields will be set to zero. The RTP header will be ignored on receipt. This mode is enabled for interoperability purposes only for devices which require an RTP header to be present.

Payload Size

For DS3, E3, DS1 and E1 circuit emulation, the payload size can be configurable in number of octets. The default values for this parameter are shown in [Table 7](#). Unstructured payload sizes can be set to a multiple of 32 octets and minimally be 64 octets.

Table 7: Unstructured Payload Defaults

TDM Circuit	Default Payload Size
DS1	192 octets
E1	256 octets

For n*64 kbps circuits, the number of octets or DS1/E1 frames to be included in the TDM payload needs to be configurable in the range 4 to 128 DS1/E1 frames in increments of 1 or the payload size in octets. The default number of frames is shown in the table below with associated packet sizes. For the number of 64 kbps channels included (N), the following number of frames defaults apply for no CAS: N=1, 64 frames; 2<=N<= 4, 32 frames; 5<=N<= 15, 16 frames; N>=16, 8 frames. For CAS circuits, the number of frames can be 24 for DS1 and 16 for E1 which yields a payload size of N*24 octets for T1 and N*16 octets for E1. For CAS, the signaling portion is an additional ((N+1)/2) bytes where N is the number of channels. The additional signaling bytes are not included in the TDM payload size, although they are included in the actual packet size shown in [Table 8](#).

The full ABCD signaling value can be derived before the packet is sent. This occurs for every 24 frames for DS1 ESF and every 16 frames for E1. Note that for DS1 SF, ABAB signaling is actually sent as SF framing only supports AB signaling every 12 frames.

Table 8: Structured Number of Frames Defaults

Num Timeslots	no CAS			DS1 CAS		E1 CAS	
	num-frames default	Default Payload	Minimum Payload	Pay-load (24 frames)	Packet Size	Pay-load (16 frames)	Packet Size
1	64	64	40	24	25	16	17
2	32	64	64	48	49	32	33
3	32	96	96	72	74	48	50
4	32	128	128	96	98	64	66
5	16	80	80	120	123	80	83
6	16	96	96	144	147	96	99
7	16	112	112	168	172	112	116
8	16	128	128	192	196	128	132
9	16	144	144	216	221	144	149
10	16	160	160	240	245	160	165

Table 8: Structured Number of Frames Defaults (Continued)

Num Timeslots	no CAS			DS1 CAS		E1 CAS	
	num-frames default	Default Payload	Minimum Payload	Pay-load (24 frames)	Packet Size	Pay-load (16 frames)	Packet Size
11	16	176	176	264	270	176	182
12	16	192	192	288	294	192	198
13	16	208	208	312	319	208	215
14	16	224	224	336	343	224	231
15	16	240	240	360	368	240	248
16	8	128	128	384	392	256	264
17	8	136	136	408	417	272	281
18	8	144	144	432	441	288	297
19	8	152	152	456	466	304	314
20	8	160	160	480	490	320	330
21	8	168	168	504	515	336	347
22	8	176	176	528	539	352	363
23	8	184	184	552	564	368	380
24	8	192	192	576	588	384	396
25	8	200	200	NA	NA	400	413
26	8	208	208	NA	NA	416	429
27	8	216	216	NA	NA	432	446
28	8	224	224	NA	NA	448	462
29	8	232	232	NA	NA	464	479
30	8	240	240	NA	NA	480	495
31	8	248	248	NA	NA	NA	NA

NOTE: num-frames DS1 CAS are multiples of 24; num-frames E1 is a multiple of 16.

Jitter Buffer

For each circuit, the maximum receive jitter buffer are configurable. Playout from this buffer starts when the buffer is 50% full to give an operational packet delay variance (PDV) equal to 75% of the maximum buffer size. The default value for the jitter buffer is nominally 5 ms. However, for lower speed N*64kbps circuits and CAS circuits, the following default values are used to align with the default number of frames (and resulting packetization delay) to allow at least two frames to be received before starting to playout the buffer. The jitter buffer is at least four times the packetization delay. The following default jitter buffer values for structured circuits apply:

Basic CES (DS1 & E1):

N=1, 32 ms

2<=N<= 4, 16 ms

5<=N<=15, 8 ms

N>=16, 5 ms

CES Circuit Operation

The circuit status can be tracked to be either up, loss of packets or administratively down. Statistics are available for the number of in service seconds and the number of out of service seconds when the circuit is administratively up.

Jitter buffer overrun and underrun counters are available by statistics and optionally logged while the circuit is up. On overruns, excess packets are discarded and counted. On underruns, all ones are sent for unstructured circuits. For structured circuits, all ones or a user defined data pattern is sent based on configuration. Also, if CAS is enabled, all ones or a user defined signaling pattern is sent based on configuration.

For each CES circuit, alarms can be optionally disabled/enabled for stray packets, malformed packets, packet loss, receive buffer overrun and remote packet loss. An alarm is raised if the defect persists for 3 seconds, and cleared when defect no longer persists for 10 seconds. These alarms are logged and trapped when enabled.

Services for Transporting CES Circuits

Each circuit can be optionally encapsulated in MPLS, Ethernet packets. Circuits encapsulated in MPLS use circuit pipes (Cpipes) to connect to the far-end circuit. Cpipes support either SAP-spoke SDP or SAP-SAP connections. Cpipes are supported over MPLS and GRE tunnels. Cpipe's default service MTU is set to 1514 bytes.

Circuits encapsulated in Ethernet can be selected as a SAP in Epipes. Circuits encapsulated in Ethernet can be SAP-spoke SDP connections or Ethernet CEM SAP to Ethernet SAP for all valid epipe SAPs. Circuits requiring CEM SAP — CEM SAP connections use Cpipes. A local and remote EC-ID and far-end destination MAC address can be configurable for each circuit. The CMA/MDA's MAC address will be used as the source MAC address for these circuits.

For all service types, there are deterministic PIR=CIR values with class=EF parameters based on the circuit emulation parameters.

All circuit emulation services support the display of status of up, loss of packets (LOP) or admin down. Also, any jitter buffer overruns or underruns are logged.

Non-stop services are supported for Cpipes and CES over Epipes.

Network Synchronization Considerations

Each OC-3/STM-1 port can be independently configured to be loop-timed or node-timed. Each OC-3/STM-1 port can be configured to be a timing source for the node.

Each DS-1 or E-1 channel without CAS signaling enabled can be independently configured to be loop-timed, node-timed, adaptive-timed or differential-timed. Each DS-1 or E-1 channel with CAS signaling enabled can be independently configured to be loop-timed or node-timed. Adaptive-timed and differential-timed are not supported on DS-1 or E-1 channels with CAS signaling enabled.

A CES circuit's adaptive recovered clock can be used a timing reference source for the node (ref1 or ref2). This is required to distribute network timing to network elements which only have packet connectivity to the network. One timing source on the CMA/MDA can be monitored for timing integrity. Both timing sources can be monitored if they are configured on separate CMA/MDAs while respecting the timing subsystem slot requirements. If a CES circuit is being used for adaptive clock recovery at the remote end (such that the local end is now an adaptive clock master), it is recommended to set the DS-1/E-1 to be node-timed to prevent potential jitter issues in the recovered adaptive clock at the remote device.

For differential-timed circuits, the following timestamp frequencies are supported: 103.68 MHz (for recommended >100MHz operation), 77.76 MHz (for interoperability with SONET/SDN based systems such as TSS-5) and 19.44 MHz (for Y.1413 compliance).

Adaptive and differential timing recovery must comply with published jitter and wander specifications (G.823, G.824 and G.8261) for traffic interfaces under typical network conditions and for synchronous interfaces under specified packet network delay, loss and delay variance (jitter) conditions. The packet network requirements to meet the synchronous interface requirements are to be determined during the testing phase.

On the 7710 SR CES CMA, a BITS port is also provided. The BITS port can be used as one of the two timing reference sources in the system timing subsystem. The operation of BITS ports configured as ref1 or ref2 is the same as existing ports configured as ref1 and ref2 with all options supported. The operation of the 7750/7450 BITS source is unchanged and the BITS ports are not available on the CES MDAs (only SF/CPM BITS are currently available).

Ethernet Pipe (Epipe) Services

This section provides information about the Epipe service and implementation notes.

Topics in this section include:

- [Epipe Service Overview on page 196](#)
 - [SAP Encapsulations and Pseudowire Types on page 236](#)
 - [QoS Policies on page 238](#)
 - [Filter Policies on page 238](#)
 - [MAC Resources on page 238](#)
- [Basic Configurations on page 241](#)
- [Common Configuration Tasks on page 241](#)
 - [Configuring VLL Components on page 242](#)
 - [Creating an Epipe Service on page 253](#)
- [Service Management Tasks on page 285](#)

Epipe Service Overview

An Epipe service is Alcatel-Lucent's implementations of an Ethernet VLL based on the IETF "Martini Drafts" (draft-martini-l2circuit-trans-mpls-08.txt and draft-martini-l2circuit-encapmpls-04.txt) and the IETF Ethernet Pseudo-wire Draft (draft-so-pwe3-ethernet-00.txt).

An Epipe service is a Layer 2 point-to-point service where the customer data is encapsulated and transported across a service provider's IP, MPLS or PBB VPLS network. An Epipe service is completely transparent to the subscriber's data and protocols. The 7750 SR Epipe service does not perform any MAC learning. A local Epipe service consists of two SAPs on the same node, whereas a distributed Epipe service consists of two SAPs on different nodes. SDPs are not used in local Epipe services.

Each SAP configuration includes a specific port/channel on which service traffic enters the 7750 SR from the customer side (also called the access side). Each port is configured with an encapsulation type. If a port is configured with an IEEE 802.1Q (referred to as Dot1q) encapsulation, then a unique encapsulation value (ID) must be specified.

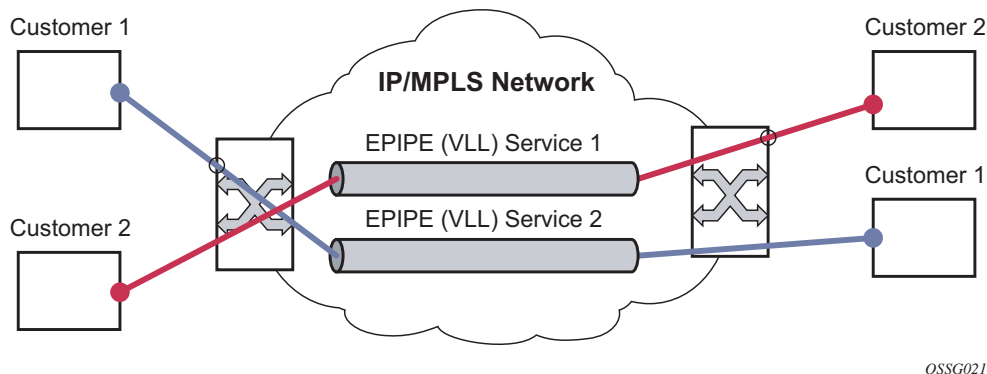


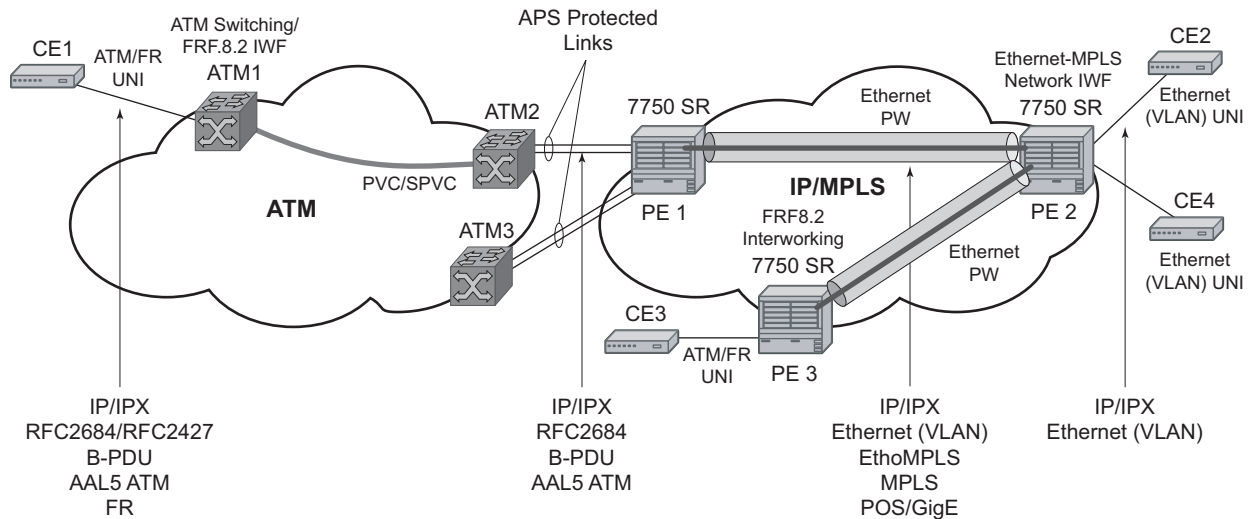
Figure 37: Epipe/VLL Service

Epipe with PBB

A pbb-tunnel may be linked to an Epipe to a B-VPLS. MAC switching and learning is not required for the point-to-point service (all packets ingressing the SAP are PBB encapsulated and forwarded to the PBB tunnel to the backbone destination MAC address and all the packets ingressing the B-VPLS destined for the ISID are PBB de-encapsulated and forwarded to the Epipe SAP. A fully specified backbone destination address must be provisioned for each PBB Epipe instance to be used for each incoming frame on the related I-SAP. If the backbone destination address is not found in the B-VPLS FDB then packets may be flooded through the B-VPLSs

All B-VPLS constructs may be used including B-VPLS resiliency and OAM. Not all generic Epipe commands are applicable when using a PBB tunnel.

Ethernet Interworking VLL



OSSG059

Figure 38: Application of Ethernet Interworking VLL Example

Figure 38 provides an example of an Ethernet interworking VLL. The Ethernet interworking VLL provides a point-to-point Ethernet VLL service between Frame-Relay-attached users, ATM attached users, and Ethernet-attached users across an IP/MPLS packet switched network. It effectively provides ATM and FR bridged encapsulation termination on the existing Epipe service of the 7750 SR.

The following connectivity scenarios are supported:

- A Frame Relay or ATM user connected to a ATM network communicating with a Ethernet user connected to a 7750 PE node on a IP/MPLS network.
- A Frame Relay or ATM user connected to 7750 SR PE node communicating with an Ethernet user connected to a 7750 PE node on a IP/MPLS network. This feature supports local cross-connecting when these users are attached to the same 7750 PE node.

Users attach over an ATM UNI with RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*, tagged/untagged bridged Ethernet PDUs, a FR UNI using RFC 2427, *Multiprotocol Interconnect over Frame Relay*, tagged/untagged bridged Ethernet PDUs, or an Ethernet tagged/untagged UNI interface. However, the VCI/VPI and the data-link control layer (DLCI) are the identifiers of the SAP in the case of ATM and FR respectively and the received tags are transparent to the service and are thus preserved.

The Ethernet pseudowire is established using Targeted LDP (TLDP) signaling and can use the **ether** or **vlan** VC types on the SDP. The SDP can be either an MPLS or GRE type.

VLL CAC

This feature provides a method to administratively account for the bandwidth used by VLL services inside an SDP which consists of RSVP LSPs.

The service manager keeps track of the available bandwidth for each SDP. The SDP available bandwidth is applied through a configured booking factor. An administrative bandwidth value is assigned to the spoke SDP. When a VLL service is bound to an SDP, the amount of bandwidth is subtracted from the adjusted available SDP bandwidth. When the VLL service binding is deleted from the SDP, the amount of bandwidth is added back into the adjusted SDP available bandwidth. If the total adjusted SDP available bandwidth is overbooked when adding a VLL service, a warning is issued and the binding is rejected.

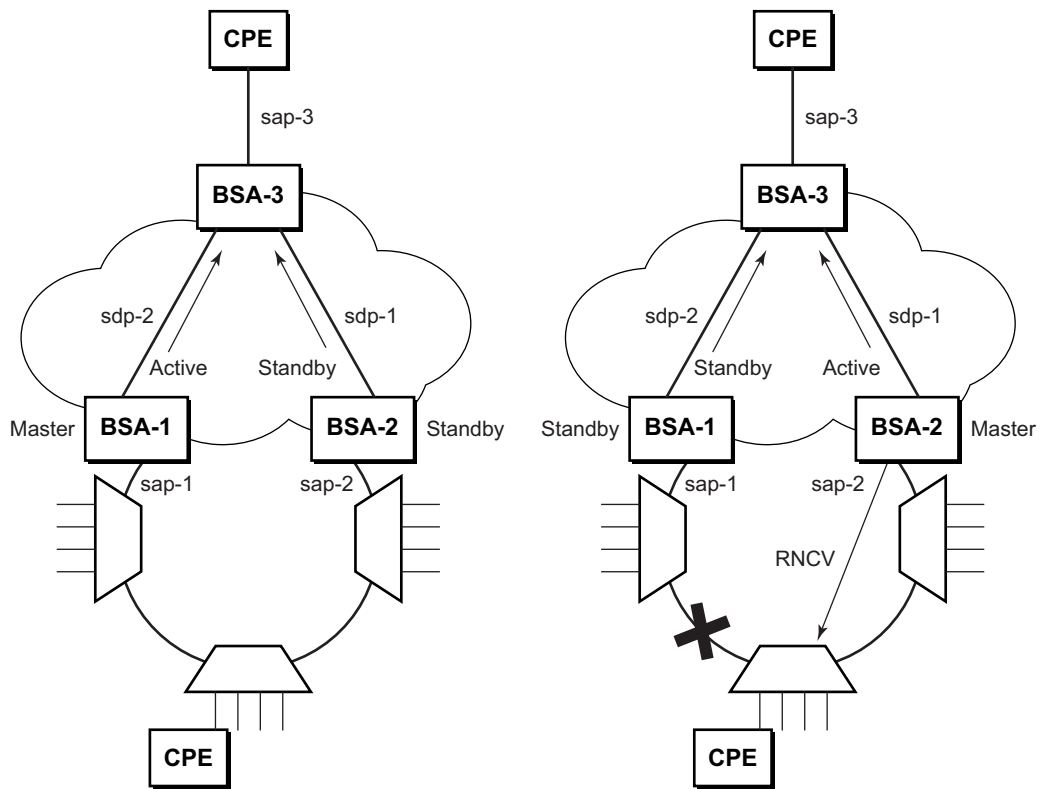
This feature does not guarantee bandwidth to a VLL service as there is no change to the datapath to enforce the bandwidth of an SDP by means such as shaping or policing of constituent RSVP LSPs.

MC-Ring and VLL

To support redundant VLL access in ring configurations, the multi-chassis ring feature is applicable to VLL SAPs. A conceptual drawing of the operation is shown in [Figure 39](#). The given CPE which is connected behind the ring node has access to both BSA through the same VLAN provisioned in all ring nodes. There are two SAPs (with the same VLAN) provisioned on both nodes.

If a closed ring status occurs, one of the BSAs becomes the master and it will signal an active status bit on the corresponding VLL pseudowire. Similarly, the standby BSA will signal a standby status. With this information, the remote node can choose the correct path to reach the CPE. In case of a broken ring, the node that can reach the ring node that the given CPE is connected to by RNCV check, will become master and will signal corresponding status on its pseudowire.

The mapping of individual SAPs to the ring nodes is done statically through CLI provisioning. In order to keep the convergence time to a minimum, MAC learning must be disabled on the ring node so all CPE originated traffic is sent in both directions. If the status is oper-down on the SAP on the standby BSA, that part of the traffic will be blocked and not forwarded to the remote site.



OSSG174

Figure 39: MC-Ring in a Combination with VLL Service

Frame Relay VLL (Fpipe) Services

This section provides information about the Fpipe service and implementation notes.

Topics in this section include:

- [Frame Relay VLL on page 201](#)
- [Frame Relay-to-ATM Interworking \(FRF.5\) VLL on page 203](#)
- [Frame Relay Traffic Management on page 204](#)
- [Basic Configurations on page 241](#)
- [Common Configuration Tasks on page 241](#)
 - [Configuring VLL Components on page 242](#)
 - [Creating an Fpipe Service on page 265](#)
- [Service Management Tasks on page 285](#)

Frame Relay VLL

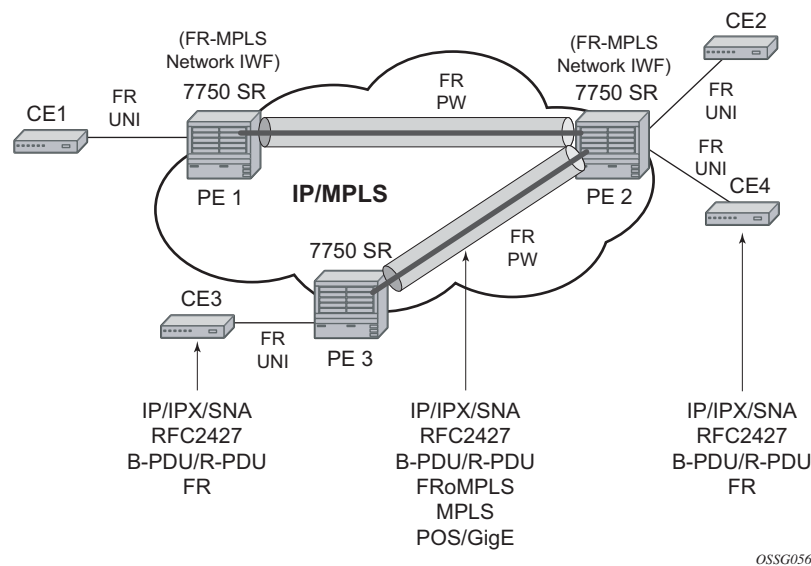
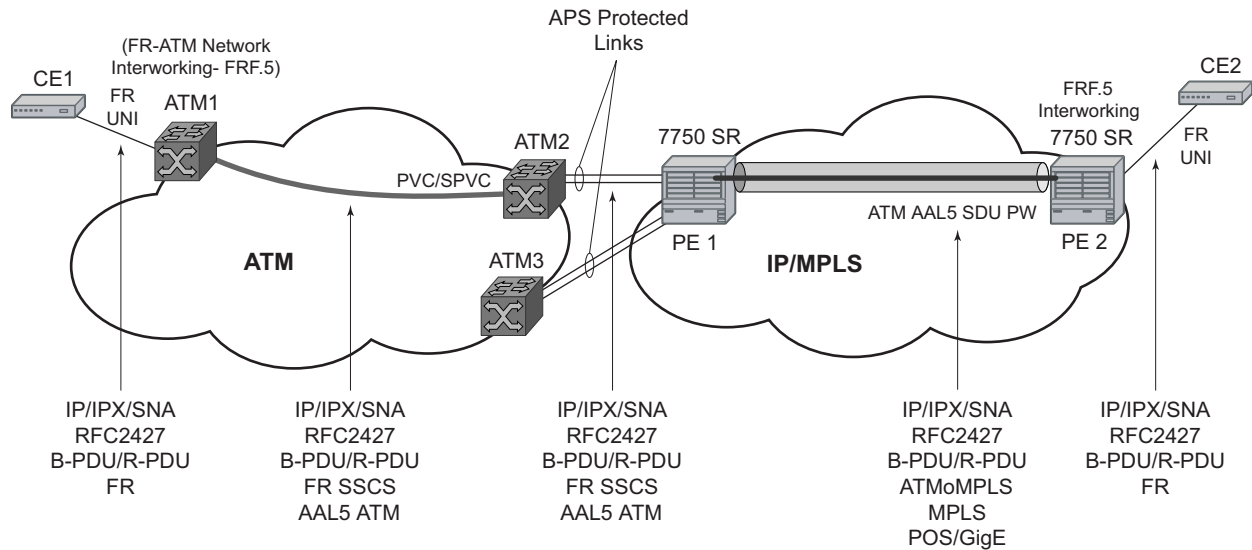


Figure 40: Application of a Frame Relay VLL Example

[Figure 40](#) depicts an application of a Frame Relay VLL. The Frame Relay VLL (Fpipe) provides a point-to-point Frame Relay service between users connected to 7750 nodes on the IP/MPLS network. Users are connected to the 7750 PE nodes using Frame Relay PVCs. PE1, PE2, and PE3 receive a standard Q.922 Core frame on the Frame Relay SAP and encapsulate it into a pseudowire packet according to the 1-to-1 Frame Relay encapsulation mode in draft-ietf-pwe3-frame-relay-xx.txt, *Encapsulation Methods for Transport of Frame Relay Over MPLS Networks*. The 7750 Frame Relay VLL feature supports local cross-connecting when the users are attached to the same 7750 PE node.

The FR pseudowire is initiated using Targeted LDP (TLDP) signaling as specified in draft-ietf-pwe3-control-protocol-xx.txt, *Pseudowire Setup and Maintenance using LDP*. The SDP can be an MPLS or a GRE type.

Frame Relay-to-ATM Interworking (FRF.5) VLL



OSSG070

Figure 41: Frame Relay-to-ATM Network Interworking (FRF.5) VLL

Figure 41 provides an example of a point-to-point Frame Relay service between users where one user is connected to an existing ATM network, the other to a 7750 PE node on an IP/MPLS network.

This VLL is realized using an ATM AAL5 SDU pseudowire between the 7750 SR PE nodes. It is configured by adding a FR SAP to an apipe service using vc-type atm-sdu. The 7750 SR PE2 node performs an FRF.5 interworking function to interwork the ingress and egress data paths in addition to the operations required in an FR and an ATM VLL.

The pseudowire is initiated using Targeted LDP signaling as specified in draft-ietf-pwe3-control-protocol-xx.txt. The SDP can be of an MPLS or a GRE type.

Traffic Management Support

Frame Relay Traffic Management

Traffic management of Frame Relay VLLs is achieved through the application of ingress and egress QoS policies to SAPs like other Frame Relay SAPs. No queuing occurs on the MDA; all queuing, policing and shaping occurs on the IOM and, as a result, traffic management is forwarding-class-aware. Forwarding classes may be determined by inspecting the DSCP marking of contained IP packets (for example) and this will determine both the queuing and the EXP bit setting of packets on a Frame Relay VLL.

Ingress SAP Classification and Marking

DE=0 frames are subject to the CIR marking algorithm in the IOM queue. Drop preference for these packets will follow the state of the CIR bucket associated with the ingress queue. The value is marked in the drop preference bit of the internal header and into the DE bit in the Q.922 frame header. DE=1 frames are classified into “out-of-profile” state and are not be overwritten by the CIR marking in the ingress IOM queue. The drop preference is set to high.

Egress Network EXP Marking

FC-to-EXP mapping is as per the Network Egress QoS policy. Marking of the EXP field in both label stacks is performed.

Ingress Network Classification

Classification is based on the EXP value of the pseudowire label and EXP-to-FC mapping is as per Network Ingress QoS policy.

IP Interworking VLL (Ipipe) Services

- [IP Interworking VLL \(Ipipe\) Services on page 205](#)
 - [Ipipe VLL on page 205](#)
 - [IP Interworking VLL Datapath on page 207](#)
- [Basic Configurations on page 241](#)
- [Common Configuration Tasks on page 241](#)
 - [Configuring VLL Components on page 242](#)
 - [Creating an Ipipe Service on page 270](#)
- [Service Management Tasks on page 285](#)

Ipipe VLL

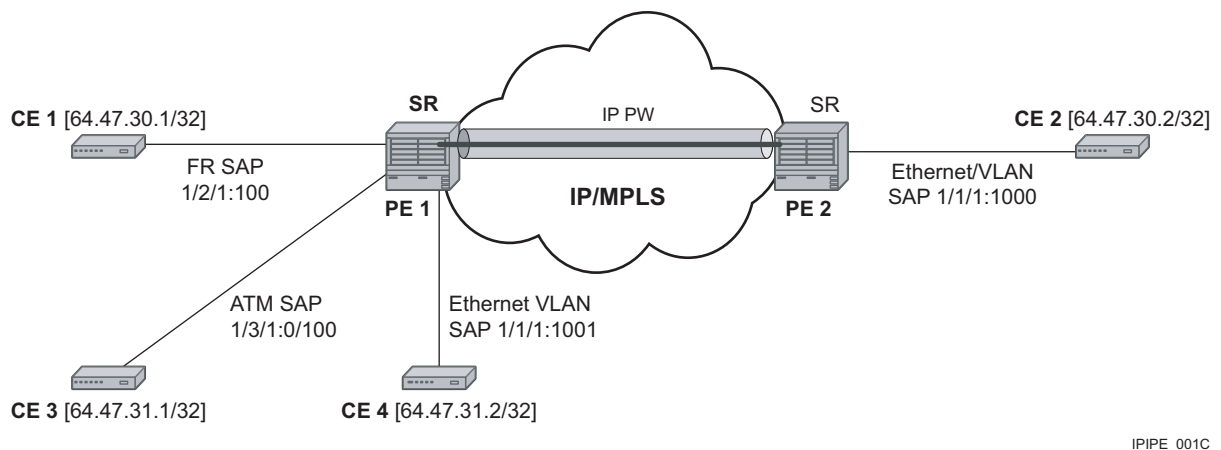


Figure 42: IP Interworking VLL (Ipipe)

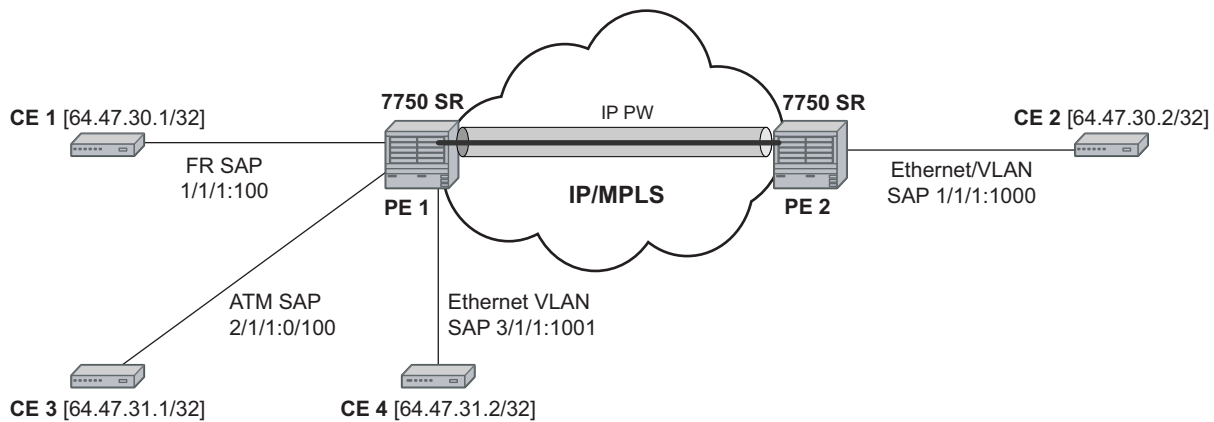
Figure 42 provides an example of IP connectivity between a host attached to a point-to-point access circuit (FR, ATM, PPP) with routed PDU IPv4 encapsulation and a host attached to an Ethernet interface. Both hosts appear to be on the same LAN segment. This feature enables service interworking between different link layer technologies. A typical use of this application is in a Layer 2 VPN when upgrading a hub site to Ethernet while keeping the spoke sites with their existing Frame Relay or ATM IPv4 routed encapsulation.

The ATM SAP carries the IPv4 packet using RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5, VC-Mux or LLC/SNAP routed PDU encapsulation*. The Frame Relay SAP makes use of RFC 2427, *Multiprotocol Interconnect over Frame Relay*, routed PDU encapsulation

of an IPv4 packet. A PPP interface makes use of RFC 1332, *The PPP Internet Protocol Control Protocol (IPCP)*, PPP IPCP encapsulation of an IPv4 packet. A Cisco HDLC SAP uses the routed IPv4 encapsulation. The pseudowire uses the IP Layer 2 transport pseudowire encapsulation type.

Note that the Ipipe is a point-to-point Layer 2 service. All packets received on one SAP of the Ipipe will be forwarded to the other SAP. No IP routing of customer packets occurs.

IP Interworking VLL Datapath



IPIPE_001

Figure 43: IP Interworking VLL Datapath

In order to be able to forward IP packets between CE 1 and CE 2 in [Figure 43](#), PE 2 is manually configured with both CE 1 and CE 2 IP addresses. These are host addresses and are entered in /32 format. PE 2 maintains an ARP cache context for each IP interworking VLL. PE 2 responds to ARP request messages received on the Ethernet SAP. PE 2 responds with the Ethernet SAP configured MAC address as a proxy for any ARP request for CE 1 IP address. PE 2 silently discards any ARP request message received on the Ethernet SAP for an address other than that of CE 1. Likewise, PE 2 silently discards any ARP request message with the source IP address other than that of CE 2. In all cases, PE 2 keeps track of the association of IP to MAC addresses for ARP requests it receives over the Ethernet SAP.

In order to forward unicast frames destined to CE 2, PE 2 needs to know CE 2 MAC address. When the Ipipe SAP is first configured and administratively enabled, PE2 sends an ARP request message for CE 2 MAC address over the Ethernet SAP. Until an ARP reply is received from CE2, providing CE2's MAC address, unicast IP packets destined for CE2 will be discarded at PE2. IP broadcast and IP multicast packets are sent on the Ethernet SAP using the broadcast or direct-mapped multicast MAC address.

In order to forward unicast frames destined to CE 1, PE 2 validates the MAC destination address of the received Ethernet frame. It should match that of the Ethernet SAP. It then removes the Ethernet header and encapsulates the IP packet directly into a pseudowire without a control word. PE 1 removes the pseudowire encapsulation and forwards the IP packet over the Frame Relay SAP using RFC 2427, *Multiprotocol Interconnect over Frame Relay*, routed PDU encapsulation.

In order to forward unicast packets destined to CE1, PE2 validates the MAC destination address of the received Ethernet frame. If the IP packet is unicast, the MAC destination must match that of

the Ethernet SAP. If the IP packet is multicast or broadcast, the MAC destination address must be an appropriate multicast or broadcast MAC address.

The other procedures are similar to the case of communication between CE 1 and CE 2, except that the ATM SAP and the Ethernet SAP are cross-connected locally and IP packets do not get sent over an SDP.

A PE does not flush the ARP cache unless the SAP goes administratively or operationally down. The PE with the Ethernet SAP sends unsolicited ARP requests to refresh the ARP cache every T seconds. ARP requests are staggered at an increasing rate if no reply is received to the first unsolicited ARP request. The value of T is configurable by user through the mac-refresh CLI command.

Extension to IP VLL for Discovery of Ethernet CE IP Address

VLL services provide IP connectivity between a host attached to a point to point access circuit (FR, ATM, PPP) with routed PDU encapsulation and a host attached to an Ethernet interface. Both hosts appear to be on the same IP interface. This feature is supported only for IPv4 payload.

In deployments where it is not practical for operators to obtain and configure their customer CE address, the following behaviors apply:

- A service comes up without prior configuration of the CE address parameter under both the SAP and the spoke SDP.
- Rely solely on received ARP messages from the Ethernet SAP attached CE device to update the ARP cache with no further check of the validity of the source IP address of the ARP request message and the IP address ARPed for.
- The LDP address list TLV to signal the learned CE IP address to the remote PE is supported. This is to allow the 7750 SR PE with the FR SAP to respond to an invFR ARP request message received from the FR attached CE device. Only Ethernet SAP and FR SAP can learn the CE address via ARP and invFR ARP respectively. The 7750 SR does not support invATM ARP on an ATM interface.

VLL Ethernet SAP Procedures

The operator can enable the following CE address discovery procedures by configuring the **ce-address-discovery** in the **config>service>ipipe** context.

- The service is brought up without the CE address parameter configured at either the SAP or the spoke SDP.
- The operator cannot configure the **ce-address** parameter under the **config>service>ipipe>sap** or **config>service>ipipe>spoke-sdp** context when the **ce-address-discovery** in the **config>service>ipipe** context is enabled. Conversely, the operator is not allowed to enable the **ce-address-discovery** option under the Ipipe service if it has a SAP and/or spoke SDP with a user-entered **ce-address** parameter.
- While an ARP cache is empty, the 7750 SR PE does not forward unicast IP packets over the Ethernet SAP but forwards multicast/broadcast packets.
- The PE waits for an ARP request from the CE to learn both IP and MAC addresses of the CE. Both entries are added into the ARP cache. The PE accepts any ARP request message received over Ethernet SAP and updates the ARP cache IP and MAC entries with no further check of the source IP address of the ARP request message or of the IP address being ARPed.

- 7750 SR will always reply to a received ARP request message from the Ethernet SAP with the SAP MAC address and a source IP address of the IP address being ARPed without any further check of the latter.
- If the router received an address list TLV from the remote PE node with a valid IP address of the CE attached to the remote PE, it not checks it against the IP address being ARPed for when replying to an ARP request over the Ethernet SAP.
- The ARP cache is flushed when the SAP bounces or when the operator manually clears the ARP cache. This results in the clearing of the CE address discovered on this SAP. However, when the SAP comes up initially or comes back up from a failure, an unsolicited ARP request is not sent over the Ethernet SAP.
- If the Ipipe service makes use of a spoke SDP, the 7750 SR includes the address list TLV in the interface parameters field of the pseudowire FEC TLV in the label mapping message. The address list TLV contains the current value of the CE address in the ARP cache. If no address was learned, then an address value of 0.0.0.0 must be used.
- If the remote PE included the address list TLV in the received label mapping message, the local 7750 SR updates the remote PE node with the most current IP address of the Ethernet CE using a T-LDP notification message with status TLV status code is set to 0x0000002C and containing an LDP address list. The notification message is sent each time an IP address different from the current value in the ARP cache is learned. This includes when the ARP is flushed and the CE address is reset to the value of 0.0.0.0.
- If the remote PE did not include the address list TLV in the received label mapping message, the local router will not send any notification messages containing the address list TLV during the lifetime of the IP pseudowire.
- If the operator disables the **ce-address-discovery** option under the VLL service, service manager instructs LDP to withdraw the service label and the service is shutdown. The pseudowire labels will only be signaled and the service will come up if the operator re-enters the option again or enters manually the **ce-address** parameter under SAP and spoke SDP.

VLL FR SAP Procedures

The operator enables the following CE address dynamic learning procedures by enabling the **ce-address-discovery** option under the VLL service.

- Allow the service to come up without the CE address parameter configured at both the SAP and spoke SDP. If one or both parameters are configured, they are ignored.
- The operator cannot configure the **ce-address** parameter under SAP or spoke SDP when the **ce-address-discovery** option under the VLL service is enabled. Conversely, the operator is not allowed to enable the **ce-address-discovery** option under the Ipipe service if it has a SAP and/or spoke SDP with a user-entered **ce-address** parameter.
- If the 7750 SR receives an invFR ARP request message over the FR SAP, it updates the ARP cache with the FR CE address. It also replies with the IP address of the CE attached to the remote PE if a valid address was advertised in the address list TLV by this remote PE. Otherwise, the router updates the ARP cache but does not reply to the invFR ARP.
- If the Ipipe service makes use of a spoke SDP, the 7750 SR includes the address list TLV in the interface parameters field of the pseudowire FEC TLV in the label mapping message. The address list TLV contains the current value of the CE address in the ARP cache. If no address was learned, then an address value of 0.0.0.0 is used.
- If the remote PE included the address list TLV in the received label mapping message, the local 7750 SR updates the remote PE node with the most current IP address of the FR CE using a T-LDP status notification message containing an LDP address list. The notification message is sent each time an IP address different from the current value in the ARP cache is learned. This includes when the ARP is flushed and the CE address is reset to the value of 0.0.0.0.
- If the remote PE did not include the address list TLV in the received label mapping message, the local 7750 SR does not send any notification messages containing the address list TLV during the lifetime of the IP pseudowire.

VLL ATM SAP Procedures

The operator enables the following CE address dynamic learning procedures by enabling the **ce-address-discovery** option under the VLL service.

- Allow the service to come up without the **ce-address** parameter configured at both the SAP and spoke SDP. If one or both parameters are configured, they are ignored.
- The operator is not allowed to configure the **ce-address** parameter under the SAP or spoke SDP when the **ce-address-discovery** option under the VLL service is enabled. Conversely, the operator is not allowed to enable the **ce-address-discovery** option under the Ipipe service if it has a SAP and/or spoke SDP with a user-entered **ce-address** parameter.
- If the 7750 SR receives an invATM ARP request message over the ATM SAP, silently discards it. The 7750 SR does not support receiving or sending of an invATM ARP message.
- If the Ipipe service makes use of a spoke SDP, the router includes the address list TLV in the interface parameters field of the pseudowire FEC TLV in the label mapping message. The address list TLV contains an address value of 0.0.0.0.
- If the remote PE included the address list TLV in the received label mapping message, the local 7750 SR will not make further updates to the address list TLV to the remote PE node using a T-LDP status notification message since the learned IP address of the ATM attached CE will never change away from the value of 0.0.0.0.
- If the remote PE did not include the address list TLV in the received label mapping message, the local 7750 SR will not send any notification messages containing the address list TLV during the lifetime of the IP pseudowire.

VLL PPP/IPCP and Cisco-HDLC SAP Procedures

The procedures are similar to the case of an ATM SAP. The remote CE address can only be learned in the case of a PPP SAP but is not sent in the address list TLV to the remote PE in both PPP and Cisco-HDLC SAP cases.

Pseudowire Switching

The pseudowire switching feature provides the user with the ability to create a VLL service by cross-connecting two spoke SDPs. This feature allows the scaling of VLL and VPLS services in a large network in which the otherwise full mesh of PE devices would require thousands of Targeted LDP (T-LDP) sessions per PE node.

Services with one SAP and one spoke SDP are created normally on the PE; however, the target destination of the SDP is the pseudowire switching node instead of what is normally the remote PE. In addition, the user configures a VLL service on the pseudowire switching node using the two SDPs.

The pseudowire switching node acts in a passive role with respect to signalling of the pseudowires. It waits until one or both of the PEs sends the label mapping message before relaying it to the other PE. This is because it needs to pass the Interface Parameters of each PE to the other.

A pseudowire switching point TLV is inserted by the switching pseudowire to record its system address when relaying the label mapping message. This TLV is useful in a few situations:

- It allows for troubleshooting of the path of the pseudowire especially if multiple pseudowire switching points exist between the two PEs.
- It helps in loop detection of the T-LDP signalling messages where a switching point would receive back a label mapping message it had already relayed.
- The switching point TLV is inserted in pseudowire status notification messages when they are sent end-to-end or from a pseudowire switching node towards a destination PE.

Pseudowire OAM is supported for the manual switching pseudowires and allows the pseudowire switching node to relay end-to-end pseudowire status notification messages between the two PEs. The pseudowire switching node can generate a pseudowire status and to send it to one or both of the PEs by including its system address in the pseudowire switching point TLV. This allows a PE to identify the origin of the pseudowire status notification message.

In the [Figure 44](#), the user configures a regular Epipe VLL service PE1 and PE2. These services consist each of a SAP and a spoke SPD. However, the target destination of the SDP is actually not the remote PE but the pseudowire switching node. In addition, the user configures an Epipe VLL service on the pseudowire switching node using the two SDPs.

```
|7x50 PE1 (Epipe)|---sdp 2:10---|7x50 PW SW (Epipe)|---sdp 7:15---|7x50 PE2 (Epipe)
```

Figure 44: Pseudowire Service Switching Node

Configuration examples can be found in [Configuring Two VLL Paths Terminating on T-PE2 on page 279](#).

Pseudowire Switching with Protection

Pseudowire switching scales VLL and VPLS services over a multi-area network by removing the need for a full mesh of targeted LDP sessions between PE nodes. [Figure 45](#) illustrates the use of pseudowire redundancy to provide a scalable and resilient VLL service across multiple IGP areas in a provider network.

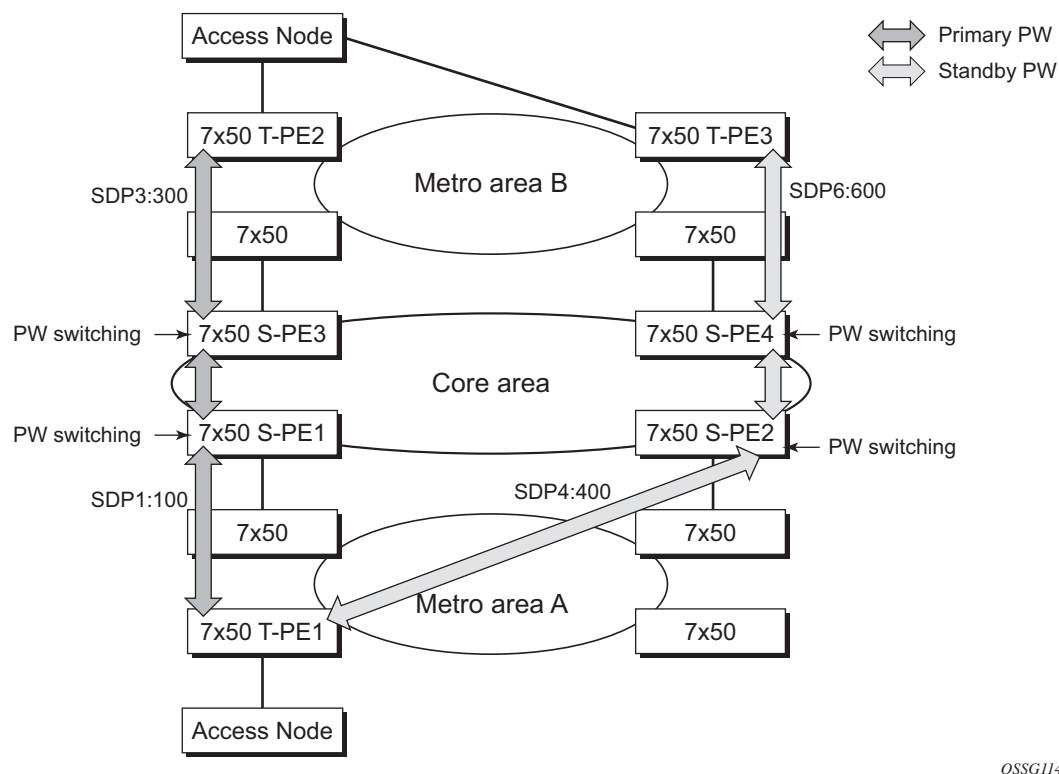


Figure 45: VLL Resilience with Pseudowire Redundancy and Switching

In the network in [Figure 45](#), PE nodes act as masters and pseudowire switching nodes act as slaves for the purpose of pseudowire signaling. A switching node will need to pass the SAP Interface Parameters of each PE to the other. T-PE1 sends a label mapping message for the Layer 2 FEC to the peer pseudowire switching node for example, S-PE1. It will include the SAP interface parameters, such as MTU, in the label mapping message. S-PE1 checks the FEC against the local information and if a match exists, it appends the optional pseudowire switching point TLV to the FEC TLV in which it records its system address. T-PE1 then relays the label mapping message to S-PE2. S-PE2 performs similar operations and forwards a label mapping message to T-PE2. The same procedures are followed for the label mapping message in the reverse direction, for example,

from T-PE2 to T-PE1. S-PE1 and S-PE2 will effect the spoke SDP cross-connect only when both directions of the pseudowire have been signaled and matched.

The pseudowire switching TLV is useful in a few situations. First, it allows for troubleshooting of the path of the pseudowire especially if multiple pseudowire switching points exist between the two T-PE nodes. Secondly, it helps in loop detection of the T-LDP signaling messages where a switching point receives back a label mapping message it already relayed. Finally, it can be inserted in pseudowire status messages when they are sent from a pseudowire switching node towards a destination PE.

Pseudowire status messages can be generated by the T-PE nodes and/or the S-PE nodes. Pseudowire status messages received by a switching node are processed and then passed on to the next hop. An S-PE node appends the optional pseudowire switching TLV, with its system address added to it, to the FEC in the pseudowire status notification message only if it originated the message or the message was received with the TLV in it. Otherwise, it means the message was originated by a T-PE node and the S-PE should process and pass the message without changes except for the VCID value in the FEC TLV.

Pseudowire Switching Behavior

In the network in [Figure 45](#), PE nodes act as masters and pseudowire switching nodes act as slaves for the purpose of pseudowire signaling. This is because a switching node will need to pass the SAP interface parameters of each PE to the other. T-PE1 sends a label mapping message for the Layer 2 FEC to the peer pseudowire switching node, for example, S-PE1. It will include the SAP interface parameters, such as MTU, in the label mapping message. S-PE1 checks the FEC against the local information and if a match exists, it appends the optional pseudowire switching point TLV to the FEC TLV in which it records its system address. T-PE1 then relays the label mapping message to S-PE2. S-PE2 performs similar operation and forwards a label mapping message to T-PE2. The same procedures are followed for the label mapping message in the reverse direction, for example, from T-PE2 to T-PE1. S-PE1 and S-PE2 will effect the spoke SDP cross-connect only when both directions of the pseudowire have been signaled and matched.

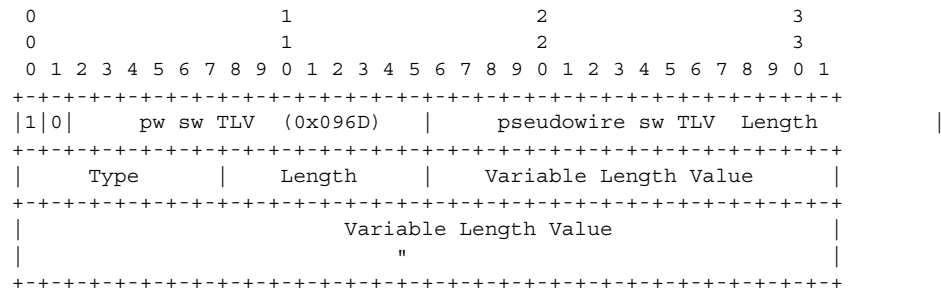
Pseudowire status notification messages can be generated by the T-PE nodes and/or the S-PE nodes. Pseudowire status notification messages received by a switching node are processed and then passed on to the next hop. An S-PE node appends the optional pseudowire switching TLV, with its system address added to it, to the FEC in the pseudowire status notification message only if it originated the message or the message was received with the TLV in it. Otherwise, it means the message was originated by a T-PE node and the S-PE should process and pass the message without changes except for the VC ID value in the FEC TLV.

The merging of the received T-LDP status notification message and the local status for the spoke SDPs from the service manager at a PE complies with the following rules:

- When the local status for both spokes is up, the S-PE passes any received SAP or SDP-binding generated status notification message unchanged, for example, the status notification TLV is unchanged but the VC-ID in the FEC TLV is set to value of the pseudowire segment to the next hop.
- When the local operational status for any of the spokes is down, the S-PE always sends SDP-binding down status bits regardless if the received status bits from the remote node indicated SAP up/down or SDP-binding up/down.

Pseudowire Switching TLV

The format of the pseudowire switching TLV is as follows:



- PW sw TLV Length — Specifies the total length of all the following pseudowire switching point TLV fields in octets
- Type — Encodes how the Value field is to be interpreted.
- Length — Specifies the length of the Value field in octets.
- Value — Octet string of Length octets that encodes information to be interpreted as specified by the Type field.

Pseudowire Switching Point Sub-TLVs

Below are details specific to pseudowire switching point sub-TLVs:

- pseudowire ID of last pseudowire segment traversed — This sub-TLV type contains a pseudowire ID in the format of the pseudowire ID
- Pseudowire switching point description string — An optional description string of text up to 80 characters long.
- IP address of pseudowire switching point.
- The IP V4 or V6 address of the pseudowire switching point. This is an optional sub-TLV.
- MH VCCV capability indication.

Static-to-Dynamic Pseudowire Switching

When one segment of the pseudowire cross-connect at the S-PE is static while the other is signaled using T-LDP, the S-PE operates much like a T-PE from a signaling perspective and as an S-PE from a data plane perspective.

The S-PE signals a label mapping message as soon as the local configuration is complete. The control word C-bit field in the pseudowire FEC is set to the value configured on the static spoke-sdp.

When the label mapping for the egress direction is also received from the T-LDP peer, and the information in the FEC matches that of the local configuration, the static-to-dynamic cross-connect is effected.

Note that it is possible that end nodes of a static pseudowire segment be misconfigured. In this case, an S-PE or T-PE node may be receiving packets with the wrong encapsulation. In this case, it is possible that an invalid payload will be forwarded over the pseudowire or the SAP respectively. Furthermore, if the S-PE or T-PE node is expecting the control word in the packet encapsulation and the received packet comes with no control word but the first nibble below the label stack is 0x0001, the packet may be mistaken for a VCCV OAM packet and may be forwarded to the CPM. In that case, the CPM will perform a check of the IP header fields such as version, IP header length, and checksum. If any of this fails the VCCV packet will be discarded.

Ingress VLAN Swapping

This feature is supported on VPLS and VLL services where the end to end solution is built using two node solutions (requiring SDP connections between the nodes).

In VLAN swapping, only the VLAN-id value is copied to the inner VLAN position. The Ethertype of the inner tag will be preserved and all consecutive nodes will work with that value. Similarly, the dot1p bits value of outer-tag will not be preserved.

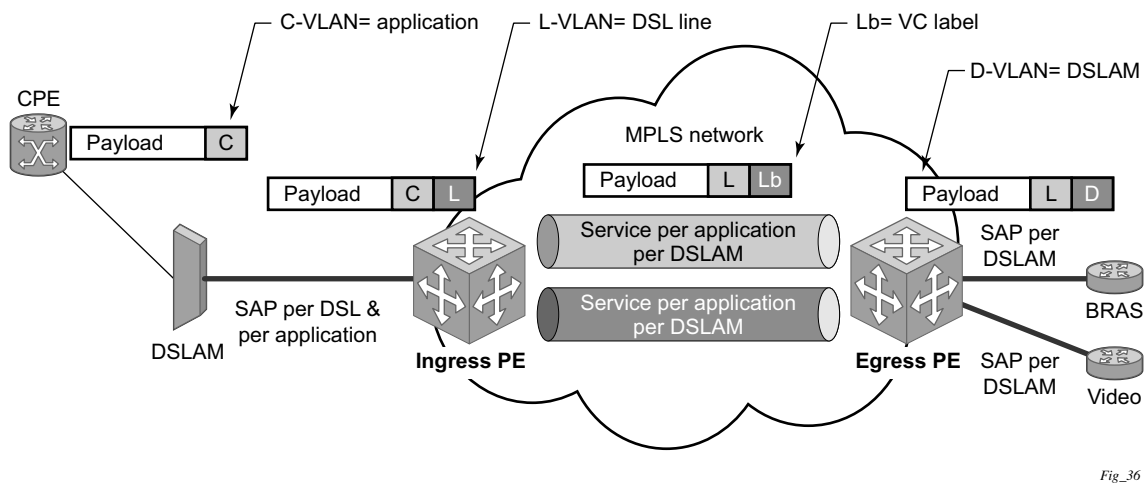


Figure 46: Ingress VLAN Swapping

The network diagram in [Figure 46](#) describes the network where at user access side (DSLAM facing SAPs) every subscriber is represented by several QinQ SAPs with inner-tag encoding service and outer-tag encoding subscriber (DSL line). The aggregation side (BRAS or PE facing SAPs) the is represented by DSL line number (inner VLAN tag) and DSLAM (outer VLAN tag). The effective operation on VLAN tag is to “drop inner tag at access side and push another tag at the aggregation side”.

Ingress VLAN Translation

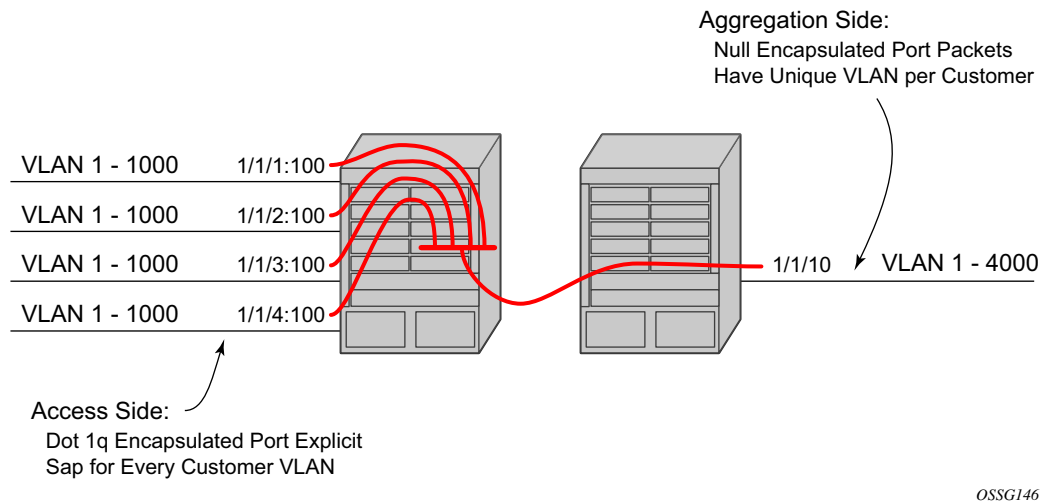


Figure 47: Ingress VLAN Translation

The drawing in [Figure 47](#) indicates an application where different circuits are aggregated in the VPLS-based network. The access side is represented by an explicit dot1q encapsulated SAP. As the VLAN-id is port specific, those connected to different ports might have the same VLAN. The aggregation side (the right side [Figure 47](#)) is aggregated on the same port, and hence, unique a VLAN-id is required.

Pseudowire Redundancy

Pseudowire redundancy provides the ability to protect a pseudowire with a pre-provisioned pseudowire and to switch traffic over to the secondary standby pseudowire in case of a SAP and/or network failure condition. Normally, pseudowires are redundant by the virtue of the SDP redundancy mechanism. For instance, if the SDP is an RSVP LSP and is protected by a secondary standby path and/or by Fast-Reroute paths, the pseudowire is also protected. However, there are a couple of applications in which SDP redundancy does not protect the end-to-end pseudowire path:

- There are two different destination PE nodes for the same VLL service. The main use case is the provision of dual-homing of a CPE or access node to two PE nodes located in different POPs. The other use case is the provision of a pair of active and standby BRAS nodes, or active and standby links to the same BRAS node, to provide service resiliency to broadband service subscribers.
- The pseudowire path is switched in the middle of the network and the SR-Series pseudowire switching node fails.

Pseudowire and VPLS link redundancy extends link-level resiliency for pseudowires and VPLS to protect critical network paths against physical link or node failures. These innovations enable the virtualization of redundant paths across the metro or core IP network to provide seamless and transparent fail-over for point-to-point and multi-point connections and services. When deployed with multi-chassis LAG, the path for return traffic is maintained through the pseudowire or VPLS switchover, which enables carriers to deliver “always on” services across their IP/MPLS networks.

VLL Resilience with Two Destination PE Nodes

Figure 48 illustrates the application of pseudowire redundancy to provide Ethernet VLL service resilience for broadband service subscribers accessing the broadband service on the service provider BRAS.

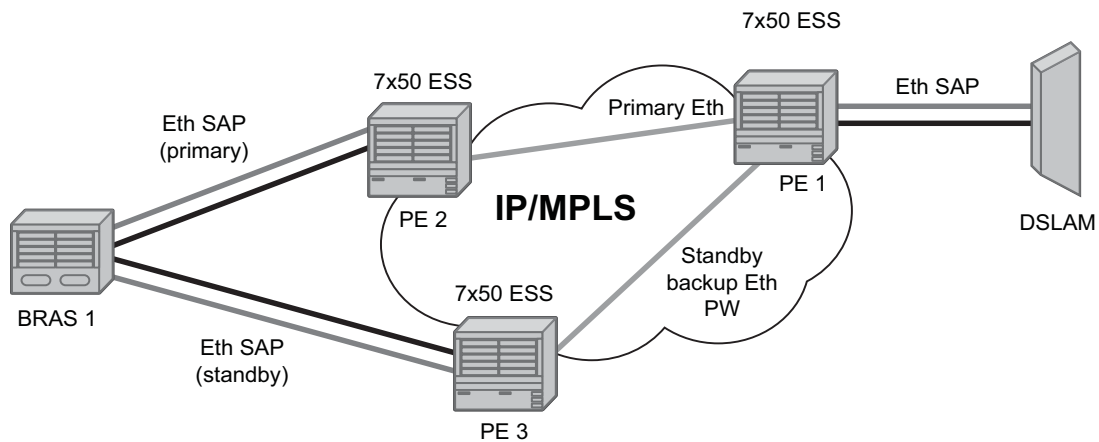


Figure 48: VLL Resilience

If the Ethernet SAP on PE2 fails, PE2 notifies PE1 of the failure by either withdrawing the primary pseudowire label it advertised or by sending a pseudowire status notification with the code set to indicate a SAP defect. PE1 will receive it and will immediately switch its local SAP to forward over the secondary standby spoke SDP. In order to avoid black holing of in-flight packets during the switching of the path, PE1 will accept packets received from PE2 on the primary pseudowire while transmitting over the backup pseudowire. However, in other applications such as those described in [Access Node Resilience Using MC-LAG and Pseudowire Redundancy on page 225](#), it will be important to minimize service outage to end users.

When the SAP at PE2 is restored, PE2 updates the new status of the SAP by sending a new label mapping message for the same pseudowire FEC or by sending pseudowire status notification message indicating that the SAP is back up. PE1 then starts a timer and reverts back to the primary at the expiry of the timer. By default, the timer is set to 0, which means PE1 reverts immediately. A special value of the timer (infinity) will mean that PE1 should never revert back to the primary pseudowire.

The behavior of the pseudowire redundancy feature is the same if PE1 detects or is notified of a network failure that brought the spoke SDP operational status to DOWN. The following are the events which will cause PE1 to trigger a switchover to the secondary standby pseudowire:

1. T-LDP peer (remote PE) node withdrew the pseudowire label.
2. T-LDP peer signaled a FEC status indicating a pseudowire failure or a remote SAP failure.
3. T-LDP session to peer node times out.
4. SDP binding and VLL service went down as a result of network failure condition such as the SDP to peer node going operationally down.

The SDP type for the primary and secondary pseudowires need not be the same. In other words, the user can protect a RSVP-TE based spoke SDP with a LDP or GRE based one. This provides the ability to route the path of the two pseudowires over different areas of the network. All VLL service types, for example, Apipe, Epipe, Fpipe, and Ipipe are supported.

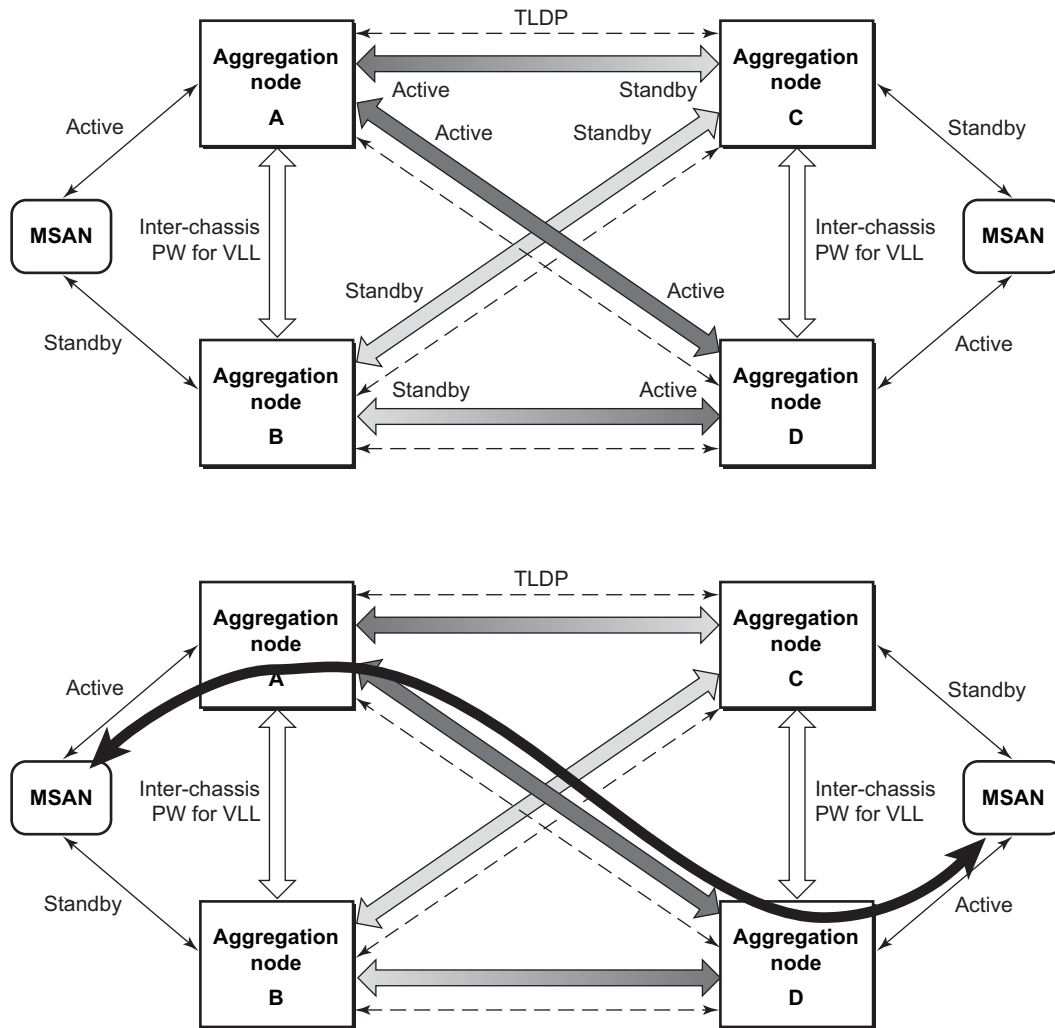
Alcatel-Lucent's routers support the ability to configure multiple secondary standby pseudowire paths. For example, PE1 uses the value of the user configurable precedence parameter associated with each spoke SDP to select the next available pseudowire path after the failure of the current active pseudowire (whether it is the primary or one of the secondary pseudowires). The revertive operation always switches the path of the VLL back to the primary pseudowire though. There is no revertive operation between secondary paths meaning that the path of the VLL will not be switched back to a secondary pseudowire of higher precedence when the latter comes back up again.

Alcatel-Lucent's routers support the ability for a user-initiated manual switchover of the VLL path to the primary or any of the secondary be supported to divert user traffic in case of a planned outage such as in node upgrade procedures.

This application can make use of all types of VLL supported on SR-Series routers. A SAP can be configured on SONET/SDH port which is part of an APS group. However, if a SAP is configured on a MC-LAG instance, only the Epipe service type is allowed.

Access Node Resilience Using MC-LAG and Pseudowire Redundancy

Figure 49 shows the use of both Multi-Chassis Link Aggregation (MC-LAG) in the access network and pseudowire redundancy in the core network to provide a resilient end-to-end VLL service to the customers.



OSSG116

Figure 49: Access Node Resilience

In this application, a new pseudowire status bit of active or standby indicates the status of the SAP in the MC-LAG instance in the SR-Series aggregation node. All spoke SDPs are of secondary type and there is no use of a primary pseudowire type in this mode of operation. Node A is in the active

state according to its local MC-LAG instance and thus advertises active status notification messages to both its peer pseudowire nodes, for example, nodes C and D. Node D performs the same operation. Node B is in the standby state according to the status of the SAP in its local MC-LAG instance and thus advertises standby status notification messages to both nodes C and D. Node C performs the same operation.

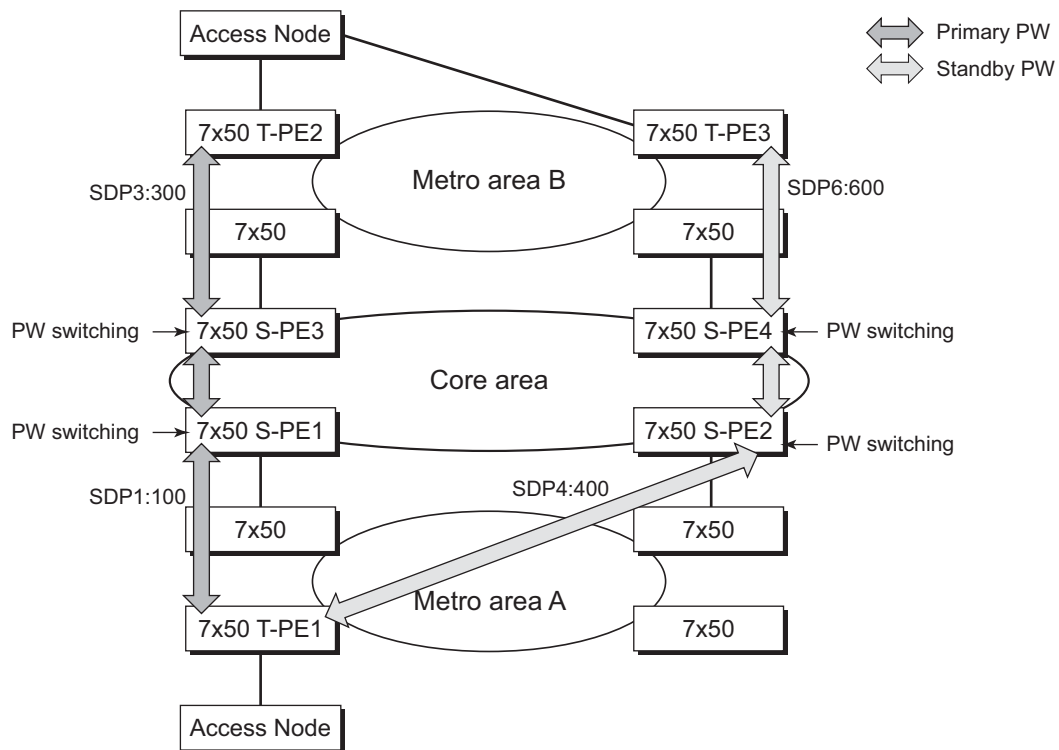
An SR-Series node selects a pseudowire as the active path for forwarding packets when both the local pseudowire status and the received remote pseudowire status indicate active status. However, an SR-Series device in standby status according to the SAP in its local MC-LAG instance is capable of processing packets for a VLL service received over any of the pseudowires which are up. This is to avoid black holing of user traffic during transitions. The SR-Series standby node forwards these packets to the active node via the Inter-Chassis Backup pseudowire (ICB pseudowire) for this VLL service. An ICB is a spoke SDP used by a MC-LAG node to backup a MC-LAG SAP during transitions. The same ICB can also be used by the peer MC-LAG node to protect against network failures causing the active pseudowire to go down.

Note that at configuration time, the user specifies a precedence parameter for each of the pseudowires which are part of the redundancy set as described in the application in [VLL Resilience with Two Destination PE Nodes on page 223](#). An SR-Series node uses this to select which pseudowire to forward packet to in case both pseudowires show active/active for the local/remote status during transitions.

Only VLL service of type Epipe is supported in this application. Furthermore, ICB spoke SDP can only be added to the SAP side of the VLL cross-connect if the SAP is configured on a MC-LAG instance.

VLL Resilience for a Switched Pseudowire Path

Figure 50 illustrates the use of both pseudowire redundancy and pseudowire switching to provide a resilient VLL service across multiple IGP areas in a provider network.



OSSG114

Figure 50: VLL Resilience with Pseudowire Redundancy and Switching

Pseudowire switching is a method for scaling a large network of VLL or VPLS services by removing the need for a full mesh of T-LDP sessions between the PE nodes as the number of these nodes grows over time.

Like in the application in [VLL Resilience with Two Destination PE Nodes on page 223](#), the T-PE1 node switches the path of a VLL to a secondary standby pseudowire in the case of a network side failure causing the VLL binding status to be DOWN or if T-PE2 notified it that the remote SAP went down. This application requires that pseudowire status notification messages generated by either a T-PE node or a S-PE node be processed and relayed by the S-PE nodes.

Note that it is possible that the secondary pseudowire path terminates on the same target PE as the primary, for example, T-PE2. This provides protection against network side failures but not against a remote SAP failure. When the target destination PE for the primary and secondary

pseudowires is the same, T-PE1 will normally not switch the VLL path onto the secondary pseudowire upon receipt of a pseudowire status notification indicating the remote SAP is down since the status notification is sent over both the primary and secondary pseudowires. However, the status notification on the primary pseudowire may arrive earlier than the one on the secondary pseudowire due to the differential delay between the paths. This will cause T-PE1 to switch the path of the VLL to the secondary standby pseudowire and remain there until the status notification is cleared. At that point in time, the VLL path is switched back to the primary pseudowire due to the revertive behavior operation. The path will not switch back to a secondary path when it becomes up even if it has a higher precedence than the currently active secondary path.

This application can make use of all types of VLL supported on the routers, for example, Apipe, Fpipe, Epipe, and Ipipe services. A SAP can be configured on SONET/SDH port which is part of an APS group. However, if a SAP is configured on a MC-LAG instance, only the Epipe service type will be allowed.

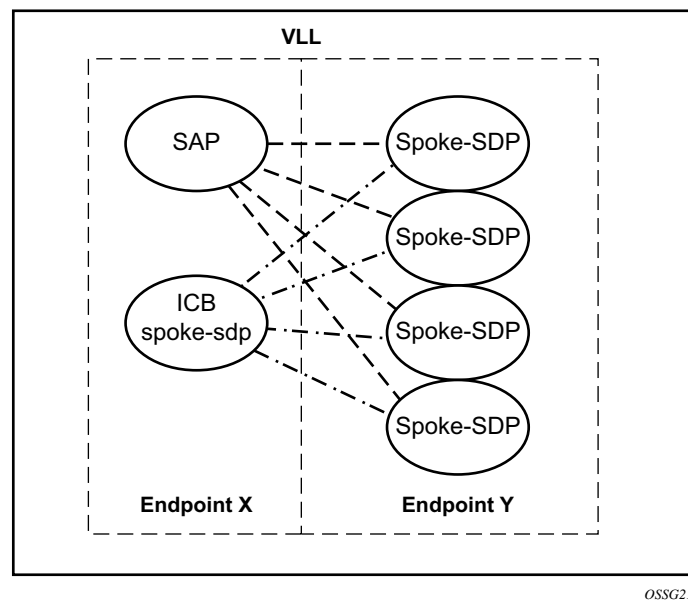
Pseudowire Redundancy Service Models

This section describes the various MC-LAG and pseudowire redundancy scenarios as well as the algorithm used to select the active transmit object in a VLL endpoint.

The redundant VLL service model is described in the following section, [Redundant VLL Service Model](#).

Redundant VLL Service Model

In order to implement pseudowire redundancy, a VLL service accommodates more than a single object on the SAP side and on the spoke SDP side. [Figure 51](#) illustrates the model for a redundant VLL service based on the concept of endpoints.



OSSG211

Figure 51: Redundant VLL Endpoint Objects

A VLL service supports by default two implicit endpoints managed internally by the system. Each endpoint can only have one object, a SAP or a spoke SDP.

In order to add more objects, up to two (2) explicitly named endpoints may be created per VLL service. The endpoint name is locally significant to the VLL service. They are referred to as endpoint 'X' and endpoint 'Y' as illustrated in [Figure 51](#).

Note that [Figure 51](#) is merely an example and that the “Y” endpoint can also have a SAP and/or an ICB spoke SDP. The following details the four types of endpoint objects supported and the rules used when associating them with an endpoint of a VLL service:

- SAP — There can only be a maximum of one SAP per VLL endpoint.
- Primary spoke SDP — The VLL service always uses this pseudowire and only switches to a secondary pseudowire when it is down the VLL service switches the path to the primary pseudowire when it is back up. The user can configure a timer to delay reverting back to primary or to never revert. There can only be a maximum of one primary spoke SDP per VLL endpoint.
- Secondary spoke SDP — There can be a maximum of four secondary spoke SDP per endpoint. The user can configure the precedence of a secondary pseudowire to indicate the order in which a secondary pseudowire is activated.
- Inter-Chassis Backup (ICB) spoke SDP — Special pseudowire used for MC-LAG and pseudowire redundancy application. Forwarding between ICBs is blocked on the same node. The user has to explicitly indicate the spoke SDP is actually an ICB at creation time. There are however a few scenarios below where the user can configure the spoke SDP as ICB or as a regular spoke SDP on a given node. The CLI for those cases will indicate both options.

A VLL service endpoint can only use a single active object to transmit at any given time but can receive from all endpoint objects

An explicitly named endpoint can have a maximum of one SAP and one ICB. Once a SAP is added to the endpoint, only one more object of type ICB spoke SDP is allowed. The ICB spoke SDP cannot be added to the endpoint if the SAP is not part of a MC-LAG instance. Conversely, a SAP which is not part of a MC-LAG instance cannot be added to an endpoint which already has an ICB spoke SDP.

An explicitly named endpoint, which does not have a SAP object, can have a maximum of four spoke SDPs and can include any of the following:

- A single primary spoke SDP.
- One or many secondary spoke SDPs with precedence.
- A single ICB spoke SDP.

T-LDP Status Notification Handling Rules

Referring to [Figure 51 on page 229](#) as a reference, the following are the rules for generating, processing, and merging T-LDP status notifications in VLL service with endpoints. Note that any allowed combination of objects as specified in [Redundant VLL Service Model on page 229](#) can be used on endpoints “X” and “Y”. The following sections refer to the specific combination objects in [Figure 51](#) as an example to describe the more general rules.

Processing Endpoint SAP Active/Standby Status Bits

The advertised admin forwarding status of active/standby reflects the status of the local LAG SAP in MC-LAG application. If the SAP is not part of a MC-LAG instance, the forwarding status of active is always advertised.

When the SAP in endpoint “X” is part of a MC-LAG instance, a node must send T-LDP forwarding status bit of “SAP active/standby” over all “Y” endpoint spoke SDPs, except the ICB spoke SDP, whenever this status changes. The status bit sent over the ICB is always zero (active by default).

When the SAP in endpoint “X” is not part of a MC-LAG instance, then the forwarding status sent over all “Y” endpoint spoke SDP's should always be set to zero (active by default).

Processing and Merging

Endpoint “X” is operationally up if at least one of its objects is operationally up. It is down if all its objects are operationally down.

If the SAP in endpoint “X” transitions locally to the down state, or received a SAP down notification via SAP specific OAM signal, the node must send T-LDP SAP down status bits on the “Y” endpoint ICB spoke SDP only. Note that Ethernet SAP does not support SAP OAM protocol. All other SAP types cannot exist on the same endpoint as an ICB spoke SDP since non Ethernet SAP cannot be part of a MC-LAG instance.

If the ICB spoke SDP in endpoint “X” transitions locally to down state, the node must send T-LDP SDP-binding down status bits on this spoke SDP.

If the ICB spoke SDP in endpoint “X” received T-LDP SDP-binding down status bits or pseudowire not forwarding status bits, the node saves this status and takes no further action. The saved status is used for selecting the active transmit endpoint object.

If all objects in endpoint “X” transition locally to down state, and/or received a SAP down notification via remote T-LDP status bits or via SAP specific OAM signal, and/or received status

bits of SDP-binding down, and/or received status bits of pseudowire not forwarding, the node must send status bits of SAP down over all “Y” endpoint spoke SDPs, including the ICB.

Endpoint “Y” is operationally up if at least one of its objects is operationally up. It is down if all its objects are operationally down.

If a spoke SDP in endpoint “Y”, including the ICB spoke SDP, transitions locally to down state, the node must send T-LDP SDP-binding down status bits on this spoke SDP.

If a spoke SDP in endpoint “Y”, including the ICB spoke SDP, received T-LDP SAP down status bits, and/or received T-LDP SDP-binding down status bits, and/or received status bits of pseudowire not forwarding, the node saves this status and takes no further action. The saved status is used for selecting the active transmit endpoint object.

If all objects in endpoint “Y”, except the ICB spoke SDP, transition locally to down state, and/or received T-LDP SAP down status bits, and/or received T-LDP SDP-binding down status bits, and/or received status bits of pseudowire not forwarding, the node must send status bits of SDP-binding down over the “X” endpoint ICB spoke SDP only.

If all objects in endpoint “Y” transition locally to down state, and/or received T-LDP SAP down status bits, and/or received T-LDP SDP-binding down status bits, and/or received status bits of pseudowire not forwarding, the node must send status bits of SDP-binding down over the “X” endpoint ICB spoke SDP, and must send a SAP down notification on the “X” endpoint SAP via the SAP specific OAM signal if applicable. An Ethernet SAP does not support signaling status notifications.

VLL Using G.8031 Protected Ethernet Tunnels

The use of MPLS tunnels provides a way to scale the core while offering fast failover times using MPLS FRR. In environments where Ethernet services are deployed using native Ethernet backbones, Ethernet tunnels are provided to achieve the same fast failover times as in the MPLS FRR case.

The Alcatel-Lucent VLL implementation offers the capability to use core Ethernet tunnels compliant with ITU-T G.8031 specification to achieve 50 ms resiliency for backbone failures. This is required to comply with the stringent SLAs provided by service providers in the current competitive environment. Epipe and Ipipe services are supported.

When using Ethernet Tunnels, the Ethernet Tunnel logical interface is created first. The Ethernet tunnel has member ports which are the physical ports supporting the links. The Ethernet tunnel control SAPs carries G.8031 and 802.1ag control traffic and user data traffic. Ethernet Service SAPs are configured on the Ethernet tunnel. Optionally when tunnels follow the same paths end to end services may be configured with, Same-fate Ethernet tunnel SAPs which carry only user data traffic and shares the fate of the Ethernet tunnel port (if properly configured).

Ethernet tunnels provide a logical interface that VLL SAPs may use just as regular interfaces. The Ethernet tunnel provides resiliency by providing end to end tunnels. The tunnels are stitched together by VPLS or Epipe services at intermediate points. Epipes offer a more scalable option.

For further information, see [G.8031 Protected Ethernet Tunnels on page 54](#)

VLL Service Considerations

This section describes various of the general 7750 SR service features and any special capabilities or considerations as they relate to VLL services.

SDPs

The most basic SDPs must have the following:

- A locally unique SDP identification (ID) number.
- The system IP address of the originating and far-end routers.
- An SDP encapsulation type, either GRE or MPLS.

The most basic Apipe and Fpipe SDP configurations must have the following:

- A locally unique SDP identification (ID) number and vc-id.

SDP Statistics for VPLS and VLL Services

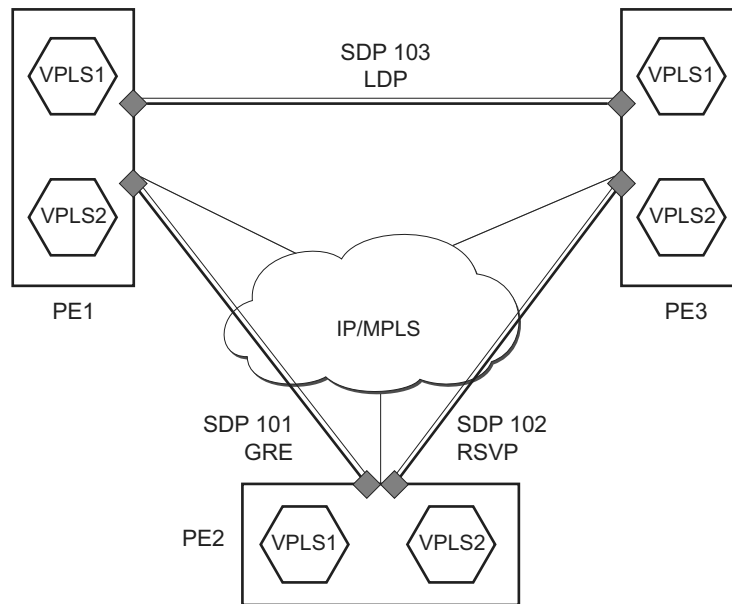


Figure 52: SDP Statistics for VPLS and VLL Services

The simple three-node network described in [Figure 52](#) shows two MPLS SDPs and one GRE SDP defined between the nodes. These SDPs connect VPLS1 and VPLS2 instances that are defined in the three nodes. With this feature the operator will have local CLI based as well as SNMP based statistics collection for each VC used in the SDPs. This will allow for traffic management of tunnel usage by the different services and with aggregation the total tunnel usage.

SAP Encapsulations and Pseudowire Types

The 7750 SR Epipe service is designed to carry Ethernet frame payloads, so it can provide connectivity between any two SAPs that pass Ethernet frames. The following SAP encapsulations are supported on the 7750 SR Epipe service:

- Ethernet null
- Ethernet dot1q
- QinQ
- SONET/SDH BCP-null
- SONET/SDH BCP-dot1q
- ATM VC with RFC 2684 Ethernet-bridged encapsulation (see [Ethernet Interworking VLL on page 198](#))
- FR VC with RFC 2427 Ethernet-bridged encapsulation (see [Ethernet Interworking VLL on page 198](#))

Note that while different encapsulation types can be used, encapsulation mismatching can occur if the encapsulation behavior is not understood by connecting devices and are unable to send and receive the expected traffic. For example if the encapsulation type on one side of the Epipe is dot1q and the other is null, tagged traffic received on the null SAP will be double tagged when it is transmitted out of the Dot1q SAP.

ATM VLLs can be configured with both endpoints (SAPs) on the same router or with the two endpoints on different 7750 SRs. In the latter case, Pseudowire Emulation Edge-to-Edge (PWE3) signalling is used to establish a pseudowire between the devices allowing ATM traffic to be tunneled through an MPLS or GRE network:

Two pseudowire encapsulation modes, i.e., SDP vc-type, are available:

- PWE3 N-to-1 Cell Mode Encapsulation
- PWE3 AAL5 SDU Mode Encapsulation

The endpoints of Frame Relay VLLs must be Data-Link Connection Identifiers (DLCIs) on any port that supports Frame Relay. The pseudowire encapsulation, or SDP vc-type, supported is the 1-to-1 Frame Relay encapsulation mode.

PWE3 N-to-1 Cell Mode

The endpoints of an N-to-1 mode VLL can be:

- ATM VCs — VPI/VCI translation is supported (i.e., the VPI/VCI at each endpoint does not need to be the same).
- ATM VPs — VPI translation is supported (i.e., the VPI at each endpoint need not be the same, but the original VCI will be maintained).
- ATM VTs (a VP range) — No VPI translation is supported (i.e., the VPI/VCI of each cell is maintained across the network).
- ATM ports — No translation is supported (i.e., the VPI/VCI of each cell is maintained across the network).

For N-to-1 mode VLLs, cell concatenation is supported. Cells will be packed on ingress to the VLL and unpacked on egress. As cells are being packed, the concatenation process may be terminated by:

- Reaching a maximum number of cells per packet.
- Expiry of a timer.
- (Optionally) change of the CLP bit.
- (Optionally) change of the PTI bits indicating end of AAL5 packet.

In N-to-1 mode, OAM cells are transported through the VLL as any other cell. The PTI and CLP bits are untouched, even if VPI/VCI translation is carried out.

PWE3 AAL5 SDU Mode

The endpoints of an AAL5 SDU mode VLL must be ATM VCs specified by port/vpi/vci. VPI/VCI translation is supported. The endpoint can also be a FR VC, specified by port/dlci. In this case FRF.5 FR-ATM network interworking is performed between the ATM VC SAP or the SDP and the FR VC SAP.

In SDU mode, the mandatory PWE3 control word is supported. This allows the ATM VLL to transport OAM cells along with SDU frames, using the “T” bit to distinguish between them, to recover the original SDU length, and to carry CLP, EFCI and UU information.

QoS Policies

When applied to 7750 SR Epipe, Apipe, and Fpipe services, service ingress QoS policies only create the unicast queues defined in the policy. The multipoint queues are not created on the service.

With Epipe, Apipe, and Fpipe services, egress QoS policies function as with other services where the class-based queues are created as defined in the policy. Note that both Layer 2 or Layer 3 criteria can be used in the QoS policies for traffic classification in a service. QoS policies on Apipes cannot perform any classification and on Fpipes Layer 3 (IP) classification is performed.

Filter Policies

7750 SR Epipe, Fpipe, and Ipipe services can have a single filter policy associated on both ingress and egress. Both MAC and IP filter policies can be used on Epipe services.

Filters cannot be configured on 7750 SR Apipe service SAPs.

MAC Resources

Epipe services are point-to-point layer 2 VPNs capable of carrying any Ethernet payloads. Although an Epipe is a Layer 2 service, the 7750 SR Epipe implementation does not perform any MAC learning on the service, so Epipe services do not consume any MAC hardware resources.

Configuring a VLL Service with CLI

This section provides information to configure Virtual Leased Line (VLL) services using the command line interface.

Topics in this section include:

- [Basic Configurations on page 241](#)
- [Common Configuration Tasks on page 241](#)
 - [Configuring VLL Components on page 242](#)
 - [Creating an Apipe Service on page 242](#)
 - [Creating a Cpipe Service on page 249](#)
 - [Creating an Epipe Service on page 253](#)
 - [Creating an Fpipe Service on page 265](#)
 - [Creating an Ipipe Service on page 270](#)
 - [Using Spoke SDP Control Words on page 274](#)
 - [Same Fate Epipe VLANs Access Protection on page 275](#)
 - [Configuring Pseudowire Scenarios](#)
 - [Pseudowire Configuration Notes on page 277](#)
 - [Configuring Two VLL Paths Terminating on T-PE2 on page 279](#)
 - [Configuring VLL Resilience on page 282](#)
 - [Configuring VLL Resilience for a Switched Pseudowire Path on page 283](#)
- [Service Management Tasks on page 285](#)
 - [Apipe:](#)
 - [Modifying Apipe Service Parameters on page 286](#)
 - [Disabling an Apipe Service on page 288](#)
 - [Re-enabling an Apipe Service on page 289](#)
 - [Deleting an Apipe Service on page 290](#)
 - [Cpipe](#)
 - [Modifying a Cpipe Service on page 291](#)
 - [Deleting a Cpipe Service on page 292](#)
 - [Epipe:](#)
 - [Modifying Epipe Service Parameters on page 293](#)
 - [Deleting an Epipe Service on page 294](#)
 - [Re-enabling an Epipe Service on page 294](#)
 - [Re-enabling an Epipe Service on page 294](#)

Fpipe:

- [Modifying Fpipe Service Parameters on page 295](#)
- [Disabling an Fpipe Service on page 297](#)
- [Re-enabling an Fpipe Service on page 298](#)
- [Deleting an Fpipe Service on page 299](#)

Ipipe

- [Modifying Ipipe Service Parameters on page 300](#)
- [Disabling an Ipipe Service on page 301](#)
- [Re-enabling an Ipipe Service on page 302](#)
- [Deleting an Ipipe Service on page 302](#)

Basic Configurations

- [Creating an Epipe Service on page 253](#)
 - [Creating an Apipe Service on page 242](#)
 - [Creating an Fpipe Service on page 265](#)
 - [Creating an Ipipe Service on page 270](#)
 - [Using Spoke SDP Control Words on page 274](#)
 - [Pseudowire Configuration Notes on page 277](#)
 - [Configuring Two VLL Paths Terminating on T-PE2 on page 279](#)
 - [Configuring VLL Resilience on page 282](#)
 - [Configuring VLL Resilience for a Switched Pseudowire Path on page 283](#)
-

Common Configuration Tasks

This section provides a brief overview of the tasks that must be performed to configure the VLL services and provides the CLI commands.

- Associate the service with a customer ID.
- Define SAP parameters
 - Optional - configure ATM parameters
 - Optional - select egress and ingress QoS and/or scheduler policies (configured in the **config>qos** context).
 - Optional - select accounting policy (configured in the **config>log** context).
- Define spoke SDP parameters.
- Enable the service.

Configuring VLL Components

This section provides VLL configuration examples for the VLL services:

- [Creating an Epipe Service on page 253](#)
 - [Configuring Epipe SAP Parameters on page 254](#)
 - [Local Epipe SAPs on page 255](#)
 - [Distributed Epipe SAPs on page 257](#)
 - [Configuring Ingress and Egress SAP Parameters on page 260](#)
 - [Creating an Apipe Service on page 242](#)
 - [Configuring Apipe SAP Parameters on page 245](#)
 - [Configuring Apipe SDP Bindings on page 247](#)
 - [Creating an Fpipe Service on page 265](#)
 - [Configuring Fpipe SAP Parameters on page 266](#)
 - [Configuring Fpipe SDP Bindings on page 268](#)
 - [Creating an Ipipe Service on page 270](#)
 - [Creating an Ipipe Service on page 270](#)
-

Creating an Apipe Service

Use the following CLI syntax to create an Apipe service.

CLI Syntax: config>service# apipe service-id [customer customer-id] [vpn vpn-id] [vc-type {atm-vcc|atm-sdu|atm-vpc|atm-cell}] [vc-switching] description description-string interworking {frf-5} service-mtu octets no shutdown

The following example displays the command usage to create an Apipe service:

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# apipe 5 customer 1 create
A:ALA-41config>service>apipe# description "apipe test"
A:ALA-41config>service>apipe# service-mtu 1400
A:ALA-41config>service>apipe# no shutdown
A:ALA-41config>service>apipe#

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# apipe 5 customer 1 create
A:ALA-42>config>service>apipe# description "apipe test"
A:ALA-42>config>service>apipe# service-mtu 1400

```
A:ALA-42>config>service>apipe# no shutdown
A:ALA-42>config>service>apipe#
```

The following example displays the Apipe service creation output.

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info
-----
...
    apipe 5 customer 1 create
        description "apipe test"
        service-mtu 1400
        no shutdown
    exit
...
-----
A:ALA-41>config>service#
```

PE Router 2 (ALA-42):

```
A:ALA-42>config>service# info
-----
...
    apipe 5 customer 1 create
        description "apipe test"
        service-mtu 1400
        no shutdown
    exit
...
-----
A:ALA-42>config>service#
```


Configuring Apipe SAP Parameters

Use the following CLI syntax to configure Apipe SAP parameters.

CLI Syntax: config>service# apipe service-id [customer customer-id] [vpn vpn-id] [vc-type {atm-vcc|atm-sdu|atm-vpc|atm-cell}] [vc-switching] sap sap-id
 accounting-policy acct-policy-id
 atm
 egress
 traffic-desc traffic-desc-profile-id
 ingress
 traffic-desc traffic-desc-profile-id
 oam
 alarm-cells
 terminate
 collect-stats
 description description-string
 egress
 qos policy-id
 scheduler-policy scheduler-policy-name
 ingress
 qos policy-id [shared-queuing]
 scheduler-policy scheduler-policy-name
 multi-service-site customer-site-name
 no shutdown

The following example displays the command usage to create Apipe SAPs:

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# apipe 5
 A:ALA-41>config>service>apife# sap 1/1/1:0/32 create
 A:ALA-41>config>service>apife>sap# ingress
 A:ALA-41>config>service>apife>sap>ingress# qos 102
 A:ALA-41>config>service>apife>sap>ingress# exit
 A:ALA-41>config>service>apife>sap# egress
 A:ALA-41>config>service>apife>sap>egress# qos 103
 A:ALA-41>config>service>apife>sap>egress# exit
 A:ALA-41>config>service>apife>sap# no shutdown
 A:ALA-41>config>service>apife>sap# exit
 A:ALA-41>config>service>apife#

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# apipe 5
 A:ALA-42>config>service>apife# sap 2/2/2:0/32 create
 A:ALA-42>config>service>apife>sap# ingress
 A:ALA-42>config>service>apife>sap>ingress# qos 102

```

A:ALA-42>config>service>apipe>sap>ingress# exit
A:ALA-42>config>service>apipe>sap# egress
A:ALA-42>config>service>apipe>sap>egress# qos 103
A:ALA-42>config>service>apipe>sap>egress# exit
A:ALA-42>config>service>apipe>sap# no shutdown
A:ALA-42>config>service>apipe>sap# exit
A:ALA-42>config>service>apipe#

```

The following output displays the Apipe SAP configuration.

PE Router 1 (ALA-41):

```

A:ALA-41>config>service# info
-----
...
    apipe 5 customer 1 create
        description "apipe test"
        service-mtu 1400
        sap 1/1/1:0/32 create
            ingress
                qos 102
            exit
            egress
                qos 103
            exit
        exit
        no shutdown
    exit
...
-----
A:ALA-41>config>service#

```

PE Router 2 (ALA-42):

```

A:ALA-42>config>service# info
-----
...
    apipe 5 customer 1 create
        description "apipe test"
        service-mtu 1400
        sap 2/2/2:0/32 create
            ingress
                qos 102
            exit
            egress
                qos 103
            exit
        exit
        no shutdown
    exit
...
-----
A:ALA-42>config>service#

```

Configuring Apipe SDP Bindings

Use the following CLI syntax to create a spoke SDP binding with an Apipe service:

CLI Syntax: config>service# apipe service-id [customer customer-id] [vpn vpn-id] [vc-type {atm-vcc|atm-sdu|atm-vpc|atm-cell}] [vc-switching] spoke-sdp sdp-id:vc-id cell-concatenation aal5-frame-aware clp-change max-cells cell-count max-delay delay-time egress vc-label egress-vc-label ingress vc-label ingress-vc-label no shutdown

The following example displays the command usage to create Apipe spoke SDPs:

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# apipe 5
A:ALA-41>config>service>apipe# spoke-sdp 1:5 create
A:ALA-41>config>service>apipe>spoke-sdp# no shutdown
A:ALA-41>config>service>apipe>spoke-sdp# exit

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# apipe 5
A:ALA-42>config>service>apipe# spoke-sdp 1:5 create
A:ALA-42>config>service>apipe>spoke-sdp# no shutdown
A:ALA-42>config>service>apipe>spoke-sdp# exit

The following output displays the Apipe spoke SDP configurations.

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info
-----
...
    apipe 5 customer 1 create
      description "apipe test"
      service-mtu 1400
      sap 1/1/1:0/32 create
        ingress
          qos 102
        exit
        egress
          qos 103
        exit
      exit
```

```

        spoke-sdp 1:5 create
        exit
        no shutdown
    exit
...
-----
A:ALA-41>config>service#

```

PE Router 2 (ALA-42):

```

A:ALA-42>config>service# info
-----
...
    apipe 5 customer 1 create
        description "apipe test"
        service-mtu 1400
        sap 2/2/2:0/32 create
            ingress
                qos 102
            exit
            egress
                qos 103
            exit
        exit
        spoke-sdp 1:5 create
        exit
        no shutdown
    exit
...
-----
A:ALA-42>config>service#

```

Creating a Cpipe Service

Use the following CLI syntax to create a Cpipe service. A route distinguisher must be defined in order for Cpipe to be operationally active.

CLI Syntax: config>service# cpipe service-id [customer customer-id] [vpn vpn-id] [vc-type {satop-e1 | satop-t1 | cesopsn | cesopsn-cas}] [vc-switching] [create]

The following displays a Cpipe service configuration example.

```
*A:ALA-1>config>service# info
-----
...
    cpipe 210 customer 1 vc-type cesopsn create
        service-mtu 1400
        sap 1/5/1.1.3.1 create
        exit
        spoke-sdp 1:210 create
        exit
        no shutdown
    exit
...
-----
*A:ALA-1>config>service#
```

Configuration Requirements

Before a Cpipe service can be provisioned, the following entities must be configured.

- [Configuring a DS1 Port on page 250](#)
 - [Configuring a Channel Group on page 250](#)
-

Configuring a DS1 Port

The following displays an example of a DS1 port configured for CES.

```
A:sim216# show port 1/5/1.1.3.1
=====
TDM DS1 Interface
=====
Description          : DS1
Interface            : 1/5/1.1.3,1
Type                 : ds1
Admin Status         : up
Physical Link        : yes
Signal Mode          : none
Last State Change    : 10/31/2006 14:23:12
Loopback             : none
Remote Loop respond  : false
Load-balance-algo    : default
BERT Duration        : N/A
BERT Synched         : 00h00m00s
BERT Errors          : 0
BERT Total Bits      : 0
Cfg Alarm            : ais los
Alarm Status         :
=====
A:sim216#
```

Configuring a Channel Group

The following displays an example of a DS1 channel group configured for CES.

```
A:sim216# show port 1/5/1.1.3.1
=====
TDM DS0 Chan Group
=====
Description          : DS0GRP
Interface            : 1/5/1.1.3.1
TimeSlots           : 1-12
Speed               : 64
Admin Status         : up
Last State Change    : 10/31/2006 14:23:12
Configured mode      : access
Admin MTU            : 4112
Physical Link        : Yes
Idle Cycle Flags     : flags
Egr. Sched. Pol     : n/a
CRC                  : 16
Oper Status          : up
Chan-Grp IfIndex     : 580943940
Encap Type           : cem
Oper MTU             : 4112
Bundle Number        : none
Load-balance-algo    : default
```

```
=====
A:sim216#
```

Configuring Cpipe SAPs and Spoke SDPs

The following output displays examples of Cpipe ASP and spoke SDP configurations.

```
*A:ALA-49>config>service# info
#-----
echo "Service Configuration"
#-----
...
    cpipe 100 customer 1 vc-type cesopsn create
        service-mtu 1400
        sap 1/5/1.1.1.1 create
        exit
        spoke-sdp 1:100 create
        exit
        no shutdown
    exit
    cpipe 200 customer 1 vc-type cesopsn-cas create
        sap 1/5/1.2.1.1 create
        exit
        sap 1/5/1.2.2.1 create
        exit
        no shutdown
    exit
    cpipe 210 customer 1 vc-type cesopsn-cas create
        service-mtu 1400
        sap 1/5/1.1.3.1 create
        exit
        spoke-sdp 1:210 create
        exit
        no shutdown
    exit
    cpipe 300 customer 1 vc-type cesopsn create
        sap 1/5/1.3.4.1 create
        exit
        sap 1/5/1.3.6.1 create
        exit
        no shutdown
    exit
    cpipe 400 customer 1 vc-type satop-el create
        sap 1/5/1.2.3.1 create
        exit
        spoke-sdp 1:400 create
        exit
        no shutdown
    exit
...
#-----
*A:ALA-49>config>service#
```

```

A:sim213>config>service>cpipe# info
-----
description "cpipe-100"
sap 1/5/1.1.1.1 create
    cem
        packet jitter-buffer 16 payload-size 384
        report-alarm rpktloss
        no report-alarm stray
        rtp-header
    exit
exit
spoke-sdp 1:100 create
exit
no shutdown
-----
A:sim213>config>service>cpipe#

```


Creating an Epipe Service

Use the following CLI syntax to create an Epipe service.

CLI Syntax: config>service# epipe service-id [customer customer-id] [vpn vpn-id] [vc-switching]
description description-string
no shutdown

The following displays an Epipe configuration example:

```
A:ALA-1>config>service# info
-----
...
    epipe 500 customer 5 vpn 500 create
        description "Local epipe service"
        no shutdown
    exit
-----
A:ALA-1>config>service#
```

Configuring Epipe SAP Parameters

A default QoS policy is applied to each ingress and egress SAP. Additional QoS policies can be configured in the **config>qos** context. Filter policies are configured in the **config>filter** context and explicitly applied to a SAP. There are no default filter policies.

Use the following CLI syntax to create:

- [Local Epipe SAPs on page 255](#)
- [Distributed Epipe SAPs on page 257](#)

CLI Syntax:

```
config>service# epipe service-id [customer customer-id]
sap sap-id [endpoint endpoint-name]
sap sap-id [no-endpoint]
    accounting-policy policy-id
    collect-stats
    description description-string
    no shutdown
    egress
        filter {ip ip-filter-name | mac mac-filter-name}
        qos sap-egress-policy-id
        scheduler-policy scheduler-policy-name
    ingress
        filter {ip ip-filter-name | mac mac-filter-name}
        match-qinq-dot1p {top|bottom}
        qos policy-id [shared-queuing]
        scheduler-policy scheduler-policy-name
```

Local Epipe SAPs

Table 9: Supported SAP Types

Uplink Type	Svc SAP Type	Cust. VID	Access SAPs	Network SAPs
L2	Null-star	N/A	Null, dot1q *	Q.*
L2	Dot1q	N/A	Dot1q	Q.*
L2	Dot1q-preserve	X	Dot1q (encap = X)	Q1.Q2 (where Q2 = X)

To configure a basic local Epipe service, enter the **sap sap-id** command twice with different port IDs in the same service configuration.

By default, QoS policy ID 1 is applied to ingress and egress service SAPs. Existing filter policies or other existing QoS policies can be associated with service SAPs on ingress and egress ports.

An existing scheduler policy can be applied to ingress and egress SAPs to be used by the SAP queues. The schedulers comprising the policy are created at the time the scheduler policy is applied to the SAP. If any orphaned queues (queues with a non-existent local scheduler defined) exist on a SAP and the policy application creates the required scheduler, the status on the queue becomes non-orphaned at this time.

Ingress and Egress SAP parameters can be applied to local and distributed Epipe service SAPs.

This example displays the SAP configurations for local Epipe service 500 on SAP 1/1/2 and SAP 1/1/3 on ALA-1.

```
A:ALA-1>config>service# epipe 500 customer 5 create
config>service>epipe$ description "Local epipe service"
config>service>epipe# sap 1/1/2:0 create
config>service>epipe>sap? ingress
config>service>epipe>sap>ingress# qos 20
config>service>epipe>sap>ingress# filter ip 1
config>service>epipe>sap>ingress# exit
config>service>epipe>sap# egress
config>service>epipe>sap>egress# qos 20
config>service>epipe>sap>egress# scheduler-policy test1
config>service>epipe>sap>egress# exit
config>service>epipe>sap# no shutdown
config>service>epipe>sap# exit

config>service>epipe# sap 1/1/3:0 create
config>service>epipe>sap# ingress
config>service>epipe>sap>ingress# qos 555
config>service>epipe>sap>ingress# filter ip 1
config>service>epipe>sap>ingress# exit
config>service>epipe>sap# egress
config>service>epipe>sap>egress# qos 627
config>service>epipe>sap>egress# scheduler-policy alpha
config>service>epipe>sap>egress# exit
config>service>epipe>sap# no shutdown
config>service>epipe>sap# exit
```

The following example displays the local Epipe configuration:

```
A:ALA-1>config>service# info
-----
...
    epipe 500 customer 5 vpn 500 create
        description "Local epipe service"
        sap 1/1/2:0 create
            ingress
                qos 20
                filter ip 1
            exit
            egress
                scheduler-policy "test1"
                qos 20
            exit
        exit
    sap 1/1/3:0 create
        ingress
            qos 555
            filter ip 1
        exit
        egress
            scheduler-policy "alpha"
            qos 627
        exit
    exit
    no shutdown
    exit
-----
A:ALA-1>config>service#
```

Distributed Epipe SAPs

To configure a distributed Epipe service, you must configure service entities on the originating and far-end nodes. You should use the same service ID on both ends (for example, Epipe 5500 on ALA-1 and Epipe 5500 on ALA-2). The **spoke-sdp** *sdp-id:vc-id* must match on both sides. A distributed Epipe consists of two SAPs on different nodes.

By default, QoS policy ID 1 is applied to ingress and egress service SAPs. Existing filter policies or other existing QoS policies can be associated with service SAPs on ingress and egress.

An existing scheduler policy can be applied to ingress and egress SAPs to be used by the SAP queues. The schedulers comprising the policy are created at the time the scheduler policy is applied to the SAP. If any orphaned queues (queues with a non-existent local scheduler defined) exist on a SAP and the policy application creates the required scheduler, the status on the queue becomes non-orphaned at this time.

Ingress and egress SAP parameters can be applied to local and distributed Epipe service SAPs.

For SDP configuration information, see [Configuring an SDP on page 94](#). For SDP binding information, see [Configuring SDP Bindings on page 261](#).

This example configures a distributed service between ALA-1 and ALA-2.

```
A:ALA-1>epipe 5500 customer 5 create
config>service>epipe$ description "Distributed epipe service to east coast"
config>service>epipe# sap 221/1/3:21 create
config>service>epipe>sap# ingress
config>service>epipe>sap>ingress# qos 555
config>service>epipe>sap>ingress# filter ip 1
config>service>epipe>sap>ingress# exit
config>service>epipe>sap# egress
config>service>epipe>sap>egress# qos 627
config>service>epipe>sap>egress# scheduler-policy alpha
config>service>epipe>sap>egress# exit
config>service>epipe>sap# no shutdown
config>service>epipe>sap# exit
config>service>epipe#

A:ALA-2>config>service# epipe 5500 customer 5 create
config>service>epipe$ description "Distributed epipe service to west coast"
config>service>epipe# sap 441/1/4:550 create
config>service>epipe>sap# ingress
config>service>epipe>sap>ingress# qos 654
config>service>epipe>sap>ingress# filter ip 1020
config>service>epipe>sap>ingress# exit
config>service>epipe>sap# egress
config>service>epipe>sap>egress# qos 432
config>service>epipe>sap>egress# filter ip 6
config>service>epipe>sap>egress# scheduler-policy test1
config>service>epipe>sap>egress# exit
config>service>epipe>sap# no shutdown
config>service>epipe#
```

The following example displays the SAP configurations for ALA-1 and ALA-2:

```
A:ALA-1>config>service# info
-----
...
    epipe 5500 customer 5 vpn 5500 create
        description "Distributed epipe service to east coast"
        sap 221/1/3:21 create
            ingress
                qos 555
                filter ip 1
            exit
        egress
            scheduler-policy "alpha"
            qos 627
        exit
    exit
exit
...
-----
A:ALA-1>config>service#

A:ALA-2>config>service# info
-----
...
    epipe 5500 customer 5 vpn 5500 create
        description "Distributed epipe service to west coast"
        sap 441/1/4:550 create
            ingress
                qos 654
                filter ip 1020
            exit
        egress
            scheduler-policy "test1"
            qos 432
            filter ip 6
        exit
    exit
exit
...
-----
A:ALA-2>config>service#
```

PBB Epipe Configuration

The following example displays the PBB Epipe configuration:

```
*A:Wales-1>config>service>epipe# info
-----
...
description "Default epipe description for service id 20000"
pbb-tunnel 200 backbone-dest-mac 00:03:fa:15:d3:a8 isid 20000
sap 1/1/2:1.1 create
    description "Default sap description for service id 20000"
    ingress
    filter mac 1
    exit
exit
no shutdown
-----
*A:Wales-1>config>service>epipe#
```

CLI Syntax: configure service vpls 200 customer 1 b-vpls create

```
*A:Wales-1>config>service>vpls# info
-----
...
service-mtu 2000
fdb-table-size 131071
stp
no shutdown
exit
sap 1/1/8 create
exit
sap 1/2/3:200 create
exit
mesh-sdp 1:200 create
exit
mesh-sdp 100:200 create
exit
mesh-sdp 150:200 create
exit
mesh-sdp 500:200 create
exit
no shutdown
-----
*A:Wales-1>config>service>vpls#
```

Configuring Ingress and Egress SAP Parameters

By default, QoS policy ID 1 is applied to ingress and egress service SAPs. Existing filter policies or other existing QoS policies can be associated with service SAPs on ingress and egress ports.

An existing scheduler policy can be applied to ingress and egress SAPs to be used by the SAP queues. The schedulers comprising the policy are created at the time the scheduler policy is applied to the SAP. If any orphaned queues (queues with a non-existent local scheduler defined) exist on a SAP and the policy application creates the required scheduler, the status on the queue becomes non-orphaned at this time.

Ingress and egress SAP parameters can be applied to local and distributed Epipe service SAPs.

This example displays SAP ingress and egress parameters.

```
ALA-1>config>service# epipe 5500
config>service>epipe# sap 2/1/3:21
config>service>epipe>sap# ingress
config>service>epipe>sap>ingress# qos 555
config>service>epipe>sap>ingress# filter ip 1
config>service>epipe>sap>ingress# exit
config>service>epipe>sap# egress
config>service>epipe>sap>egress# qos 627
config>service>epipe>sap>egress# scheduler-policy alpha
config>service>epipe>sap>egress# exit
config>service>epipe>sap#
```

The following example displays the Epipe SAP ingress and egress configuration:

```
A:ALA-1>config>service#
-----
...
    epipe 5500 customer 5 vpn 5500 create
        description "Distributed epipe service to east coast"
        sap 2/1/3:21 create
            ingress
                qos 555
                filter ip 1
            exit
            egress
                scheduler-policy "alpha"
                qos 627
            exit
        exit
    spoke-sdp 2:123 create
        ingress
            vc-label 6600
        exit
        egress
            vc-label 5500
        exit
    exit
    no shutdown
    exit
-----
A:ALA-1>config>service#
```


Configuring SDP Bindings

Figure 53 displays an example of a distributed Epipe service configuration between two routers, identifying the service and customer IDs, and the uni-directional SDPs required to communicate to the far-end routers.

A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received.

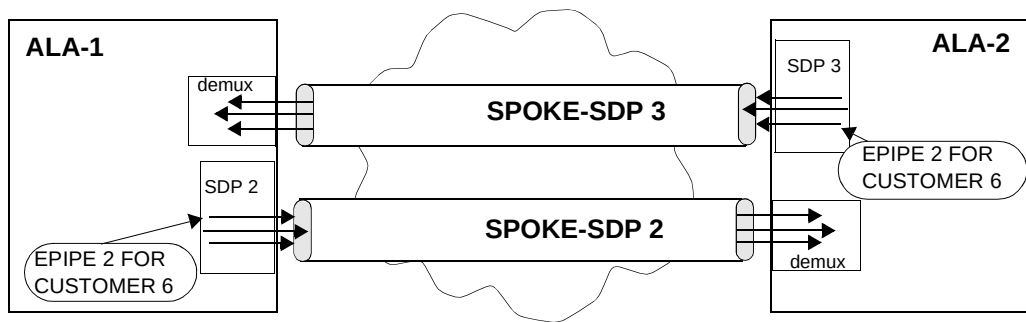


Figure 53: SDPs — Uni-Directional Tunnels

Use the following CLI syntax to create a spoke SDP binding with an Epipe service:

CLI Syntax:

```
config>service# epipe service-id [customer customer-id]
spoke-sdp sdp-id:vc-id [vc-type {ether | vlan}]
vlan-vc-tag 0..4094
egress
  filter {ip ip-filter-id}
  vc-label egress-vc-label
ingress
  filter {ip ip-filter-id}
  vc-label ingress-vc-label
no shutdown
```

The following example displays the command usage to bind an Epipe service between ALA-1 and ALA-2. This example assumes the SAPs have already been configured (see [Distributed Epipe SAPs on page 257](#)).

```

A:ALA-1>config>service# epipe 5500
config>service>epipe# spoke-sdp 2:123
config>service>epipe>spoke-sdp# egress
config>service>epipe>spoke-sdp>egress# vc-label 5500
config>service>epipe>spoke-sdp>egress# exit
config>service>epipe>spoke-sdp# ingress
config>service>epipe>spoke-sdp>ingress# vc-label 6600
config>service>epipe>spoke-sdp>ingress# exit
config>service>epipe>spoke-sdp# no shutdown

ALA-2>config>service# epipe 5500
config>service>epipe# spoke-sdp 2:456
config>service>epipe>spoke-sdp# egress
config>service>epipe>spoke-sdp>egress# vc-label 6600
config>service>epipe>spoke-sdp>egress# exit
config>service>epipe>spoke-sdp# ingress
config>service>epipe>spoke-sdp>ingress# vc-label 5500
config>service>epipe>spoke-sdp>ingress# exit
config>service>epipe>spoke-sdp# no shutdown

```

This example displays the SDP binding for the Epipe service between ALA-1 and ALA-2:

```

A:ALA-1>config>service# info
-----
...
    epipe 5500 customer 5 vpn 5500 create
        description "Distributed epipe service to east coast"
        sap 2/1/3:21 create
            ingress
                qos 555
                filter ip 1
            exit
            egress
                scheduler-policy "alpha"
                qos 627
            exit
        exit
        spoke-sdp 2:123 create
            ingress
                vc-label 6600
            exit
            egress
                vc-label 5500
            exit
        exit
        no shutdown
    exit
...
-----
A:ALA-1>config>service#

A:ALA-2>config>service# info
-----
...
exit
    epipe 5500 customer 5 vpn 5500 create
        description "Distributed epipe service to west coast"
        sap 441/1/4:550 create
            ingress
                qos 654

```

```
        filter ip 1020
    exit
    egress
        scheduler-policy "test1"
        qos 432
        filter ip 6
    exit
exit
spoke-sdp 2:456 create
    ingress
        vc-label 5500
    exit
    egress
        vc-label 6600
    exit
exit
no shutdown
exit
...
-----
A:ALA-2>config>service#
```


Creating an Fpipe Service

Use the following CLI syntax to create an Fpipe service.

CLI Syntax: config>service# fpipe service-id [customer customer-id] [vpn vpn-id] [vc-type {fr-dlci}] [vc-switching]
 description description-string
 service-mtu octets
 no shutdown

The following example displays the command usage to create an Fpipe service:

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# fpipe 1 customer 1 create
 A:ALA-41config>service>fpipe# description "fpipe test"
 A:ALA-41config>service>fpipe# service-mtu 1400
 A:ALA-41config>service>fpipe# no shutdown
 A:ALA-41config>service>fpipe#

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# fpipe 1 customer 1 create
 A:ALA-42>config>service>fpipe# description "fpipe test"
 A:ALA-42>config>service>fpipe# service-mtu 1400
 A:ALA-42>config>service>fpipe# no shutdown
 A:ALA-42>config>service>fpipe#

The following example displays the Fpipe service creation output.

PE router 1 (A:ALA-41):

```
A:ALA-41>config>service# info
-----
...
      fpipe 1 customer 1 create
        description "fpipe test"
        service-mtu 1400
        no shutdown
      exit
...
-----
A:ALA-41>config>service#
```

PE router 2 (A:ALA-42):

```
A:ALA-42>config>service# info
-----
...
      fpipe 1 customer 1 create
        description "fpipe test"
        service-mtu 1400
        no shutdown
      exit
...
-----
A:ALA-42>config>service#
```

Configuring Fpipe SAP Parameters

Use the following CLI syntax to configure Fpipe SAP parameters.

CLI Syntax: config>service# fpipe service-id [customer customer-id] [vpn vpn-id] [vc-type {fr-dlci}] [vc-switching]
sap sap-id
accounting-policy acct-policy-id
collect-stats
description description-string
egress
filter [ip ip-filter-id]
qos policy-id
scheduler-policy scheduler-policy-name
ingress
filter [ip ip-filter-id]
qos policy-id [shared-queuing]
scheduler-policy scheduler-policy-name
multi-service-site customer-site-name
no shutdown

The following example displays the command usage to create an Fpipe SAP:

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# fpipe 1
A:ALA-41>config>service>fpipe# sap 1/2/1:16 create
A:ALA-41>config>service>fpipe>sap# ingress
A:ALA-41>config>service>fpipe>sap>ingress# qos 101
A:ALA-41>config>service>fpipe>sap>ingress# exit
A:ALA-41>config>service>fpipe>sap# egress
A:ALA-41>config>service>fpipe>sap>egress# qos 1020
A:ALA-41>config>service>fpipe>sap>egress# exit
A:ALA-41>config>service>fpipe>sap# no shutdown
A:ALA-41>config>service>fpipe>sap# exit
A:ALA-41>config>service>fpipe#

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# fpipe 1
A:ALA-42>config>service>fpipe# sap 2/1/1.1:16 create
A:ALA-42>config>service>fpipe>sap# ingress
A:ALA-42>config>service>fpipe>sap>ingress# qos 101
A:ALA-42>config>service>fpipe>sap>ingress# exit
A:ALA-42>config>service>fpipe>sap# egress
A:ALA-42>config>service>fpipe>sap>egress# qos 1020
A:ALA-42>config>service>fpipe>sap>egress# exit
A:ALA-42>config>service>fpipe>sap# no shutdown
A:ALA-42>config>service>fpipe>sap# exit
A:ALA-42>config>service>fpipe#

The following example displays the Fpipe SAP configurations.

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info
-----
...
    fpipe 1 customer 1 create
        description "fpipe test"
        service-mtu 1400
        sap 1/2/1:16 create
            ingress
                qos 101
            exit
            egress
                qos 1020
            exit
        exit
        no shutdown
    exit
...
-----
A:ALA-41>config>service#
```

PE Router 2 (ALA-42):

```
A:ALA-42>config>service# info
-----
...
    fpipe 1 customer 1 create
        description "fpipe test"
        service-mtu 1400
        sap 2/1/1.1:16 create
            ingress
                qos 101
            exit
            egress
                qos 1020
            exit
        exit
        no shutdown
    exit
...
-----
A:ALA-42>config>service#
```

Configuring Fpipe SDP Bindings

Use the following CLI syntax to create a spoke SDP binding with an Fpipe service:

CLI Syntax: config>service# fpipe *service-id* [customer *customer-id*] [vpn *vpn-id*] [vc-type {fr-dlci}] [vc-switching]
spoke-sdp *sdp-id:vc-id*
egress
filter ip *ip-filter-id*
vc-label *egress-vc-label*
ingress
filter ip *ip-filter-id*
vc-label *ingress-vc-label*
no shutdown

The following example displays the command usage to create an Fpipe spoke SDP:

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# fpipe 1
A:ALA-41>config>service>fpipe# spoke-sdp 1:1 create
A:ALA-41>config>service>spoke-sdp# no shutdown
A:ALA-41>config>service>spoke-sdp# exit

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# fpipe 1
A:ALA-42>config>service>fpipe# spoke-sdp 1:1 create
A:ALA-42>config>service>spoke-sdp# no shutdown
A:ALA-42>config>service>spoke-sdp# exit

The following output displays the Fpipe spoke SDP configuration.

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info
-----
...
    fpipe 1 customer 1 create
        description "fpipe test"
        service-mtu 1400
        sap 1/2/1:16 create
            ingress
                qos 101
            exit
            egress
                qos 1020
            exit
        exit
        spoke-sdp 1:1 create
        exit
        no shutdown
    exit
...
-----
A:ALA-41>config>service#
```


PE Router 2 (ALA-42):

```
A:ALA-42>config>service# info
-----
...
    fpipe 1 customer 1 create
        description "fpipe test"
        service-mtu 1400
        sap 2/1/1.1:16 create
            ingress
                qos 101
            exit
            egress
                qos 1020
            exit
        exit
        spoke-sdp 1:1 create
        exit
        no shutdown
    exit
...
-----
A:ALA-42>config>service#
```

Creating an Ipipe Service

Use the following CLI syntax to create an Ipipe service.

CLI Syntax: `config>service# ipipe service-id [customer customer-id] [vpn vpn-id] [vc-switching]
description description-string
no shutdown`

The following example displays an Ipipe configuration example:

```
A:ALA-1>config>service# info
-----
...
    ipipe 202 customer 1 create
        description "eth_ipipe"
        no shutdown
    exit
-----
A:ALA-1>config>service#
```

Configuring Ipipe SAP Parameters

The following displays an Ipipe SAP configuration example:

```
A:ALA-48>config>service# info
-----
...
    ipipe 202 customer 1 create
        sap 1/1/2:444 create
            description "eth_ipipe"
            ce-address 31.31.31.1
        exit
        sap 1/3/2:445 create
            description "eth_ipipe"
            ce-address 31.31.31.2
        exit
        no shutdown
    exit
...
-----
A:ALA-48>config>service#
```

The following displays a Frame Relay to Ethernet local Ipipe example:

Example:

```
config>service# ipipe 204 customer 1 create
config>service>ipipe$ sap 1/1/2:446 create
config>service>ipipe>sap$ description "eth_fr_ipipe"
config>service>ipipe>sap$ ce-address 32.32.32.1
config>service>ipipe>sap$ no shutdown
config>service>ipipe>sap$ exit
config>service>ipipe# sap 2/2/2:16 create
config>service>ipipe>sap$ ce-address 32.32.32.2
config>service>ipipe>sap$ no shutdown
config>service>ipipe>sap$ exit
config>service>ipipe# no shutdown
config>service>ipipe# exit
config>service#
```

The following displays the output:

```
A:ALA-48>config>service# info
-----
...
    ipipe 204 customer 1 create
        sap 1/1/2:446 create
            description "eth_fr_ipipe"
            ce-address 32.32.32.1
        exit
        sap 2/2/2:16 create
            ce-address 32.32.32.2
        exit
        no shutdown
    exit
...
-----
A:ALA-48>config>service#
```

The following displays a PPP to Ethernet local Ipipe example:

Example:

```
config>service# ipipe 206 customer 1 create
config>service>ipipe$ sap 1/1/2:447 create
config>service>ipipe>sap$ description "eth_ppp_ipipe"
config>service>ipipe>sap$ ce-address 33.33.33.1
config>service>ipipe>sap$ no shutdown
config>service>ipipe>sap$ exit
config>service>ipipe# sap 2/2/2 create
config>service>ipipe>sap$ description "ppp_eth_ipipe"
config>service>ipipe>sap$ ce-address 33.33.33.2
config>service>ipipe>sap$ no shutdown
config>service>ipipe>sap$ exit
config>service>ipipe# no shutdown
config>service>ipipe# exit
config>service#
```

The following displays the output:

```
A:ALA-48>config>service# info
-----
...
    ipipe 206 customer 1 create
        sap 1/1/2:447 create
            description "eth_ppp_ipipe"
            ce-address 33.33.33.1
        exit
        sap 2/2/2 create
            description "ppp_eth_ipipe"
            ce-address 33.33.33.2
        exit
        no shutdown
    exit
...
-----
A:ALA-48>config>service#
```

Configuring Ipipe SDP Bindings

The following displays an Ipipe SDP configuration example:

```
A:ALA-48>config>service# info
-----
...
    sdp 16 mpls create
        far-end 4.4.4.4
        ldp
        path-mtu 1600
        keep-alive
        shutdown
    exit
    no shutdown
exit
...
    ipipe 207 customer 1 create
        shutdown
        sap 1/1/2:449 create
            description "Remote_Ipipe"
            ce-address 34.34.34.1
        exit
        spoke-sdp 16:516 create
            ce-address 31.31.31.2
        exit
    exit
...
-----
A:ALA-48>config>service#
```

Using Spoke SDP Control Words

The control word command provides the option to add a control word as part of the packet encapsulation for PW types for which the control word is optional. These are Ethernet PW (epipe), ATM N:1 cell mode PWs (apipe vc-types atm-vcc and atm-vpc) and VT PW (apipe vc-type atm-cell). The control word might be needed because when ECMP is enabled on the network, packets of a given PW may be spread over multiple ECMP paths if the hashing router mistakes the PW packet payload for an IPv4 or IPv6 packet. This occurs when the first nibble following the service label corresponds to a value of 4 or 6.

The control word negotiation procedures described in Section 6.2 of RFC 4447 are not supported and therefore the service will only come up if the same C bit value is signaled in both directions. If a spoke-sdp is configured to use the control word but the node receives a label mapping message with a C-bit clear, the node releases the label with an “Illegal C-bit” status code per Section 6.1 of RFC 4447. As soon as the user enables control of the remote peer, the remote peer withdraws its original label and sends a label mapping with the C-bit set to 1 and the VLL service is up in both nodes.

When the control word is enabled, VCCV packets also include the VCCV control word. In that case, the VCCV CC type 1 (OAM CW) is signaled in the VCCV parameter in the FEC. If the control word is disabled on the spoke-sdp, then the Router Alert label is used. In that case, VCCV CC type 2 is signaled. Note that for a multi-segment PW (MS-PW), the CC type 1 is the only supported and thus the control word must be enabled on the spoke-sdp to be able to use VCCV-ping and VCCV-trace.

The following displays a spoke SDP control word configuration example:

```
-Dut-B>config>service>epipe# info
-----
description "Default epipe description for service id 2100"
sap 1/2/7:4 create
description "Default sap description for service id 2100"
exit
spoke-sdp 1:2001 create
control-word
exit
no shutdown
-----
*A:ALA-Dut-B>config>service>epipe#
To disable the control word on spoke-sdp 1:2001:
*A:ALA-Dut-B>config>service>epipe# info
-----
description "Default epipe description for service id 2100"
sap 1/2/7:4 create
description "Default sap description for service id 2100"
exit
spoke-sdp 1:2001 create
exit
no shutdown
-----
*A:ALA-Dut-B>config>service>epipe#
```

Same Fate Epipe VLANs Access Protection

The following displays a G.8031 Ethernet Tunnel for Epipe protection configuration example using same-fate SAPs for each Epipe access (two ethernet member ports 1/1/1 and 2/1/1 are used):

```
*A:7750_ALU>config>eth-tunnel 1
-----
description "Protection is APS"
protection-type 8031_1to1
ethernet
    mac 00:11:11:11:11:12
    encap-type dot1q
exit
ccm-hold-time down 5 up 10 // 50 ms down, 1 second up
path 1
    member 1/1/1
    control-tag 5 // primary control vlan 5
    precedence primary
    eth-cfm
        mep 2 domain 1 association 1
        ccm-enable
        control-mep
        no shutdown
    exit
exit
no shutdown
exit
path 2
    member 2/1/1
    control-tag 105 //secondary control vlan 105
    eth-cfm
        mep 2 domain 1 association 2
        ccm-enable
        control-mep
        no shutdown
    exit
exit
no shutdown
exit
no shutdown
-----
# Configure Ethernet tunnel SAPs
-----
*A:7750_ALU>config>service epipe 10 customer 5 create
    sap eth-tunnel-1 create // Uses control tags from the Ethernet tunnel port
        description "g8031-protected access ctl/data SAP for eth-tunnel 1"

    exit
    no shutdown
-----
*A:7750_ALU>config>service epipe 11 customer 5 create
    sap eth-tunnel-1:1 create
        description "g8031-protected access same-fate SAP for eth-tunnel 1"

    // must specify tags for each corresponding path in Ethernet tunnel port
    eth-tunnel path 1 tag 6
    eth-tunnel path 2 tag 106
exit
...
```

```
-----
*A:7750_ALU>config>service epipe 10 customer 5 create
  sap eth-tunnel-1:3 create
    description "g8031-protected access same-fate SAP for eth-tunnel 1"
    // must specify tags for each path for same-fate SAPs
    eth-tunnel path 1 tag 10
    eth-tunnel path 2 tag 110
  exit
  ...
-----
```


Pseudowire Configuration Notes

The **vc-switching** parameter must be specified at the time the VLL service is created. Note that when the **vc-switching** parameter is specified, you are configuring an S-PE. This is a pseudowire switching point (switching from one pseudowire to another). Therefore, you cannot add a SAP to the configuration.

The following example show the configuration when a SAP is added to a pseudowire. The CLI generates an error response if you attempt to create a SAP. VC switching is only needed on the pseudowire at the S-PE.

```
*A:ALA-701>config>service# epipe 28 customer 1 create vc-switching
*A:ALA-701>config>service>epipe$ sap 1/1/3 create
MINOR: SVCMGR #1311 SAP is not allowed under PW switching service
*A:ALA-701>config>service>epipe$
```

Use the following CLI syntax to create pseudowire switching VLL services.

CLI Syntax: config>service# apipe service-id [customer customer-id] [vpn vpn-id] [vc-type {atm-vcc|atm-sdu|atm-vpc|atm-cell}] [vc-switching] description description-string spoke-sdp sdp-id:vc-id

CLI Syntax: config>service# epipe service-id [customer customer-id] [vpn vpn-id] [vc-switching] description description-string spoke-sdp sdp-id:vc-id

CLI Syntax: config>service# fpipe service-id [customer customer-id] [vpn vpn-id] [vc-type {fr-dlci}] [vc-switching] description description-string spoke-sdp sdp-id:vc-id

CLI Syntax: config>service# ipipe service-id [customer customer-id] [vpn vpn-id] [vc-switching] description description-string spoke-sdp sdp-id:vc-id

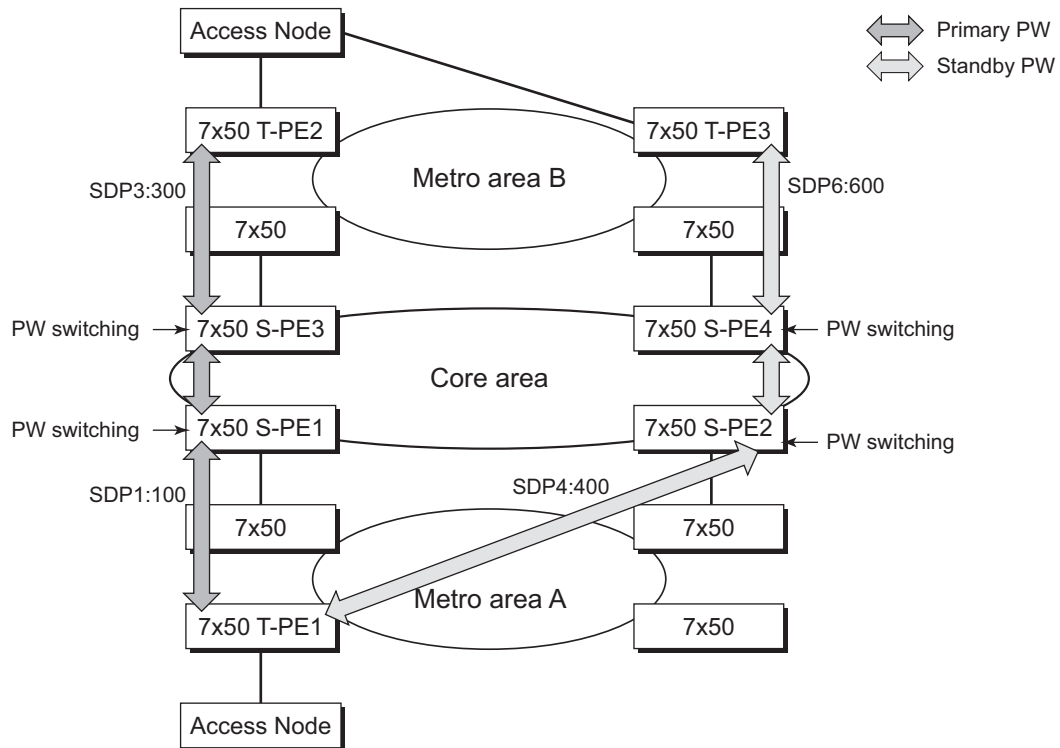
The following displays an example of the command usage to configure VLL pseudowire switching services:

Example:config>service# apipe 1 customer 1 vpn 1 vc-switching create
config>service>apipe\$ description "Default apipe description for service id 100"
config>service>apipe# spoke-sdp 3:1 create
config>service>apipe>spoke-sdp# exit
config>service>apipe# spoke-sdp 6:200 create
config>service>apipe>spoke-sdp# exit
config>service>apipe# no shutdown

The following example displays configurations for each service:

```
*A:ALA-48>config>service# info
-----
...
    apipe 100 customer 1 vpn 1 vc-switching create
        description "Default apipe description for service id 100"
        spoke-sdp 3:1 create
        exit
        spoke-sdp 6:200 create
        exit
        no shutdown
    exit
...
    epipe 107 customer 1 vpn 107 vc-switching create
        description "Default epipe description for service id 107"
        spoke-sdp 3:8 create
        exit
        spoke-sdp 6:207 create
        exit
        no shutdown
    exit
...
    ipipe 108 customer 1 vpn 108 vc-switching create
        description "Default ipipe description for service id 108"
        spoke-sdp 3:9 create
        exit
        spoke-sdp 6:208 create
        exit
        no shutdown
    exit
...
    fpipe 109 customer 1 vpn 109 vc-switching create
        description "Default fpipe description for service id 109"
        spoke-sdp 3:5 create
        exit
        spoke-sdp 6:209 create
        exit
        no shutdown
    exit
...
-----
*A:ALA-48>config>service#
```

Configuring Two VLL Paths Terminating on T-PE2



OSSG114

Figure 54: VLL Resilience with Pseudowire Redundancy and Switching

T-PE1

The following displays an example of the T-PE1 configuration.

```
*A:ALA-T-PE1>config>service>epipe# info
-----
endpoint "x" create
exit
endpoint "y" create
exit
spoke-sdp 1:100 endpoint "y" create
precedence primary
revert-time 0
exit
spoke-sdp 4:400 endpoint "y" create
precedence 0
exit
no shutdown
-----
*A:ALA-T-PE1>config>service>epipe#
```

The following displays an example of the T-PE2 configuration.

T-PE2

```
*A:ALA-T-PE2>config>service>epipe# info
-----
      endpoint "x" create
      exit
      endpoint "y" create
      exit
      sap 2/2/2:200 endpoint "x" create
      exit
      spoke-sdp 3:300 endpoint "y" create
          precedence primary
          revert-time 0
      exit
      spoke-sdp 6:600 endpoint "y" create
          precedence 0
      exit
      no shutdown
-----
*A:ALA-T-PE2>config>service>epipe#
```

S-PE1: Note that specifying the **vc-switching** parameter enables a VC cross-connect so the service manager does not signal the VC label mapping immediately but will put this into passive mode.

The following example displays the configuration:

```
*A:ALA-S-PE1>config>service>epipe# info
-----
...
      spoke-sdp 2:200 create
      exit
      spoke-sdp 3:300 create
      exit
      no shutdown
-----
*A:ALA-S-PE1>config>service>epipe#
```

S-PE2: Note that specifying the **vc-switching** parameter enables a VC cross-connect so the service manager does not signal the VC label mapping immediately but will put this into passive mode.

The following example displays the configuration:

```
*A:ALA-S-PE2>config>service>epipe# info
-----
...
      spoke-sdp 2:200 create
      exit
      spoke-sdp 3:300 create
      exit
      no shutdown
-----
*A:ALA-S-PE2>config>service>epipe#
```

Configuring VLL Resilience

Figure 55 displays an example to create VLL resilience. Note that the zero revert-time value means that the VLL path will be switched back to the primary immediately after it comes back up.

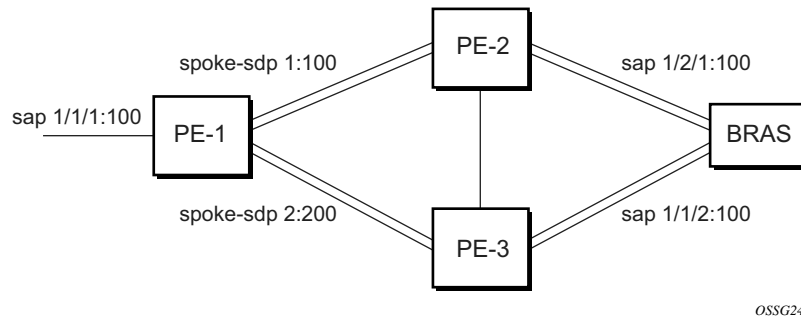


Figure 55: VLL Resilience

PE1:

The following displays an example for the configuration on PE1.

```
*A:ALA-48>config>service>epipe# info
-----
    endpoint "x" create
    exit
    endpoint "y" create
    exit
    spoke-sdp 1:100 endpoint "y" create
        precedence primary
    exit
    spoke-sdp 2:200 endpoint "y" create
        precedence 1
    exit
    no shutdown
-----
*A:ALA-48>config>service>epipe#
```

Configuring VLL Resilience for a Switched Pseudowire Path

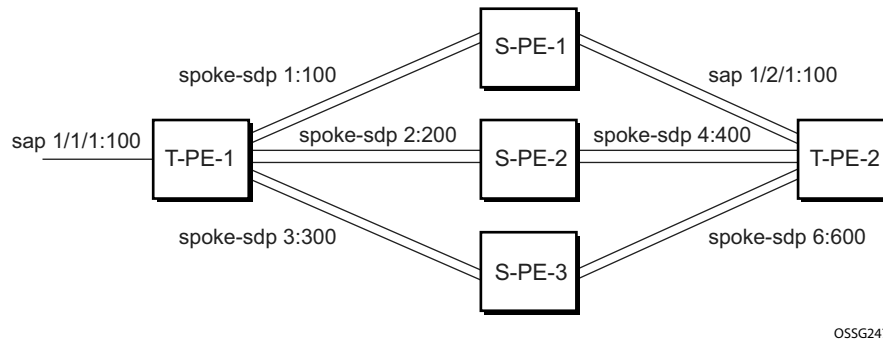


Figure 56: VLL Resilience with Pseudowire Switching

T-PE1

The following displays an example for the configuration on TPE1.

```
*A:ALA-48>config>service>epipe# info
-----
    endpoint "x" create
    exit
    endpoint "y" create
    exit
    sap 1/1/1:100 endpoint "x" create
    exit
    spoke-sdp 1:100 endpoint "y" create
        precedence primary
    exit
    spoke-sdp 2:200 endpoint "y" create
        precedence 1
    exit
    spoke-sdp 3:300 endpoint "y" create
        precedence 1
    exit
    no shutdown
-----
*A:ALA-48>config>service>epipe#
```

T-PE2

The following displays an example for the configuration on TPE2.

```
*A:ALA-49>config>service>epipe# info
-----
      endpoint "x" create
      exit
      endpoint "y" create
        revert-time 100
      exit
      spoke-sdp 4:400 endpoint "y" create
        precedence primary
      exit
      spoke-sdp 5:500 endpoint "y" create
        precedence 1
      exit
      spoke-sdp 6:600 endpoint "y" create
        precedence 1
      exit
      no shutdown
-----
*A:ALA-49>config>service>epipe#
```

S-PE1

The following displays an example for the configuration on S-PE1.

```
*A:ALA-50>config>service>epipe# info
-----
...
      spoke-sdp 1:100 create
      exit
      spoke-sdp 4:400 create
      exit
      no shutdown
-----
*A:ALA-49>config>service>epipe#
```


Service Management Tasks

This section discusses the following Apipe service management tasks:

- [Modifying Apipe Service Parameters on page 286](#)
- [Disabling an Apipe Service on page 288](#)
- [Re-enabling an Apipe Service on page 289](#)
- [Deleting an Apipe Service on page 290](#)

This section discusses the following Cpipe service management tasks:

- [Modifying a Cpipe Service on page 291](#)
- [Deleting a Cpipe Service on page 292](#)

This section discusses the following Epipe service management tasks:

- [Modifying Epipe Service Parameters on page 293](#)
- [Disabling an Epipe Service on page 293](#)
- [Re-enabling an Epipe Service on page 294](#)
- [Deleting an Epipe Service on page 294](#)

This section discusses the following Fpipe service management tasks:

- [Modifying Fpipe Service Parameters on page 295](#)
- [Disabling an Fpipe Service on page 297](#)
- [Re-enabling an Fpipe Service on page 298](#)
- [Deleting an Fpipe Service on page 299](#)

This section discusses the following Ipipe service management tasks:

- [Modifying Ipipe Service Parameters on page 300](#)
- [Disabling an Ipipe Service on page 301](#)
- [Re-enabling an Ipipe Service on page 302](#)
- [Deleting an Ipipe Service on page 302](#)

Modifying Apipe Service Parameters

The following example displays command usage to modify Apipe parameters:

PE router 1 (A:ALA-41):

```
Example: A:ALA-41>config>service# apipe 5
A:ALA-41>config>service>apipe# sap 1/1/1:0/32 create
A:ALA-41>config>service>apipe>sap# accounting-policy 2
A:ALA-41>config>service>apipe>sap# exit
A:ALA-41>config>service>apipe# spoke-sdp 1:4
A:ALA-41>config>service>apipe>spoke-sdp# egress
A:ALA-41>config>service>apipe>spoke-sdp>egress# vc-label 16
A:ALA-41>config>service>apipe>spoke-sdp>egress# exit
A:ALA-41>config>service>apipe>spoke-sdp# exit
A:ALA-41>config>service>apipe#
```

PE router 2 (A:ALA-42):

```
Example: A:ALA-42>config>service# apipe 5
A:ALA-42>config>service>apipe# sap 2/2/2:0/32 create
A:ALA-42>config>service>apipe>sap# accounting-policy 2
A:ALA-42>config>service>apipe>sap# exit
A:ALA-42>config>service>apipe# spoke-sdp 1:4
A:ALA-42>config>service>apipe>spoke-sdp# egress
A:ALA-42>config>service>apipe>spoke-sdp>egress# vc-label 16
A:ALA-42>config>service>apipe>spoke-sdp>egress# exit
A:ALA-42>config>service>apipe>spoke-sdp# exit
A:ALA-42>config>service>apipe#
```

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info
-----
...
    apipe 5 customer 1 create
        description "apipe test"
        service-mtu 1400
        sap 1/1/1:0/32 create
            accounting-policy 2
            ingress
                qos 102
            exit
            egress
                qos 103
            exit
        spoke-sdp 1:4 create
            egress
                vc-label 16
            exit
        no shutdown
    exit
...
-----
A:ALA-41>config>service#
```

```
PE Router 2 (ALA-42):
A:ALA-42>config>service# info
-----
...
    apipe 5 customer 1 create
        description "apipe test"
        service-mtu 1400
        sap 2/2/2:0/32 create
            accounting-policy 2
            ingress
                qos 102
            exit
            egress
                qos 103
            exit
        exit
        spoke-sdp 1:4 create
            egress
                vc-label 16
        exit
        no shutdown
    exit
...
-----
A:ALA-42>config>service#
```

Disabling an Apipe Service

An Apipe service can be shut down without deleting any service parameters.

CLI Syntax: config>service#
 apipe *service-id*
 shutdown

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# apipe 5
 A:ALA-41>config>service>apipe# shutdown
 A:ALA-41>config>service>apipe# exit

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# apipe 5
 A:ALA-42>config>service>apipe# shutdown
 A:ALA-42>config>service>apipe# exit

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info
-----
...
    apipe 5 customer 1 create
        shutdown
        description "apipe test"
        service-mtu 1400
        sap 1/1/1:0/32 create
            accounting-policy 2
            ingress
                qos 102
            exit
        egress
            qos 103
        exit
    exit
    spoke-sdp 1:4 create
        egress
            vc-label 16
        exit
    no shutdown
    exit
...
-----
A:ALA-41>config>service#
```

PE Router 2 (ALA-42):

```
A:ALA-42>config>service# info
-----
...
    apipe 5 customer 1 create
        shutdown
        description "apipe test"
        service-mtu 1400
        sap 2/2/2:0/32 create
            accounting-policy 2
            ingress
...
-----
```

```

        qos 102
    exit
    egress
        qos 103
    exit
    exit
    spoke-sdp 1:4 create
    egress
        vc-label 16
    exit
    exit
...
-----
A:ALA-42>config>service#

```

Re-enabling an Apipe Service

To re-enable an Apipe service that was shut down.

CLI Syntax: config>service#
 apipe *service-id*
 no shutdown

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# apipe 5
 A:ALA-41>config>service>apipe# no shutdown
 A:ALA-41>config>service>apipe# exit

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# apipe 5
 A:ALA-42>config>service>apipe# no shutdown
 A:ALA-42>config>service>apipe# exit

Deleting an Apipe Service

An Apipe service cannot be deleted until the SAP is shut down. If protocols and/or a spoke-SDP are defined, they must be shut down and removed from the configuration as well.

Use the following CLI syntax to delete Apipe services:

CLI Syntax: config>service#
no apipe *service-id*
shutdown
no sap *sap-id*
shutdown
no spoke-sdp [*sdp-id:vc-id*]
shutdown

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# apipe 5
A:ALA-41>config>service>apipe# sap 1/1/1:0/32
A:ALA-41>config>service>apipe>sap# shutdown
A:ALA-41>config>service>apipe>sap# exit
A:ALA-41>config>service>apipe# no sap 1/1/1:0/32
A:ALA-41>config>service>apipe# spoke-sdp 1:4
A:ALA-41>config>service>apipe>spoke-sdp# shutdown
A:ALA-41>config>service>apipe>spoke-sdp# exit
A:ALA-41>config>service>apipe# no spoke-sdp 1:4
A:ALA-41>config>service>apipe# shutdown
A:ALA-41>config>service>apipe# exit
A:ALA-41>config>service# no apipe 5

PE router 2 (A:ALA-42):

Example: A:ALA-41>config>service# apipe 5
A:ALA-41>config>service>apipe# sap 2/2/2:0/32
A:ALA-41>config>service>apipe>sap# shutdown
A:ALA-41>config>service>apipe>sap# exit
A:ALA-41>config>service>apipe# no sap 2/2/2:0/32
A:ALA-41>config>service>apipe# spoke-sdp 1:4
A:ALA-41>config>service>apipe>spoke-sdp# shutdown
A:ALA-41>config>service>apipe>spoke-sdp# exit
A:ALA-41>config>service>apipe# no spoke-sdp 1:4
A:ALA-41>config>service>apipe# shutdown
A:ALA-41>config>service>apipe# exit
A:ALA-41>config>service# no apipe 5

Modifying a Cpipe Service

The following example displays the Cpipe service configuration.

```
*A:ALA-1>config>service# info
-----
...
      cpipe 210 customer 1 vc-type cesopsn create
      vrf-import "vrfImpPolCust1"
      vrf-export "vrfExpPolCust1"
      ecmp 8
      maximum-routes 2000
      autonomous-system 10000
      route-distinguisher 10001:1
      interface "to-cel" create
        address 10.1.1.1/24
        sap 1/1/10:1 create
        exit
      exit
      static-route 6.5.0.0/24 next-hop 10.1.1.2
      spoke-sdp 2 create
      exit
    exit
  ...
-----
*A:ALA-1>config>service> Cpipe#
```

Deleting a Cpipe Service

A Cpipe service cannot be deleted until SAPs are shut down and deleted. If a spoke-SDP is defined, it must be shut down and removed from the configuration as well.

Use the following CLI syntax to delete a Cpipe service:

CLI Syntax: config>service#
 [no] cpipe *service-id* [customer *customer-id*]
 [no] spoke-sdp *sdp-id*
 [no] shutdown
 shutdown

Modifying Epipe Service Parameters

The following displays an example of adding an accounting policy to an existing SAP:

```
Example:config>service# epipe 2
        config>service>epipe# sap 2/1/3:21
        config>service>epipe>sap# accounting-policy 14
        config>service>epipe>sap# exit
```

The following output displays the SAP configuration:

```
ALA-1>config>service# info
-----
      epipe 2 customer 6 vpn 2 create
      description "Distributed Epipe service to east coast"
      sap 2/1/3:21 create
      accounting-policy 14
      exit
      spoke-sdp 2:6000 create
      exit
      no shutdown
      exit
-----
ALA-1>config>service#
```

Disabling an Epipe Service

You can shut down an Epipe service without deleting the service parameters.

CLI Syntax: config>service> epipe *service-id*
shutdown

```
Example:config>service# epipe 2
        config>service>epipe# shutdown
        config>service>epipe# exit
```

Re-enabling an Epipe Service

To re-enable an Epipe service that was shut down.

CLI Syntax: config>service# epipe service-id
no shutdown

Example:config>service# epipe 2
config>service>epipe# no shutdown
config>service>epipe# exit

Deleting an Epipe Service

Perform the following steps prior to deleting an Epipe service:

1. Shut down the SAP and SDP.
2. Delete the SAP and SDP.
3. Shut down the service.

Use the following CLI syntax to delete an Epipe service:

CLI Syntax: config>service
[no] epipe service-id
shutdown
[no] sap sap-id
shutdown
[no] spoke-sdp sdp-id:vc-id
shutdown

Example:config>service# epipe 2
config>service>epipe# sap 2/1/3:21
config>service>epipe>sap# shutdown
config>service>epipe>sap# exit
config>service>epipe# no sap 2/1/3:21
config>service>epipe# spoke-sdp 2:6000
config>service>epipe>spoke-sdp# shutdown
config>service>epipe>spoke-sdp# exit
config>service>epipe# no spoke-sdp 2:6000
config>service>epipe# epipe 2
config>service>epipe# shutdown
config>service>epipe# exit
config>service# no epipe 2

Modifying Fpipe Service Parameters

The following example displays command usage to modify Fpipe parameters:

PE router 1 (A:ALA-41):

```
Example: A:ALA-41>config>service# fpipe 1
A:ALA-41>config>service>fpipe# sap 1/2/1:16 create
A:ALA-41>config>service>fpipe>sap# accounting-policy 2
A:ALA-41>config>service>fpipe>sap# exit
A:ALA-41>config>service>fpipe# spoke-sdp 1:4
A:ALA-41>config>service>fpipe>spoke-sdp# ingress
A:ALA-41>config>service>fpipe>spoke-sdp>filter ip 10
A:ALA-41>config>service>fpipe>spoke-sdp# exit
A:ALA-41>config>service>fpipe#
```

PE router 2 (A:ALA-42):

```
Example: A:ALA-42>config>service# fpipe 1
A:ALA-42>config>service>fpipe# sap 2/1/1.1:16 create
A:ALA-42>config>service>fpipe>sap# accounting-policy 2
A:ALA-42>config>service>fpipe>sap# exit
A:ALA-42>config>service>fpipe# spoke-sdp 1:1
A:ALA-42>config>service>fpipe>spoke-sdp# egress
A:ALA-42>config>service>fpipe>spoke-sdp>egress# filter ip 10
A:ALA-42>config>service>fpipe>spoke-sdp>egress# exit
A:ALA-42>config>service>fpipe>spoke-sdp# exit
A:ALA-42>config>service>fpipe#
```

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info
-----
...
    fpipe 1 customer 1 create
        description "fpipe test"
        service-mtu 1400
        sap 1/2/1:16 create
            accounting-policy 2
            ingress
                qos 101
            exit
            egress
                qos 1020
            exit
        spoke-sdp 1:1 create
            ingress
                filter ip 10
            exit
        no shutdown
    exit
...
-----
A:ALA-41>config>service#
```

PE Router 2 (ALA-42):

```
A:ALA-42>config>service# info
```

```
-----
```

```
...
```

```
    fpipe 1 customer 1 create
        description "fpipe test"
        service-mtu 1400
        sap 2/1/1.1:16 create
            accounting-policy 2
            ingress
                qos 101
            exit
            egress
                qos 1020
            exit
        exit
        spoke-sdp 1:1 create
            egress
                filter ip 10
        exit
        no shutdown
    exit
```

```
...
```

```
-----
A:ALA-42>config>service#
```

Disabling an Fpipe Service

An Fpipe service can be shut down without deleting any service parameters.

CLI Syntax: config>service#
 fpipe *service-id*
 shutdown

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# fpipe 1
 A:ALA-41>config>service>fpipe# shutdown

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# fpipe 1
 A:ALA-42>config>service>fpipe# shutdown

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info
-----
...
      fpipe 1 customer 1 create
      shutdown
      description "fpipe test"
      service-mtu 1400
      sap 1/2/1:16 create
      accounting-policy 2
      ingress
      qos 101
      exit
      egress
      qos 1020
      exit
      exit
      spoke-sdp 1:1 create
      ingress
      filter ip 10
      exit
      exit
...
-----
A:ALA-41>config>service#
```

PE Router 2 (ALA-42):

```
A:ALA-42>config>service# info
-----
...
      fpipe 1 customer 1 create
```

```

shutdown
description "fpipe test"
service-mtu 1400
sap 2/1/1.1:16 create
    accounting-policy 2
    ingress
        qos 101
    exit
    egress
        qos 1020
    exit
exit
spoke-sdp 1:1 create
    egress
        filter ip 10
    exit
exit
...
-----
A:ALA-42>config>service#

```

Re-enabling an Fpipe Service

To re-enable an Fpipe service that was shut down.

CLI Syntax: config>service#
 fpipe *service-id*
 no shutdown

PE router 1 (A:ALA-41):

Example: A:ALA-41>config>service# fpipe 1
 A:ALA-41>config>service>fpipe# no shutdown
 A:ALA-41>config>service>fpipe# exit

PE router 2 (A:ALA-42):

Example: A:ALA-42>config>service# fpipe 1
 A:ALA-42>config>service>fpipe# no shutdown
 A:ALA-42>config>service>fpipe# exit

Deleting an Fpipe Service

An Fpipe service cannot be deleted until the SAP is shut down. If protocols and/or a spoke-SDP are defined, they must be shut down and removed from the configuration as well.

Use the following CLI syntax to delete a Fpipe service:

CLI Syntax:

```
config>service#
    no fpipe service-id
    shutdown
    no sap sap-id
    shutdown
    no spoke-sdp [sdp-id:vc-id]
    shutdown
```

PE router 1 (A:ALA-41):

Example:

```
A:ALA-41>config>service# fpipe 1
A:ALA-41>config>service>fpipe# sap 1/1/1:0/32
A:ALA-41>config>service>fpipe>sap# shutdown
A:ALA-41>config>service>fpipe>sap# exit
A:ALA-41>config>service>fpipe# no sap 1/1/1:0/32
A:ALA-41>config>service>fpipe# spoke-sdp 1:1
A:ALA-41>config>service>fpipe>spoke-sdp# shutdown
A:ALA-41>config>service>fpipe>spoke-sdp# exit
A:ALA-41>config>service>fpipe# no spoke-sdp 1:1
A:ALA-41>config>service>fpipe# shutdown
A:ALA-41>config>service>fpipe# exit
A:ALA-41>config>service# no fpipe 1
```

PE router 2 (A:ALA-42):

Example:

```
A:ALA-41>config>service# fpipe 1
A:ALA-41>config>service>fpipe# sap 2/1/1.1:16
A:ALA-41>config>service>fpipe>sap# shutdown
A:ALA-41>config>service>fpipe>sap# exit
A:ALA-41>config>service>fpipe# no sap 2/1/1.1:16
A:ALA-41>config>service>fpipe# spoke-sdp 1:1
A:ALA-41>config>service>fpipe>spoke-sdp# shutdown
A:ALA-41>config>service>fpipe>spoke-sdp# exit
A:ALA-41>config>service>fpipe# no spoke-sdp 1:1
A:ALA-41>config>service>fpipe# shutdown
A:ALA-41>config>service>fpipe# exit
A:ALA-41>config>service# no fpipe 1
```

Modifying Ipipe Service Parameters

The following example displays command usage to modify Ipipe parameters:

Example: config>service# ipipe 202
config>service>ipipe# sap 1/1/2:444
config>service>ipipe>sap# shutdown
config>service>ipipe>sap# exit
config>service>ipipe# no sap 1/1/2:444
config>service>ipipe# sap 1/1/2:555 create
config>service>ipipe>sap\$ description "eth_ipipe"
config>service>ipipe>sap\$ ce-address 31.31.31.1
config>service>ipipe>sap\$ no shutdown
config>service>ipipe>sap\$ exit
config>service>ipipe# info

```
A:ALA-48>config>service# info
-----
...
    ipipe 202 customer 1 create
        sap 1/1/2:445 create
            description "eth_ipipe"
            ce-address 31.31.31.2
        exit
        sap 1/1/2:555 create
            description "eth_ipipe"
            ce-address 31.31.31.1
        exit
        no shutdown
    exit
...
-----
A:ALA-48>config>service#
```


Disabling an Ipipe Service

An Ipipe service can be shut down without deleting any service parameters.

CLI Syntax: config>service#
 ipipe service-id
 shutdown

Example: A:ALA-41>config>service# ipipe 202
 A:ALA-41>config>service>ipipe# shutdown

```
A:ALA-48>config>service# info
-----
...
      ipipe 202 customer 1 create
          shutdown
      sap 1/1/2:445 create
          description "eth_ipipe"
          ce-address 31.31.31.2
      exit
      sap 1/1/2:555 create
          description "eth_ipipe"
          ce-address 31.31.31.1
      exit
      exit
...
-----
A:ALA-48>config>service#
```

Re-enabling an Ipipe Service

To re-enable an Ipipe service that was shut down.

CLI Syntax: config>service#
 ipipe service-id
 no shutdown

Example: A:ALA-41>config>service# ipipe 202
 A:ALA-41>config>service>ipipe# no shutdown

Deleting an Ipipe Service

An Ipipe service cannot be deleted until the SAP is shut down. If protocols and/or a spoke-SDP are defined, they must be shut down and removed from the configuration as well.

Use the following CLI syntax to delete an Ipipe service:

CLI Syntax: config>service#
 no ipipe service-id
 shutdown
 no sap sap-id
 shutdown
 no spoke-sdp [sdp-id:vc-id]
 shutdown

Example: config>service# ipipe 207
 config>service>ipipe# sap 1/1/2:449
 config>service>ipipe>sap# shutdown
 config>service>ipipe>sap# exit
 config>service>ipipe# no sap 1/1/2:449
 config>service>ipipe# spoke-sdp 16:516
 config>service>ipipe>spoke-sdp# shutdown
 config>service>ipipe>spoke-sdp# exit
 config>service>ipipe# no spoke-sdp 16:516
 config>service>ipipe# exit
 config>service# no ipipe 207
 config>service#

VLL Services Command Reference

Command Hierarchies

- [Apipe Service Configuration Commands on page 303](#)
- [Cpipe Service Configuration Commands on page 306](#)
- [Epipe Service Configuration Commands on page 309](#)
- [Fpipe Service Configuration Commands on page 314](#)
- [Ipipe Service Configuration Commands on page 317](#)
- [Show Commands on page 361](#)
- [Clear Commands on page 361](#)
- [Debug Commands on page 361](#)

Apipe Service Configuration Commands

```

config
  — service
    — apipe service-id [customer customer-id] [vpn vpn-id] [vc-type {atm-vcc | atm-sdu | atm-vpc
      | atm-cell}] [vc-switching]
    — no apipe service-id
      — description description-string
      — no description
      — [no] endpoint endpoint-name
        — active-hold-delay active-endpoint-delay
        — no active-hold-delay
        — description description-string
        — no description
        — revert-time revert-time
        — no revert-time
      — interworking {frf-5}
      — no interworking
      — sap sap-id [no-endpoint]
      — sap sap-id [endpoint endpoint-name]
      — no sap sap-id
        — accounting-policy acct-policy-id
        — no accounting-policy
        — atm
          — egress
            — traffic-desc traffic-desc-profile-id
            — no traffic-desc
          — ingress
            — traffic-desc traffic-desc-profile-id
            — no traffic-desc
          — [no] llf

```

```

— oam
  — [no] alarm-cells
  — [no] terminate
— [no] collect-stats
— description description-string
— no description
— egress
  — agg-rate-limit agg-rate
  — no agg-rate-limit
  — [no] qinq-mark-top-only
  — qos policy-id
  — no qos
  — [no] queue-override
    — [no] queue queue-id
      — adaptation-rule [pir adaptation-rule] [cir
        adaptation-rule]
      — no adaptation-rule
      — avg-frame-overhead percentage
      — no avg-frame-overhead
      — cbs size-in-kbytes
      — no cbs
      — high-prio-only percent
      — no high-prio-only
      — mbs {size-in-kbytes | default}
      — no mbs
      — rate pir-rate [cir cir-rate]
      — no rate
    — [no] scheduler-override
      — [no] scheduler scheduler-name
      — rate pir-rate [cir cir-rate]
      — no rate
      — scheduler-policy scheduler-policy-name
      — no scheduler-policy
— frame-relay
  — scheduling-class class-id
  — no scheduling-class
— ingress
  — qos policy-id [shared-queuing]
  — no qos
  — [no] queue-override
    — [no] queue queue-id
      — adaptation-rule [pir adaptation-rule] [cir
        adaptation-rule]
      — no adaptation-rule
      — cbs size-in-kbytes
      — no cbs
      — high-prio-only percent
      — no high-prio-only
      — mbs {size-in-kbytes | default}
      — no mbs
      — rate pir-rate [cir cir-rate]
      — no rate
    — [no] scheduler-override
      — [no] scheduler scheduler-name
      — rate pir-rate [cir cir-rate]

```

```

— no rate
— scheduler-policy scheduler-policy-name
— no scheduler-policy
— multi-service-site customer-site-name
— no multi-service-site
— [no] shutdown
— tod-suite tod-suite-name
— no tod-suite
— service-mtu octets
— no service-mtu
— service-name service-name
— no service-name
— [no] shutdown
— spoke-sdp [sdp-id[:vc-id]] [no-endpoint]
— spoke-sdp [sdp-id[:vc-id]] endpoint endpoint-name [icb]
— no spoke-sdp [sdp-id[:vc-id]]
— bandwidth
— no bandwidth
— cell-concatenation
— [no] aal5-frame-aware
— [no] clp-change
— max-cells cell-count
— no max-cells [cell-count>]
— max-delay delay-time
— no max-delay [delay-time]
— [no] control-word
— egress
— vc-label ingress-vc-label
— no vc-label [ingress-vc-label]
— ingress
— vc-label ingress-vc-label
— no vc-label [ingress-vc-label]
— precedence [precedence-value] primary ]
— no precedence
— [no] shutdown

```

Cpipe Service Configuration Commands

```

config
  — service
    — cpipe service-id [customer customer-id] [vpn vpn-id] [vc-type {satop-e1 | satop-t1 | satop-
      e3 | satop-t3 | cesopsn | cesopsn-cas}] [vc-switching] [create]
    — no cpipe service-id
      — description description-string
      — no description [description-string]
      — endpoint endpoint-name [create]
      — no endpoint endpoint-name
        — active-hold-delay active-endpoint-delay
        — no active-hold-delay
        — description description-string
        — no description [description-string]
        — revert-time revert-time
        — no revert-time
      — sap sap-id [no-endpoint] [create]
      — sap sap-id endpoint endpoint-name [create]
      — no sap sap-id
        — accounting-policy acct-policy-id
        — no accounting-policy [acct-policy-id>]
        — cem
          — packet jitter-buffer milliseconds [payload-size bytes]
          — packet payload-size bytes
          — no packet
          — [no] report-alarm [stray] [malformed] [pktloss] [overrun]
            [underrun] [rpktloss] [rfault] [rrdi]
          — [no] rtp-header
        — [no] collect-stats
        — description description-string
        — no description [description-string]
        — egress
          — agg-rate-limit agg-rate
          — no agg-rate-limit
          — [no] qinq-mark-top-only
          — qos [policy-id]
          — no qos policy-id
          — [no] queue-override
            — queue queue-id [create]
            — no queue queue-id
              — adaptation-rule [pir adaptation-rule}] [cir
                adaptation-rule}]
              — no adaptation-rule
              — avg-frame-overhead percent
              — no avg-frame-overhead
              — cbs size-in-kbytes
              — no cbs
              — high-prio-only percent
              — no high-prio-only
              — mbs size-in-kbytes
              — no mbs
              — rate pir-rate [cir cir-rate]
              — no rate
            — [no] scheduler-override

```

```

— scheduler scheduler-name [create]
— no scheduler scheduler-name
— rate pir-rate [cir cir-rate]
— no rate
— scheduler-policy scheduler-policy-name
— no scheduler-policy
— ingress
— [no] qos [policy-id]
— [no] queue-override
— queue queue-id [create]
— no queue queue-id
— adaptation-rule [pir adaptation-rule}] [cir adap-
tation-rule}]
— no adaptation-rule
— avg-frame-overhead percent
— no avg-frame-overhead
— cbs size-in-kbytes
— no cbs
— high-prio-only percent
— no high-prio-only
— mbs size-in-kbytes
— no mbs
— rate pir-rate [cir cir-rate]
— no rate
— [no] scheduler-override
— scheduler scheduler-name [create]
— no scheduler scheduler-name
— rate pir-rate [cir cir-rate]
— no rate
— scheduler-policy scheduler-policy-name
— no scheduler-policy
— multi-service-site customer-site-name
— no multi-service-site
— tod-suite tod-suite-name
— no tod-suite
— service-mtu octets
— no service-mtu
— service-name service-name
— no service-name
— [no] shutdown
— spoke-sdp sdp-id[:vc-id] [no-endpoint] [create]
— spoke-sdp sdp-id:vc-id [create] endpoint endpoint-name [icb]
— no spoke-sdp sdp-id[:vc-id]
— accounting-policy acct-policy-id
— no accounting-policy
— bandwidth bw-value
— bandwidth max
— no bandwidth
— [no] collect-stats
— [no] control-word
— egress
— vc-label egress-vc-label
— no vc-label [egress-vc-label]
— ingress

```

- **vc-label** *ingress-vc-label*
- **no vc-label** [*ingress-vc-label*]
- **precedence** [*precedence-value*] **primary**
- **no precedence**
- [**no**] **shutdown**

Epipe Service Configuration Commands

```

config
  — service
    — [no] epipe service-id [customer customer-id] [create] [vpn vpn-id] [vc-switching]
      — description description-string
      — no description
      — [no] endpoint endpoint-name
        — active-hold-delay active-endpoint-delay
        — no active-hold-delay
        — description description-string
        — no description
        — revert-time [revert-time | infinite]
        — no revert-time
        — standby-signaling-master
        — no standby-signaling-master
      — [no] per-service-hashing
      — tunnel service-id backbone-dest-mac mac-name| ieee-address isid ISID
      — no tunnel
      — service-name service-name
      — no service-name

```

Epipe SAP Configuration Commands

```

config
  — service
    — epipe service-id
      — sap sap-id [no-endpoint] [create]
      — [no] sap eth-tunnel-tunnel-id [:eth-tunnel-sap-id] [create]
      — sap sap-id [endpoint endpoint-name] [create]
      — no sap sap-id
        — accounting-policy acct-policy-id
        — no accounting-policy
        — app-profile app-profile-name
        — no app-profile
        — atm
          — egress
            — traffic-desc traffic-desc-profile-id
            — no traffic-desc
          — encapsulation atm-encap-type
          — ingress
            — traffic-desc traffic-desc-profile-id
            — no traffic-desc
          — oam
            — [no] alarm-cells
      — cem
        — local-ecid emulated circuit identifier
        — no local-ecid
        — packet jitter-buffer milliseconds [payload-size bytes]
        — packet payload-size bytes

```

- **no packet**
- **remote-ecid** *emulated circuit identifier*
- **no remote-ecid**
- **remote-mac** *ieee-address*
- **no remote-mac**
- **[no] report-alarm** [*stray*] [*malformed*] [*pktloss*] [*overrun*] [*underrun*] [*rpktloss*] [*rfault*] [*rrdi*]
- **[no] rtp-header**
- **[no] collect-stats**
- **description** *description-string*
- **no description**
- **eth-cfm**
- **eth-tunnel**
 - **path** *path-index* **tag** *qtag* [*.qtag*]
 - **no path** *path-index*
 - **mep** *mep-id* **domain** *md-index* **association** *ma-index* [*direction* {*up* | *down*}]
 - **no mep** *mep-id* **domain** *md-index* **association** *ma-index*
 - **[no] ais-enable**
 - **client-meg-level** [[*level* [*level...*]]]
 - **no client-meg-level**
 - **interval** {**1** | **60**}
 - **no interval**
 - **priority** *priority-value*
 - **no priority**
 - **[no] ccm-enable**
 - **ccm-ltm-priority** *priority*
 - **no ccm-ltm-priority**
 - **[no] eth-test-enable**
 - **test-pattern** {*all-zeros* | *all-ones*} [*crc-enable*]
 - **no test-pattern**
 - **fault-propagation-enable** {*use-if-tlv* | *suspend-ccm*}
 - **no fault-propagation-enable**
 - **low-priority-defect** {*allDef* | *macRemErrXcon* | *remErrXcon* | *errXcon* | *xcon* | *noXcon*}
 - **mac-address** *mac-address*
 - **no mac-address**
 - **[no] shutdown**
- **ethernet**
 - **[no] llf**
- **frame-relay**
 - **[no] frf-12**
 - **ete-fragment-threshold** *threshold*
 - **no ete-fragment-threshold**
 - **[no] interleave**
 - **scheduling-class** *class-id*
 - **no scheduling-class**
- **egress**
 - **agg-rate-limit** *agg-rate* [*queue-frame-based-accounting*]
 - **no agg-rate-limit**
 - **filter** [*ip ip-filter-id*]
 - **filter** [*ipv6 ipv6-filter-id*]
 - **filter** [*mac mac-filter-id*]
 - **no filter** [*ip ip-filter-id*] [*ipv6 ipv6-filter-id*] [*mac mac-filter-id*]

- [no] **hsmda-queue-override**
 - **packet-byte-offset** {add add-bytes | subtract sub-bytes}
 - **no packet-byte-offset**
 - **queue** queue-id [create]
 - **no queue** queue-id
 - **rate** pir-rate [cir cir-rate]
 - **no rate**
 - **slope-policy** hsmda-slope-policy-name
 - **no slope-policy**
 - **secondary-shaper** secondary-shaper-name
 - **no secondary-shaper**
- [no] **qinq-mark-top-only**
- **qos** policy-id
- **no qos**
- [no] **queue-override**
 - [no] **queue** queue-id
 - **adaptation-rule** [pir adaptation-rule] [cir adaptation-rule]
 - **no adaptation-rule**
 - **avg-frame-overhead** percentage
 - **no avg-frame-overhead**
 - **cbs** size-in-kbytes
 - **no cbs**
 - **high-prio-only** percent
 - **no high-prio-only**
 - **mbs** {size-in-kbytes | default}
 - **no mbs**
 - **rate** pir-rate [cir cir-rate]
 - **no rate**
- [no] **scheduler-override**
 - [no] **scheduler** scheduler-name
 - **rate** pir-rate [cir cir-rate]
 - **no rate**
- **scheduler-policy** scheduler-policy-name
- **no scheduler-policy**
- **ethernet**
 - [no] **llf**
- **ingress**
 - **filter** [ip ip-filter-id]
 - **filter** [ipv6 ipv6-filter-id]
 - **filter** [mac mac-filter-id]
 - **no filter** [ip ip-filter-id] [ipv6 ipv6-filter-id] [mac mac-filter-id]
 - [no] **hsmda-queue-override**
 - **packet-byte-offset** {add add-bytes | subtract sub-bytes}
 - **no packet-byte-offset**
 - **queue** queue-id [create]
 - **no queue** queue-id
 - **rate** pir-rate [cir cir-rate]
 - **no rate**
 - **slope-policy** hsmda-slope-policy-name
 - **no slope-policy**
 - **secondary-shaper** secondary-shaper-name

```

— no secondary-shaper
— vlan-translation {vlan-id | copy-outer}
— no vlan-translation
— match-qinq-dot1p {top | bottom}
— no match-qinq-dot1p
— qos policy-id [shared-queuing]
— no qos
— [no] queue-override
    — [no] queue queue-id
        — adaptation-rule [pir adaptation-rule] [cir
            adaptation-rule]
        — no adaptation-rule
        — cbs size-in-kbytes
        — no cbs
        — high-prio-only percent
        — no high-prio-only
        — mbs size-in-kbytes
        — no mbs
        — rate pir-rate [cir cir-rate]
        — no rate
    — [no] scheduler-override
        — [no] scheduler scheduler-name
            — rate pir-rate [cir cir-rate]
            — no rate
        — scheduler-policy scheduler-policy-name
        — no scheduler-policy
— multi-service-site customer-site-name
— no multi-service-site
— tod-suite tod-suite-name
— no tod-suite
— [no] shutdown
— service-mtu octets
— no service-mtu
— [no] shutdown

```

SPOKE SDP CONFIGURATION COMMANDS

```

config
— service
    — epipe service-id
        — spoke-sdp sdp-id[:vc-id] [vc-type {ether | vlan}] [create] [no-endpoint]
        — spoke-sdp sdp-id[:vc-id] [vc-type {ether | vlan}] [create] endpoint [icb]
        — no spoke-sdp sdp-id[:vc-id]
            — accounting-policy acct-policy-id
            — no accounting-policy
            — bandwidth bandwidth
            — no bandwidth
            — [no] collect-stats
            — [no] control-word
            — [no] description
            — [no] egress
                — filter [ip ip-filter-id]
                — filter [ipv6 ipv6-filter-id]
                — filter [mac mac-filter-id]
                — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id][mac mac-filter-id]
                — [no] vc-label egress-vc-label
            — [no] hash-label
            — eth-cfm
                — mep mep-id domain md-index association ma-index [direction {up | down}]
                — no mep mep-id domain md-index association ma-index
                    — [no] ccm-enable
                    — ccm-ltm-priority priority
                    — no ccm-ltm-priority
                    — fault-propagation-enable {use-if-tlv | suspend-ccm}
                    — no fault-propagation-enable
                    — low-priority-defect {allDef | macRemErrXcon | remErrXcon | errXcon | xcon | noXcon}
                    — mac-address mac-address
                    — no mac-address
                    — [no] shutdown
            — [no] force-vlan-vc-forwarding
            — [no] ingress
                — filter [ip ip-filter-id]
                — filter [ipv6 ipv6-filter-id]
                — filter [mac mac-filter-id]
                — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id][mac mac-filter-id]
                — [no] vc-label egress-vc-label
            — precedence [precedence-value] primary]
            — no precedence
            — [no] shutdown
            — vlan-vc-tag 0..4094
            — no vlan-vc-tag [0..4094]

```

Fpipe Service Configuration Commands

```

config
  — service
    — fpipe service-id [customer customer-id] [vpn vpn-id] [vc-type {fr-dlci}] [vc-switching]
    — no fpipe service-id
      — description description-string
      — no description
      — [no] endpoint endpoint-name
        — active-hold-delay active-endpoint-delay
        — no active-hold-delay
        — description description-string
        — no description
        — revert-time revert-time
        — no revert-time
      — sap sap-id [no-endpoint]
      — sap sap-id endpoint endpoint-name
      — no sap sap-id
        — accounting-policy acct-policy-id
        — no accounting-policy
        — [no] collect-stats
        — description description-string
        — no description
        — egress
          — agg-rate-limit agg-rate
          — no agg-rate-limit
          — filter [ip ip-filter-id]
          — filter [ipv6 ipv6-filter-id]
          — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
          — [no] qinq-mark-top-only
          — qos policy-id
          — no qos
          — [no] queue-override
            — [no] queue queue-id
              — adaptation-rule [pir adaptation-rule] [cir adaptation-rule]
              — no adaptation-rule
              — avg-frame-overhead percent
              — no avg-frame-overhead
              — cbs size-in-kbytes
              — no cbs
              — high-prio-only percent
              — no high-prio-only
              — mbs {size-in-kbytes | default}
              — no mbs
              — rate pir-rate [cir cir-rate]
              — no rate
            — [no] scheduler-override
              — [no] scheduler scheduler-name
              — rate pir-rate [cir cir-rate]
              — no rate
          — scheduler-policy scheduler-policy-name
          — no scheduler-policy frame-relayscheduling-class class-idno scheduling-class
        — ingress

```

```

— filter [ip ip-filter-id]
— filter [ipv6 ipv6-filter-id]
— no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
— qos policy-id [shared-queuing]
— no qos
— [no] queue-override
    — [no] queue queue-id
        — adaptation-rule [pir adaptation-rule] [cir
            adaptation-rule]
        — no adaptation-rule
        — avg-frame-overhead percent
        — no avg-frame-overhead
        — cbs size-in-kbytes
        — no cbs
        — high-prio-only percent
        — no high-prio-only
        — mbs {size-in-kbytes | default}
        — no mbs
        — rate pir-rate [cir cir-rate]
        — no rate
    — [no] scheduler-override
        — [no] scheduler scheduler-name
        — rate pir-rate [cir cir-rate]
        — no rate
        — scheduler-policy scheduler-policy-name
        — no scheduler-policy
        — scheduler-policy scheduler-policy-name
        — no scheduler-policy
— multi-service-site customer-site-name
— no multi-service-site
— [no] shutdown
— tod-suite tod-suite-name
— no tod-suite
— service-mtu octets
— no service-mtu
— service-name service-name
— no service-name
— [no] shutdown
— spoke-sdp sdp-id[:vc-id] [no-endpoint]
— spoke-sdp sdp-id[:vc-id] endpoint endpoint-name [icb]
— no spoke-sdp sdp-id[:vc-id]
    — bandwidth bandwidth
    — no bandwidth
    — egress
        — filter [ip ip-filter-id]
        — filter [ipv6 ipv6-filter-id]
        — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
        — vc-label ingress-vc-label
        — no vc-label [ingress-vc-label]
    — ingress
        — filter [ip ip-filter-id]
        — filter [ipv6 ipv6-filter-id]
        — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
        — vc-label ingress-vc-label

```

- **no** **vc-label** *[ingress-vc-label]*
- **precedence** *[precedence-value]* **primary**
- **no** **precedence**
- **[no]** **shutdown**

Ipipe Service Configuration Commands

```

config
  — service
    — ipipe service-id [customer customer-id] [vpn vpn-id] [vc-switching]
    — no ipipe service-id
      — [no] ce-address-discovery
      — description description-string
      — no description
      — [no] endpoint endpoint-name
        — active-hold-delay active-endpoint-delay
        — no active-hold-delay
        — description description-string
        — no description
        — revert-time revert-time
        — no revert-time
      — sap sap-id [no-endpoint]
      — sap sap-id endpoint endpoint-name
      — [no] sap eth-tunnel-tunnel-id [:eth-tunnel-sap-id] [create]
      — no sap sap-id
        — accounting-policy acct-policy-id
        — no accounting-policy
        — atm
          — egress
            — traffic-desc traffic-desc-profile-id
            — no traffic-desc
          — encapsulation atm-encap-type
          — ingress
            — traffic-desc traffic-desc-profile-id
            — no traffic-desc
          — oam
            — [no] alarm-cells
        — ce-address ip-address
        — no ce-address
        — collect-stats
        — no collect-stats
        — description description-string
        — no description
        — egress
          — agg-rate-limit agg-rate
          — no agg-rate-limit
          — filter [ip ip-filter-id]
          — no filter
          — [no] hsmdda-queue-override
            — packet-byte-offset {add add-bytes | subtract sub-
              bytes}
            — no packet-byte-offset
            — queue queue-id [create]
            — no queue queue-id
              — rate pir-rate [cir cir-rate]
              — no rate
              — slope-policy hsmdda-slope-policy-name
              — no slope-policy

```

```

— secondary-shaper secondary-shaper-name
— no secondary-shaper
— [no] qinq-mark-top-only
— qos policy-id
— no qos
— [no] queue-override
— [no] queue queue-id
— adaptation-rule [pir adaptation-rule] [cir
adaptation-rule]
— no adaptation-rule
— avg-frame-overhead percent
— no avg-frame-overhead
— cbs size-in-kbytes
— no cbs
— high-prio-only percent
— no high-prio-only
— mbs {size-in-kbytes | default}
— no mbs
— rate pir-rate [cir cir-rate]
— no rate
— [no] scheduler-override
— [no] scheduler scheduler-name
— rate pir-rate [cir cir-rate]
— no rate
— scheduler-policy scheduler-policy-name
— no scheduler-policy
— eth-cfm
— mep mep-id domain md-index association ma-index [direction
{up | down}]
— no mep mep-id domain md-index association ma-index
— fault-propagation-enable {use-if-tlv | suspend-
ccm}
— no fault-propagation-enable
— eth-tunnel
— path path-index tag qtag [.qtag]
— no path path-index
— ingress
— filter [ip ip-filter-id]
— no filter
— [no] hsmda-queue-override
— packet-byte-offset {add add-bytes | subtract sub-
bytes}
— no packet-byte-offset
— queue queue-id [create]
— no queue queue-id
— rate pir-rate [cir cir-rate]
— no rate
— slope-policy hsmda-slope-policy-name
— no slope-policy
— secondary-shaper secondary-shaper-name
— no secondary-shaper
— match-qinq-dot1p {top | bottom}
— no match-qinq-dot1p
— qos policy-id [shared-queuing]
— no qos

```

```

— [no] queue-override
  — [no] queue queue-id
    — adaptation-rule [pir adaptation-rule] [cir adaptation-rule]
    — no adaptation-rule
    — cbs size-in-kbytes
    — no cbs
    — high-prio-only percent
    — no high-prio-only
    — mbs {size-in-kbytes | default}
    — no mbs
    — rate pir-rate [cir cir-rate]
    — no rate
  — [no] scheduler-override
    — [no] scheduler scheduler-name
    — rate pir-rate [cir cir-rate]
    — no rate
  — scheduler-policy scheduler-policy-name
  — no scheduler-policy
— mac [ieee-address]
— no mac
— mac-refresh [refresh interval]
— no mac-refresh
— multi-service-site customer-site-name
— no multi-service-site
— [no] shutdown
— tod-suite tod-suite-name
— no tod-suite
— [no] use-broadcast-mac
— service-mtu octets
— no service-mtu
— service-name service-name
— no service-name
— [no] shutdown
— spoke-sdp [sdp-id[:vc-id]] [no-endpoint]
— spoke-sdp [sdp-id[:vc-id]] endpoint endpoint-name [icb]
— no spoke-sdp sap-id
  — bandwidth bandwidth
  — no bandwidth
  — ce-address ip-address
  — no ce-address
  — [no] control-word
  — egress
    — filter {ip ip-filter-id }
    — no filter
    — [no] vc-label vc-label
  — ingress
    — filter {ip ip-filter-id}
    — no filter
    — vc-label ingress-vc-label
    — no vc-label [ingress-vc-label]
— precedence [precedence-value] primary
— no precedence
— [no] shutdown

```

VLL Service Configuration Commands

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 - [VLL SAP Commands on page 333](#)
 - [VLL Frame Relay Commands on page 376](#)
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-

Generic Commands

shutdown

Syntax	<code>[no] shutdown</code>
Context	<pre> config>service>apipe config>service>apipe>sap config>service>apipe>spoke-sdp config>service>cpipe config>service>cpipe>sap config>service>cpipe>spoke-sdp config>service>epipe config>service>epipe>sap config>service>epipe>spoke-sdp config>service>epipe>sap>eth-cfm>mep config>service>epipe>spoke-sdp>eth-cfm>mep config>service>fpipe config>service>fpipe>sap config>service>fpipe>spoke-sdp config>service>ipipe config>service>ipipe>sap config>service>ipipe>spoke-sdp </pre>
Description	This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they may be deleted. Services are created in the administratively down (shutdown) state. When a no shutdown command is entered, the service becomes administratively up and then tries to enter the operationally up state. Default administrative states for services and service entities is described below in Special Cases.

The **no** form of this command places the entity into an administratively enabled state.

- Special Cases**
- Service Admin State** — Bindings to an SDP within the service will be put into the out-of-service state when the service is shutdown. While the service is shutdown, all customer packets are dropped and counted as discards for billing and debugging purposes.
- Service Operational State** — A service is regarded as operational providing that at least one SAP and one SDP are operational or if two SAP's are operational.
- SDP (global)** — When an SDP is shutdown at the global service level, all bindings to that SDP are put into the out-of-service state and the SDP itself is put into the administratively and operationally down states. Packets that would normally be transmitted using this SDP binding will be discarded and counted as dropped packets.
- SDP (service level)** — Shutting down an SDP within a service only affects traffic on that service from entering or being received from the SDP. The SDP itself may still be operationally up for other services.

description

Syntax	description <i>description-string</i> no description
Context	config>service>apipe config>service>apipe>sap config>service>apipe>endpoint config>service>cpipe config>service>cpipe>endpoint config>service>cpipe>sap config>service>epipe config>service>epipe>sap config>service>epipe>spoke-sdp config>service>epipe>endpoint config>service>fpipe config>service>fpipe>sap config>service>fpipe>endpoint config>service>ipipe config>service>ipipe>sap config>service>ipipe>endpoint
Description	This command creates a text description stored in the configuration file for a configuration context. The description command associates a text string with a configuration context to help identify the content in the configuration file. The no form of this command removes the string from the configuration.
Default	No description associated with the configuration context.
Parameters	<i>string</i> — The description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

VLL Global Commands

apipe

Syntax	apipe <i>service-id</i> [customer <i>customer-id</i>] [vpn <i>vpn-id</i>] [vc-type { atm-vcc atm-sdu atm-vpc atm-cell }] [vc-switching] no apipe <i>service-id</i>
Context	config>service
Description	The Apipe service provides a point-to-point Layer 2 VPN connection to a remote SAP or to another local SAP. An Apipe can connect an ATM or Frame Relay endpoint either locally or over a PSN to a remote endpoint of the same type or of a different type and perform interworking between the two access technologies.
Parameters	<i>service-id</i> — The unique service identification number or string identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The <i>service-id</i> must be the same number used for every 7750 SR, 7450 ESS and 7710 SR on which this service is defined. Values <i>service-id:</i> 1 — 2147483648 <i>svc-name:</i> 64 characters maximum customer <i>customer-id</i> — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting. Values 1 — 2147483647 vpn <i>vpn-id</i> — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN identification number. Values 1 — 2147483647 Default null (0) vc-type — Specifies a 15 bit value that defines the type of the VC signaled to the peer. Its values are defined in <i>draft-ietf-pwe3-iana-allocation</i> and it defines both the signaled VC type as well as the resulting datapath encapsulation over the Apipe. Values atm-vcc, atm-sdu, atm-vpc, atm-cell Default atm-sdu vc-switching — Specifies if the pseudowire switching signalling is used for the spoke SDPs configured in this service.

cpipe

Syntax	cpipe <i>service-id</i> [customer <i>customer-id</i>] [vpn <i>vpn-id</i>] [vc-type { satop-e1 satop-t1 satop-e3 satop-t3 [vc-switching] cesopsn-cas }] [vc-switching] [create] no cpipe <i>service-id</i>
Context	config>service
Description	This command configures a Circuit Emulation Services instance. When a service is created, the customer keyword and <i>customer-id</i> must be specified and associates the service with a customer. The <i>customer-id</i> must already exist having been created using the customer command in the service context. Once a service has been created with a customer association, it is not possible to edit the customer association. The service must be deleted and recreated with a new customer association. Once a service is created, the use of the customer <i>customer-id</i> is optional for navigating into the service configuration context. Attempting to edit a service with the incorrect <i>customer-id</i> specified will result in an error. By default, no services exist until they are explicitly created with this command. The no form of this command deletes the service instance with the specified <i>service-id</i>. The service cannot be deleted until the service has been shutdown.
Parameters	<i>service-id</i> — The unique service identification number or string identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The <i>service-id</i> must be the same number used for every 7750 SR or 7710 SR on which this service is defined. Values <i>service-id</i>: 1 — 2147483648 <i>svc-name</i>: Specifies an existing service name up to 64 characters in length. customer <i>customer-id</i> — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting. Values 1 — 2147483647 vpn <i>vpn-id</i> — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN ID. If this parameter is not specified, the VPN ID uses the same service ID number. Values 1 — 2147483647 Default null (0) vc-type — The vc-type defines the type of unstructured or structured circuit emulation service to be configured. Values satop-e1: unstructured E1 circuit emulation service satop-t1: unstructured DS1 circuit emulation service satop-e3: unstructured E3 circuit emulation service satop-t3: unstructured DS3 circuit emulation service cesopsn: basic structured n*64 kbps circuit emulation service cesopsn-cas: structured n*64 kbps circuit emulation service with signaling vc-switching — Specifies if the pseudowire switching signalling is used for the spoke SDPs configured in this service.

create — Keyword used to create the service. The **create** keyword requirement can be enabled/disabled in the **environment>create** context.

epipe

Syntax	epipe <i>service-id</i> customer <i>customer-id</i> [vpn <i>vpn-id</i>] [vc-switching] [create] epipe <i>service-id</i> no epipe <i>service-id</i>				
Context	config>service				
Description	This command configures an Epipe service instance. This command is used to configure a point-to-point epipe service. An Epipe connects two endpoints defined as Service Access Points (SAPs). Both SAPs may be defined in one 7750 SR or they may be defined in separate 7750 SR devices connected over the service provider network. When the endpoint SAPs are separated by the service provider network, the far end SAP is generalized into a Service Distribution Point (SDP). This SDP describes a destination 7750 SR and the encapsulation method used to reach it. No MAC learning or filtering is provided on an Epipe. When a service is created, the customer keyword and <i>customer-id</i> must be specified and associates the service with a customer. The <i>customer-id</i> must already exist having been created using the customer command in the service context. Once a service has been created with a customer association, it is not possible to edit the customer association. The service must be deleted and recreated with a new customer association. Once a service is created, the use of the customer <i>customer-id</i> is optional for navigating into the service configuration context. Attempting to edit a service with the incorrect <i>customer-id</i> specified will result in an error. By default, no epipe services exist until they are explicitly created with this command. The no form of this command deletes the epipe service instance with the specified <i>service-id</i>. The service cannot be deleted until the service has been shutdown.				
Parameters	<i>service-id</i> — The unique service identification number or string identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The <i>service-id</i> must be the same number used for every 7750 SR, 7450 ESS and 7710 SR on which this service is defined. <table> <tr> <td>Values</td><td> <i>service-id:</i> 1 — 2147483648 <i>svc-name:</i> 64 characters maximum </td></tr> </table> customer <i>customer-id</i> — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting. <table> <tr> <td>Values</td><td>1 — 2147483647</td></tr> </table> vpn <i>vpn-id</i> — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN ID. If this parameter is not specified, the VPN ID uses the same service ID number.	Values	<i>service-id:</i> 1 — 2147483648 <i>svc-name:</i> 64 characters maximum	Values	1 — 2147483647
Values	<i>service-id:</i> 1 — 2147483648 <i>svc-name:</i> 64 characters maximum				
Values	1 — 2147483647				

Values 1 — 2147483647

Default null (0)

vc-switching — Specifies if the pseudowire switching signalling is used for the spoke SDPs configured in this service.

create — Keyword used to create the service instance. The **create** keyword requirement can be enabled/disabled in the **environment>create** context.

fpipe

Syntax **fpipe** *service-id* [**customer** *customer-id*] [**vpn** *vpn-id*] [**vc-type** {**fr-dlci**}] [**vc-switching**]
no fpipe *service-id*

Context config>service

Description This command configures an Fpipe service. An Fpipe provides a point-to-point L2 VPN connection to a remote SAP or to another local SAP. An Fpipe connects only Frame Relay endpoints either locally or over a PSN to a remote endpoint of the same type.

Parameters *service-id* — The unique service identification number or string identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The *service-id* must be the same number used for every 7750 SR, 7450 ESS and 7710 SR on which this service is defined.

Values *service-id:* 1 — 2147483648
svc-name: 64 characters maximum

customer *customer-id* — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting.

Values 1 — 2147483647

vpn *vpn-id* — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN identification number.

Values 1 — 2147483647

Default null (0)

vc-type — Specifies a 15 bit value that defines the type of the VC signaled to the peer. Its values are defined in *draft-ietf-pwe3-iana-allocation* and it defines both the signaled VC type as well as the resulting datapath encapsulation over the apipe.

Values fr-dlci

vc-switching — Specifies if the pseudowire switching signalling is used for the spoke SDPs configured in this service.

ipipe

Syntax **ipipe** *service-id* [**customer** *customer-id*] [**create**] [**vpn** *vpn-id*] [**vc-switching**]

	no ipipe <i>service-id</i>
Context	config>service
Description	This command configures an IP-Pipe service.
Parameters	<i>service-id</i> — The unique service identification number or string identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The <i>service-id</i> must be the same number used for every 7750 SR, 7450 ESS and 7710 SR on which this service is defined. Values <i>service-id:</i> 1 — 2147483648 <i>svc-name:</i> 64 characters maximum customer <i>customer-id</i> — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting. Values 1 — 2147483647 vpn <i>vpn-id</i> — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN identification number. Values 1 — 2147483647 Default null (0) vc-switching — Specifies if the pseudowire switching signalling is used for the spoke SDPs configured in this service. create — Keyword used to create the Ipipe service instance. The create keyword requirement can be enabled/disabled in the environment>create context.

ce-address-discovery

Syntax	[no] ce-address-discovery
Context	config>service>ipipe
Description	This command specifies whether the service will automatically discover the CE IP addresses. When enabled, the addresses will be automatically discovered on SAPs that support address discovery, and on the spoke SDPs. When enabled, addresses configuration on the Ipipe SAP and spoke SDPs will not be allowed. If disabled, CE IP addresses must be manually configured for the SAPs to become operationally up.

endpoint

Syntax	[no] endpoint <i>endpoint-name</i>
Context	config>service>apipe config>service>cpipe config>service>fpipe config>service>epipe

config>service>ipipe

- Description** This command configures a service endpoint.
- Parameters** *endpoint-name* — Specifies an endpoint name.

per-service-hashing

- Syntax** [no] **per-service-hashing**
- Context** config>service>epipe
- Description** This command enables on a per service basis, consistent per-service hashing for Ethernet services over LAG, over Ethernet tunnel (eth-tunnel) using loadsharing protection-type or over CCAG. Specifically, it enables the new hashing procedures for Epipe, VPLS, regular or PBB services.
- The following algorithm describes the hash-key used for hashing when the new option is enabled:
- If the packet is PBB encapsulated (contains an I-TAG ethertype) at the ingress side, use the ISID value from the I-TAG
 - If the packet is not PBB encapsulated at the ingress side
 - For regular (non-PBB) VPLS and EPIPE services, use the related service ID
 - If the packet is originated from an ingress IVPLS or PBB Epipe SAP
 - If there is an ISID configured use the related ISID value
 - If there is no ISID yet configured use the related service ID
 - For BVPLS transit traffic use the related flood list id
 - Transit traffic is the traffic going between BVPLS endpoints
 - An example of non-PBB transit traffic in BVPLS is the OAM traffic
 - The above rules apply regardless of traffic type
 - Unicast, BUM flooded without MMRP or with MMRP, IGMP snooped
- The **no** form of this command implies the use of existing hashing options.
- Default** no per-service-hashing

tunnel

- Syntax** **tunnel** *service-id* **backbone-dest-mac** *ieee-address* **isid** *ISID*
no tunnel
- Context** config>service>epipe>pbb
- Description** This command configures a Provider Backbone Bridging (PBB) tunnel with Backbone VPLS (B-VPLS) service information.
- Parameters** *service-id* — Specifies the B-VPLS service for the PBB tunnel associated with this service.

Values *service-id:* 1 — 2147483648
 svc-name: 64 characters maximum

backbone-dest-mac *ieee-address* — Specifies the backbone destination MAC-address for PBB packets.

isid *ISID* — Specifies a 24 bit service instance identifier for the PBB tunnel associated with this service. As part of the PBB frames, it is used at the destination PE as a demultiplexor field.

Values 0 — 16777215

active-hold-delay

Syntax	active-hold-delay <i>active-hold-delay</i> no active-hold-delay
Context	config>service>cpipe>endpoint config>service>apipe>endpoint config>service>epipe>endpoint config>service>fpipe>endpoint config>service>ipipe>endpoint
Description	This command specifies that the node will delay sending the change in the T-LDP status bits for the VLL endpoint when the MC-LAG transitions the LAG subgroup which hosts the SAP for this VLL endpoint from active to standby or when any object in the endpoint. For example., SAP, ICB, or regular spoke SDP, transitions from up to down operational state. By default, when the MC-LAG transitioned the LAG subgroup which hosts the SAP for this VLL endpoint from active to standby, the node sends immediately new T-LDP status bits indicating the new value of "standby" over the spoke SDPs which are on the mate-endpoint of the VLL. The same applies when any object in the endpoint changes an operational state from up to down. There is no delay applied to the VLL endpoint status bit advertisement when the MC-LAG transitions the LAG subgroup which hosts the SAP from "standby" to "active" or when any object in the endpoint transitions to an operationally up state.
Default	0 — A value of zero means that when the MC-LAG transitioned the LAG subgroup which hosts the SAP for this VLL endpoint from active to standby , the node sends immediately new T-LDP status bits indicating the new value of standby over the spoke SDPs which are on the mate-endpoint of the VLL. The same applies when any object in the endpoint changes an operational state from up to down.
Parameters	<i>active-hold-delay</i> — Specifies the active hold delay in 100s of milliseconds.
Values	0 — 60

revert-time

Syntax	revert-time [<i>revert-time</i> infinite] no revert-time
Context	config>service>apipe>endpoint

```

config>service>cpipe>endpoint
config>service>epipe>endpoint
config>service>fpipe>endpoint
config>service>ipipe>endpoint

```

Description This command configures the time to wait before reverting back to the primary spoke SDP defined on this service endpoint, after having failed over to a backup spoke SDP.

Parameters *revert-time* — Specify the time, in seconds, to wait before reverting to the primary SDP.

Values 0 — 600

Default 0

infinite — Causes the endpoint to be non-revertive.

standby-signaling-master

Syntax **standby-signaling-master**
no standby-signaling-master

Context config>service>vll>endpoint

Description When this command is enabled, the pseudowire standby bit (value 0x00000020) will be sent to T-LDP peer for each spoke-sdp of the endpoint that is selected as a standby.

This command is mutually exclusive with a VLL mate SAP created on a mc-lag/mc-aps or ICB. It is also mutually exclusive with vc-switching.

Default standby-signaling-master

interworking

Syntax **interworking {frf-5}**
no interworking

Context config>service>apipe

Description This command specifies the interworking function that should be applied for packets that ingress/egress SAPs that are part of an Apipe service.

Interworking is applicable only when the two endpoints (i.e., the two SAPs or the SAP and the spoke-sdp) are of different types. Also, there are limitations on the combinations of SAP type, vc-type, and interworking values as shown in the following table.

SAP Type	Allowed VC-Type Value	Allowed Interworking Value
ATM VC	atm-vcc, atm-sdu	none
	fr-dlci	Not Supported
FR DLCI	fr-dlci	none

	SAP Type	Allowed VC-Type Value	Allowed Interworking Value
		atm-sdu	frf-5
Default	none (Interworking must be configured before adding a Frame-Relay SAP to an Apipe service.)		
Parameters	frf-5 — Specify Frame Relay to ATM Network Interworking (FRF.5).		

service-name

Syntax	service-name <i>service-name</i> no service-name
Context	config>service>epipe config>service>apipe config>service>cpipe config>service>fpipe config>service>ipipe
Description	This command configures an optional service name, up to 64 characters in length, which adds a name identifier to a given service to then use that service name in configuration references as well as display and use service names in show commands throughout the system. This helps the service provider/administrator to identify and manage services within the 7750 SR, 7450 ESS and 7710 SR platforms. All services are required to assign a service ID to initially create a service. However, either the service ID or the service name can be used to identify and reference a given service once it is initially created.
Parameters	<i>service-name</i> — Specifies a unique service name to identify the service. Service names may not begin with an integer (0-9).

service-mtu

Syntax	service-mtu <i>octets</i> no service-mtu
Context	config>service>epipe config>service>apipe config>service>cpipe config>service>fpipe config>service>ipipe
Description	This command configures the service payload (Maximum Transmission Unit – MTU), in bytes, for the service. This MTU value overrides the service-type default MTU. The service-mtu defines the payload capabilities of the service. It is used by the system to validate the SAP and SDP binding's operational state within the service. The service MTU and a SAP's service delineation encapsulation overhead (i.e., 4 bytes for a dot1q tag) is used to derive the required MTU of the physical port or channel on which the SAP was created. If the required payload is larger than the port or channel MTU, then the SAP will be placed in an

inoperative state. If the required MTU is equal to or less than the port or channel MTU, the SAP will be able to transition to the operative state.

When binding an SDP to a service, the service MTU is compared to the path MTU associated with the SDP. The path MTU can be administratively defined in the context of the SDP. The default or administrative path MTU can be dynamically reduced due to the MTU capabilities discovered by the tunneling mechanism of the SDP or the egress interface MTU capabilities based on the next hop in the tunnel path. If the service MTU is larger than the path MTU, the SDP binding for the service will be placed in an inoperative state. If the service MTU is equal to or less than the path MTU, then the SDP binding will be placed in an operational state.

In the event that a service MTU, port or channel MTU, or path MTU is dynamically or administratively modified, then all associated SAP and SDP binding operational states are automatically re-evaluated.

P binding operational states are automatically re-evaluated.

For i-VPLS and EPIPEs bound to a b-VPLS, the service-mtu must be at least 18 bytes smaller than the b-VPLS service MTU to accommodate the PBB header.

Because this connects a Layer 2 to a Layer 3 service, adjust either the service-mtu under the Epipe service. The MTU that is advertised from the Epipe side is service-mtu minus EtherHeaderSize.

By default if no service-mtu is configured it is $(1514 - 14) = 1500$.

The **no** form of this command returns the default **service-mtu** for the indicated service type to the default value.

Default apipe, fpipe: 1508

 ipipe: 1500

 epipe: 1514

The following table displays MTU values for specific VC types.

SAP VC-Type	Example Service MTU	Advertised MTU
Ethernet	1514	1500
Ethernet (with preserved dot1q)	1518	1504
VPLS	1514	1500
VPLS (with preserved dot1q)	1518	1504
VLAN (dot1p transparent to MTU value)	1514	1500
VLAN (Q-in-Q with preserved bottom Qtag)	1518	1504

octets — The size of the MTU in octets, expressed as a decimal integer, between 1 — 9194.

VLL SAP Commands

sap

Syntax	sap sap-id [no-endpoint] [create] sap sap-id endpoint endpoint-name [create] no sap sap-id
Context	config>service>apipe config>service>cpipe config>service>fpipe config>service>ipipe config>service>epipe
Description	This command creates a Service Access Point (SAP) within a service. A SAP is a combination of port and encapsulation parameters which identifies the service access point on the interface and within the 7750. Each SAP must be unique. All SAPs must be explicitly created. If no SAPs are created within a service or on an IP interface, a SAP will not exist on that object. Enter an existing SAP without the create keyword to edit SAP parameters. The SAP is owned by the service in which it was created. A SAP can only be associated with a single service. A SAP can only be defined on a port that has been configured as an access port. Channelized TDM ports are always access ports. If a port is shutdown, all SAPs on that port become operationally down. When a service is shutdown, SAPs for the service are not displayed as operationally down although all traffic traversing the service will be discarded. The operational state of a SAP is relative to the operational state of the port on which the SAP is defined. The following are supported: • ATM VPI/VCI on an ATM port for vc-type atm-vcc and atm-sdu • ATM VPI on an ATM port for vc-type atm-vpc • ATM virtual trunk - a range of VPIs on an ATM port for vc-type atm-cell • ATM port for vc-type atm-cell • Frame Relay DLCI on a port for vc-type atm-sdu • ATM SAP carries the IPv4 packet using RFC 2684, VC-Mux or LLC/SNAP routed PDU encapsulation for an Ipipe service • Frame Relay SAP RFC 2427, routed PDU encapsulation for an Ipipe service • Ethernet SAP RFC 1332, PPP IPCP encapsulation of an IPv4 packet for an Ipipe service • Ethernet SAP HDLC SAP uses the routed IPv4 encapsulation for an Ipipe service • ATM - Frame Relay, PPP/IPCP - PPP/IPCP

- Frame Relay-Frame Relay, ATM - ATM
- Ethernet-Ethernet
- cHDLc-cHDLc
- Ethernet SAPs support null, dot1q, and qinq
- An ATM SAP can be part of an IMA bundle.
- A PPP SAP can be part of an MLPPP bundle.
- A FR SAP can be part of a MLFR bundle.

The **no** form of this command deletes the SAP with the specified port. When a SAP is deleted, all configuration parameters for the SAP will also be deleted. For Internet Enhanced Service (IES), the IP interface must be shutdown before the SAP on that interface may be removed.

Default No SAPs are defined.

Special Cases A SAP can be defined with Ethernet ports, SONET/SDH or TDM channels. At most, only one sdp-id can be bound to an VLL service. Since a VLL is a point-to-point service, it can have, at most, two end points. The two end points can be one SAP and one SDP or two SAPs. Up to 49 SDPs can be associated with a service in a single router. Each SDP must have a unique router destination or an error will be generated.

A default SAP has the following format: port-id:*. This type of SAP is supported only on Ethernet MDAs and its creation is allowed only in the scope of Layer 2 services (Epipe and VPLS). This type of SAP is mutually exclusive with a SAP defined by explicit null encapsulation (for example, 1/1/1:0).

Two Frame Relay SAPs cannot be configured on an Apipe service. The limitation is for an Apipe service in local mode, which has two SAPs associated with the service, as opposed to a configuration with a SAP and a SDP in remote case, the only combination of the type of SAPs allowed is either two ATM SAPs or an ATM SAP and a Frame Relay SAP. The CLI prevents adding two Frame Relay SAPs under an Apipe service.

Parameters *sap-id* — Specifies the physical port identifier portion of the SAP. See [Common CLI Command Descriptions on page 1933](#) for command syntax.

port-id — Specifies the physical port ID in the *slot/mda/port* format.

If the card in the slot has Media Dependent Adapters (MDAs) installed, the *port-id* must be in the slot_number/MDA_number/port_number format. For example 6/2/3 specifies port 3 on MDA 2 in slot 6.

The *port-id* must reference a valid port type. When the *port-id* parameter represents SONET/SDH and TDM channels, the port ID must include the channel ID. A period “.” separates the physical port from the *channel-id*. The port must be configured as an access port.

If the SONET/SDH port is configured as clear-channel then only the port is specified.

endpoint — Adds a SAP endpoint association.

no endpoint — removes the association of a SAP or a spoke-sdp with an explicit endpoint name.

create — Keyword used to create a SAP instance. The **create** keyword requirement can be enabled/disabled in the **environment>create** context.

sap

Syntax	[no] sap eth-tunnel-tunnel-id[:eth-tunnel-sap-id] [create]
Context	config>service>epipe config>service>ipipe config>service>vpls
Description	This command configures an Ethernet tunnel SAP. An Ethernet tunnel control SAP has the format <i>eth-tunnel-tunnel-id</i> and is not configured with an Ethernet tunnel SAP ID. No Ethernet tunnel tags can be configured under a control SAP since the control SAP uses the control tags configured under the Ethernet tunnel port. This means that at least one member port and control tag must be configured under the Ethernet tunnel port before this command is executed. The control SAP is needed for carrying G.8031 and 802.1ag protocol traffic. This SAP can also carry user data traffic. An Ethernet tunnel same-fate SAP has the format <i>eth-tunnel-tunnel-id:eth-tunnel-sap-id</i>. Same-fate SAPs carry only user data traffic. Multiple same-fate SAPs can be configured on one Ethernet tunnel port and share the fate of that port, provided the SAPs are properly configured with corresponding tags. Ethernet tunnel SAPs are supported under VPLS, Epipe and Ipipe services only.
Default	no sap
Parameters	<i>tunnel-id</i> — Specifies the tunnel ID. Values 1 — 1024 <i>eth-tunnel-sap-id</i> — Specifies a SAP ID of a same-fate SAP. Values 0 — 4094

agg-rate-limit

Syntax	agg-rate-limit agg-rate [queue-frame-based-accounting] agg-rate-limit agg-rate [queue-frame-based-accounting] (Epipe services) no agg-rate-limit
Context	config>service>cpipe>sap>egress config>service>ipipe>sap>egress config>service>epipe>sap>egress
Description	This command defines a maximum total rate for all egress queues on a service SAP or multi-service site. The agg-rate-limit command is mutually exclusive with the egress scheduler policy. When an egress scheduler policy is defined, the agg-rate-limit command will fail. If the agg-rate-limit command is specified, an attempt to bind a scheduler-policy to the SAP or multi-service site will fail. A multi-service site must have a port scope defined that ensures all queues associated with the site are on the same port or channel. If the scope is not set to a port, the agg-rate-limit command will fail. Once an agg-rate-limit has been assigned to a multi-service site, the scope cannot be changed to card level.

A port scheduler policy must be applied on the egress port or channel the SAP or multi-service site are bound to in order for the defined agg-rate-limit to take effect. The egress port scheduler enforces the aggregate queue rate as it distributes its bandwidth at the various port priority levels. The port scheduler stops offering bandwidth to member queues once it has detected that the aggregate rate limit has been reached.

If a port scheduler is not defined on the egress port, the queues are allowed to operate based on their own bandwidth parameters.

The **no** form of the command removes the aggregate rate limit from the SAP or multi-service site.

Parameters *agg-rate* — Defines the rate, in kilobits-per-second, that the maximum aggregate rate the queues on the SAP or MSS can operate.

Values 1 — 40000000, max

queue-frame-based-accounting — This keyword enables frame based accounting on all queues associated with the SAP or Multi-Service Site. If frame based accounting is required when an aggregate limit is not necessary, the max keyword should precede the queue-frame-based-accounting keyword. If frame based accounting must be disabled, execute agg-rate-limit without the queue-frame-based-accounting keyword present. Note that this parameter is configurable in Epipe VLL services.

Default Frame based accounting is disabled by default.

ce-address

Syntax **ce-address** *ip-address*
no ce-address

Context config>service>ipipe>sap
config>service>ipipe>spoke-sdp

Description This command specifies the IP address of the CE device associated with an Ipipe SAP or spoke SDP. In the case of a SAP, it is the address of the CE device directly attached to the SAP. For a spoke SDP, it is the address of the CE device reachable through that spoke SDP (for example, attached to the SAP on the remote node). The address must be a host address (no subnet addresses are accepted) as there must be only one CE device attached to an Ipipe SAP. The CE address specified at one end of an Ipipe will be used in processing ARP messages at the other endpoint, as the router acts as a proxy for ARP messages.

none

Default

Parameters *ip-address* — specifies the IP address of the CE device associated with an Ipipe SAP.

qinq-mark-top-only

Syntax [**no**] **qinq-mark-top-only**

Context config>service>cpipe>sap>egress
config>service>apipe>sap>egress
config>service>epipe>sap>egress

```
config>service>apipe>sap>egress
```

Description When enabled (the encapsulation type of the access port where this SAP is defined as qinq), the **qinq-mark-top-only** command specifies which P-bits to mark during packet egress. When disabled, both set of P-bits are marked. When the enabled, only the P-bits in the top Q-tag are marked.

Default no qinq-mark-top-only

multi-service-site

Syntax **multi-service-site** *customer-site-name*
no multi-service-site

Context config>service>ipipe>sap
 config>service>apipe>sap
 config>service>cpipe>sap
 config>service>fpipe>sap
 config>service>epipe>sap

Description This command associates the SAP with a *customer-site-name*. If the specified *customer-site-name* does not exist in the context of the service customer ID an error occurs and the command will not execute. If *customer-site-name* exists, the current and future defined queues on the SAP (ingress and egress) will attempt to use the scheduler hierarchies created within *customer-site-name* as parent schedulers.

The **no** form of the command removes the SAP from any multi-service customer site the SAP belongs to. Removing the site can cause existing or future queues to enter an orphaned state.

Default None

customer-site-name — The customer-site-name must exist in the context of the customer-id defined as the service owner. If customer-site-name exists and local scheduler policies have not been applied to the SAP, the current and future queues defined on the SAP will look for their parent schedulers within the scheduler hierarchies defined on customer-site-name.

Values Any valid customer-site-name created within the context of the customer-id.

tod-suite

Syntax **tod-suite** *tod-suite-name*
no tod-suite

Context config>service>apipe>sap
 config>service>cpipe>sap
 config>service>fpipe>sap
 config>service>ipipe>sap
 config>service>epipe>sap

Description This command applies a time-based policy (filter or QoS policy) to the service SAP. The suite name must already exist in the **config>cron** context.

Default no tod-suite

Parameters *tod-suite-name* — Specifies collection of policies (ACLs, QoS) including time-ranges that define the full or partial behavior of a SAP. The suite can be applied to more than one SAP.

use-broadcast-mac

Syntax **[no] use-broadcast-mac**

Context config>service>ipipe>sap

Description This command enables the user of a of broadcast MAC on SAP.

 An Ipipe VLL service with the **ce-address-discovery** command enabled forwards unicast IP packets using the broadcast MAC address until the ARP cache is populated with a valid entry for the CE IP and MAC addresses.

 The **no** form of this command enables the user of a of broadcast MAC on SAP.

Default no use-broadcast-mac

mac

Syntax **[no] mac** *ieee-address*

Context config>service>ipipe>sap

Description This command assigns a specific MAC address to an Ipipe SAP.

 The **no** form of this command returns the MAC address of the SAP to the default value.

Default The physical MAC address associated with the Ethernet interface where the SAP is configured.

Parameters *ieee-address* — Specifies the 48-bit MAC address in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers.

mac-refresh

Syntax **mac-refresh** *refresh interval*
 no mac-refresh

Context config>service>ipipe>sap

Description This command specifies the interval between ARP requests sent on this Ipipe SAP. When the SAP is first enabled, an ARP request will be sent to the attached CE device and the received MAC address will be used in addressing unicast traffic to the CE. Although this MAC address will not expire while the Ipipe SAP is enabled and operational, it is verified by sending periodic ARP requests at the specified interval.

 The **no** form of this command restores mac-refresh to the default value.

Default 14400

Parameters *refresh interval* — Specifies the interval, in seconds, between ARP requests sent on this Ipipe SAP.

Values 0 — 65535

accounting-policy

Syntax **accounting-policy** *acct-policy-id*
no accounting-policy

Context config>service>apipe>sap
 config>service>cpipe>sap
 config>service>epipe>sap
 config>service>epipe>spoke-sdp
 config>service>fpipe>sap
 config>service>ipipe

Description This command creates the accounting policy context that can be applied to a SAP.

An accounting policy must be defined before it can be associated with a SAP. If the *policy-id* does not exist, an error message is generated.

A maximum of one accounting policy can be associated with a SAP at one time. Accounting policies are configured in the **config>log** context.

The **no** form of this command removes the accounting policy association from the SAP, and the accounting policy reverts to the default.

Default Default accounting policy.

Parameters *acct-policy-id* — Enter the accounting *policy-id* as configured in the **config>log>accounting-policy** context.

Values 1 — 99

app-profile

Syntax **app-profile** *app-profile-name*
no app-profile

Context config>service>vpls>sap

Description This command configures the application profile name.

Parameters *app-profile-name* — Specifies an existing application profile name configured in the **config>app-assure>group>policy** context.

bandwidth

Syntax **bandwidth** *bandwidth*
no bandwidth

Context	<pre>config>service>epipe>spoke-sdp config>service>fpipe>spoke-sdp config>service>apipe>spoke-sdp config>service>ipipe>spoke-sdp config>service>cpipe>spoke-sdp</pre>
Description	This command specifies the bandwidth to be used for VLL bandwidth accounting by the VLL CAC feature. The service manager keeps track of the available bandwidth for each SDP. The maximum value is the sum of the bandwidths of all constituent LSPs in the SDP. The SDP available bandwidth is adjusted by the user configured booking factor. If an LSP consists of a primary and many secondary standby LSPs, then the bandwidth used in the maximum SDP available bandwidth is that of the active path. Any change to and LSP active path bandwidth will update the maximum SDP available bandwidth. Note however that a change to any constituent LSP bandwidth due to re-signaling of the primary LSP path or the activation of a secondary path which causes overbooking of the maximum SDP available bandwidth causes a warning and a trap to be issued but no further action is taken. The activation of a bypass or detour LSP in the path of the primary LSP does not change the maximum SDP available bandwidth. When the user binds a VLL service to this SDP, an amount of bandwidth equal to bandwidth is subtracted from the SDP available bandwidth adjusted by the booking factor. When the user deletes this VLL service binding from this SDP, an amount of bandwidth equal to bandwidth is added back into the SDP available bandwidth. If the total SDP available bandwidth when adding this VLL service is about to overbook, a warning is issued and the binding is rejected. This means that the spoke-sdp bandwidth does not update the maximum SDP available bandwidth. In this case, the spoke-sdp is put in operational down state and a status message of “pseudowire not forwarding” is sent to the remote SR-Series PE node. A trap is also generated. The service manager will not put the spoke-sdp into operational UP state until the user performs a shutdown/no-shutdown of the spoke-sdp and the bandwidth check succeeds. Thus, the service manager will not automatically audit spoke-sdp’s subsequently to their creation to check if bandwidth is available. If the VLL service contains an endpoint with multiple redundant spoke-sdp’s, each spoke-sdp will have its bandwidth checked against the available bandwidth of the corresponding SDP. If the VLL service performs a pseudowire switching (VC switching) function, each spoke-sdp is separately checked for bandwidth against the corresponding SDP. Note this feature does not alter the way service packets are sprayed over multiple RSVP LSPs, which are part of the same SDP. In other words, by default load balancing of service packets occurs over the SDP LSP’s based on service-id, or based on a hash of the packet header if ingress SAP shared queuing is enabled. In both cases, the VLL bandwidth is not checked against the selected LSP(s) available bandwidth but on the total SDP available bandwidth. Thus, if there is a single LSP per SDP, these two match. If class-forwarding is enabled on the SDP, VLL service packets are forwarded to the SDP LSP which the packet forwarding class maps to, or if this is down to the default LSP. However, the VLL bandwidth is not checked against the selected LSP available bandwidth but on the total SDP available bandwidth. If there is a single LSP per SDP, these two match. If a non-zero bandwidth is specified for a VLL service and attempts to bind the service to an LDP or a GRE SDP, a warning is issued that CAC failed but the VLL is established. A trap is also generated. The no form of the command reverts to the default value.

Values 0 — 100000000, max in units of kilobits/sec.

Default 0

collect-stats

Syntax [no] collect-stats

Context config>service>cpipe>sap
 config>service>cpipe>spoke-sdp
 config>service>epipe>spoke-sdp
 config>service>apipe>sap
 config>service>fpipe>sap
 config>service>epipe>sap

Description This command enables accounting and statistical data collection for either the SAP, network port, or IP interface. When applying accounting policies the data, by default, is collected in the appropriate records and written to the designated billing file.

When the **no collect-stats** command is issued the statistics are still accumulated by the IOM cards. However, the CPU will not obtain the results and write them to the billing file. If a subsequent **collect-stats** command is issued then the counters written to the billing file include all the traffic while the **no collect-stats** command was in effect.

Default collect-stats

ethernet

Syntax ethernet

Context config>service>epipe>sap

Description Use this command to configure Ethernet properties in this SAP.

llf

Syntax	[no] llf
Context	config>service>apipe>sap>atm config>service>epipe>sap>eth
Description	This command enables Link Loss Forwarding (LLF) on an Ethernet port or an ATM port. This feature provides an end-to-end OAM fault notification for Ethernet VLL service and for ATM VLL service of vc-type atm-cell. It brings down the Ethernet port (Ethernet LLF) or sends a SONET/SDH Path AIS (ATM LLF) towards the attached CE when there is a local fault on the Pseudowire or service, or a remote fault on the SAP or pseudowire, signaled with label withdrawal or T-LDP status bits. It ceases when the fault disappears. The Ethernet port must be configured for null encapsulation. The ATM port must be configured as the SAP on an apipe service of vc-type atm-cell. The ATM port must be configured as a clear channel OC-3/STM-1 on an ASAP MDA. The no form of the command disables LLF.

Circuit Emulation Commands

cem

Syntax	cem
Context	config>service>cpipe>sap config>service>epipe>sap
Description	This command enables the context to specify circuit emulation (CEM) properties.

local-ecid

Syntax	local-ecid <i>emulated circuit identifier</i> no local-ecid
Context	config>service>epipe>sap>cem
Description	This command defines the Emulated Circuit Identifiers (ECID) to be used for the local (source) end of the circuit emulation service. The no form of the command removes the ECID from the configuration.
Default	65535
Parameters	<i>emulated circuit identifier</i> — Specifies the value to be used as the local (source) ECID for the circuit emulation service. On CES packet reception, the ECID in the packet will be compared to the configured local-ecid value. These must match for the packet payload to be used for the TDM circuit. The remote-ecid value is inserted into the MEF-8 CES packet to be transmitted. Values 0 — 1048575

packet

Syntax	packet jitter-buffer <i>milliseconds</i> [payload-size <i>bytes</i>] packet payload-size <i>bytes</i> no packet <i>bytes</i>
Context	config>service>cpipe>sap config>service>epipe>sap>cem
Description	This command specifies the jitter buffer size, in milliseconds, and payload size, in bytes.
Default	The default value depends on the CEM SAP endpoint type, and if applicable, the number of timeslots:

Endpoint Type	Timeslots	Default Jitter Buffer (in ms)
unstructuredE1	n/a	5
unstructuredT1	n/a	5
unstructuredE3	n/a	5
unstructuredT3	n/a	5
nxDS0 (E1/T1)		32
	N = 1	16
	N = 2..4	8
	N = 5..15	5
nxDS0WithCas (E1)	N	8
nxDS0WithCas (T1)	N	12

Parameters *milliseconds* — specifies the jitter buffer size in milliseconds (ms).

Configuring the payload size and jitter buffer to values that result in less than 2 packet buffers or greater than 32 packet buffers is not allowed. Setting the jitter buffer value to 0 sets it back to the default value.

Values 1 — 250

payload-size bytes — Specifies the payload size (in bytes) of packets transmitted to the packet service network (PSN) by the CEM SAP. This determines the size of the data that will be transmitted over the service. If the size of the data received is not consistent with the payload size then the packet is considered malformed.

Default The default value depends on the CEM SAP endpoint type, and if applicable, the number of timeslots:

Endpoint Type	Timeslots	Default Payload Size (in bytes)
unstructuredE1	n/a	256
unstructuredT1	n/a	192
unstructuredE3	n/a	1024
unstructuredT3	n/a	1024
nxDS0 (E1/T1)	N = 1	64
	N = 2..4	N x 32
	N = 5..15	N x 16
	N >= 16	N x 8
nxDS0WithCas (E1)	N	N x 16
nxDS0WithCas (T1)	N	N x 24

For all endpoint types except for nxDS0WithCas, the valid payload size range is from the default to 2048 bytes.

For nxDS0WithCas, the payload size divide by the number of timeslots must be an integer factor of the number of frames per trunk multi-frame (for example, 16 for E1 trunk and 24 for T1 trunk).

For 1xDS0, the payload size must be a multiple of 2.

For NxDS0, where $N > 1$, the payload size must be a multiple of the number of timeslots.

For unstructuredE1, unstructuredT1, unstructuredE3 and unstructuredT3, the payload size must be a multiple of 32 bytes.

Configuring the payload size and jitter buffer to values that result in less than 2 packet buffers or greater than 32 packet buffer is not allowed.

Setting the payload size to 0 sets it back to the default value.

Values 0, 16 — 2048

remote-ecid

Syntax	remote-ecid <i>emulated circuit identifier</i> no remote-ecid
Context	config>service>epipe>sap>cem
Description	This command defines the Emulated Circuit Identifiers (ECID) to be used for the remote (destination) end of the circuit emulation service.
Parameters	<i>emulated circuit identifier</i> — Specifies the value to be used as the remote (destination) ECID for the circuit emulation service. Upon CES packet reception, the ECID in the packet will be compared to the configured local-ecid value. These must match for the packet payload to be used for the TDM circuit. The remote-ecid value is inserted into the MEF-8 CES packet to be transmitted.

remote-mac

Syntax	remote-mac <i>ieee-address</i> no remote-mac
Context	config>service>epipe>sap>cem
Description	This command defines the destination IEEE MAC address to be used to reach the remote end of the circuit emulation service.
Default	00:00:00:00:00:00
Parameters	<i>ieee-address</i> — Specifies the 48-bit MAC address in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

report-alarm

Syntax	[no] report-alarm [stray] [malformed] [pktloss] [overrun] [underrun] [rpktloss] [rfault] [rrdi]
Context	config>service>epipe>sap>cem
Description	This command indicates the type of CEM SAP alarm. The no form of the command removes the parameter from the configuration.
Default	On: stray, malformed, pktloss and overrun Off: rpktloss, rfault, rrdi
Parameters	stray — Reports the reception of packets not destined for this CES circuit. malformed — Reports the reception of packet not properly formatted as CES packets. pktloss — Reports the lack of reception of CES packets. overrun — Reports reports the reception of too many CES packets resulting in a overrun of the receive jitter buffer. underrun — Reportsreports the reception of too few CES packets resulting in a overrun of the receive jitter buffer. rpktloss — Reports hat the remote peer is currently in packet loss status. rfault — Reports that the remote TDM interface is currently not in service. rrdi — Reports that the remote TDM interface is currently in RDI status.

rtp-header

Syntax	[no] rtp-header
Context	config>service>epipe>sap>cem config>service>cpipe>sap>cem
Description	This command specifies whether an RTP header is used when packets are transmitted to the packet service network (PSN) by the CEM SAP. This mode must be enabled for differential-timed DS1/E1s. It can optionally be enabled for other DS1/E1s for interoperability purposes.
Default	no rtp-header

ETH-CFM Service Commands

eth-cfm

Syntax	eth-cfm
Context	config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp config>service>vpls config>service>vpls>sap
Description	This command enables the context to configure ETH-CFM parameters.

eth-tunnel

Syntax	eth-tunnel
Context	config>service>epipe>sap config>service>ipipe>sap
Description	The command enables the context to configure Ethernet Tunnel SAP parameters.

path

Syntax	path <i>path-index</i> tag <i>qtag</i> [<i>qtag</i>] no path <i>path-index</i>
Context	config>service>epipe>sap>eth-tunnel config>service>ipipe>sap>eth-tunnel
Description	This command configures Ethernet tunnel SAP path parameters. The no form of the command removes the values from the configuration.
Default	none
Parameters	<i>path-index</i> — Specifies the path index value. Values 1 — 16 <i>tag</i> <i>qtag</i> [<i>qtag</i>] — Specifies the qtag value. Values 0 — 4094, *
Syntax	eth-cfm
Context	config>service>epipe>spoke-sdp config>service>epipe>sap config>service>ies>sub-if

```
config>service>ipipe>sap>eth-cfm>mep
```

Description This command enables the context to configure ETH-CFM parameters.

mep

Syntax **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**direction** {**up** | **down**}]
no mep *mep-id* **domain** *md-index* **association** *ma-index*

Context config>service>epipe>sap>eth-cfm
 config>service>ies>sub-if>eth-cfm
 config>service>epipe>spoke-sdp>eth-cfm

This command provisions an 802.1ag maintenance endpoint (MEP or MIP).
 The **no** form of the command reverts to the default values.

Parameters *mep-id* — Specifies the maintenance association end point identifier.

Values 1 — 81921

md-index — Specifies the maintenance domain (MD) index value.

Values 1 — 4294967295

ma-index — Specifies the MA index value.

Values 1 — 4294967295

direction up | down — Indicates the direction in which the maintenance association (MEP or MIP) faces on the bridge port.

down — Sends continuity check messages away from the MAC relay entity.

up — Sends continuity check messages towards the MAC relay entity.

ais-enable

Syntax [**no**] **ais-enable**

Context config>service>epipe>sap>eth-cfm>mep
 config>service>epipe>spoke-sdp>eth-cfm>mep

Description This command enables the generation and the reception of AIS messages.

client-meg-level

Syntax **client-meg-level** [[*level* [*level* ...]]]
no client-meg-level

Context config>service>epipe>spoke-sdp>eth-cfm>mep>ais-enable
 config>service>epipe>sap>eth-cfm>mep>ais-enable

Description This command configures the client maintenance entity group (MEG) level(s) to use for AIS message generation. Up to 7 levels can be provisioned with the restriction that the client MEG level must be higher than the local MEG level.

Parameters *level* — Specifies the client MEG level.

Values 1 — 7

Default 1

interval

Syntax **interval {1 | 60}**
no interval

Context config>service>epipe>spoke-sdp>eth-cfm>mep>ais-enable
config>service>epipe>sap>eth-cfm>mep>ais-enable

Description This command specifies the transmission interval of AIS messages in seconds.

Parameters **1 | 60** — The transmission interval of AIS messages in seconds.

Default 1

priority

Syntax **priority *priority-value***
no priority

Context config>service>epipe>spoke-sdp>eth-cfm>mep>ais-enable
config>service>epipe>sap>eth-cfm>mep>ais-enable

Description This command specifies the priority of AIS messages originated by the node.

Parameters *priority-value* — Specify the priority value of the AIS messages originated by the node.

Values 0 — 7

Default 1

ccm-enable

Syntax **[no] ccm-enable**

Context config>service>epipe>spoke-sdp>eth-cfm>mep
config>service>epipe>sap>eth-cfm>mep

Description This command enables the generation of CCM messages.

The **no** form of the command disables the generation of CCM messages.

ccm-ltm-priority

Syntax	ccm-ltm-priority <i>priority</i> no ccm-ltm-priority
Context	config>service>epipe>spoke-sdp>eth-cfm>mep config>service>epipe>sap>eth-cfm>mep
Description	This command specifies the priority value for CCMs and LTMs transmitted by the MEP. The no form of the command removes the priority value from the configuration.
Default	The highest priority on the bridge-port.
Parameters	<i>priority</i> — Specifies the priority of CCM and LTM messages. Values 0 — 7

eth-test-enable

Syntax	[no] eth-test-enable
Context	config>service>epipe>spoke-sdp>eth-cfm>mep config>service>epipe>sap>eth-cfm>mep
Description	For this test to work, operators need to configure ETH-test parameters on both sender and receiver nodes. The ETH-test then can be done using the following OAM commands: oam eth-cfm eth-test <i>mac-address</i> mep <i>mep-id</i> domain <i>md-index</i> association <i>ma-index</i> [<i>priority priority</i>] [<i>data-length data-length</i>] A check is done for both the provisioning and test to ensure the MEP is an Y.1731 MEP (MEP provisioned with domain format none, association format icc-based). If not, the operation fails. An error message in the CLI and SNMP will indicate the problem.

test-pattern

Syntax	test-pattern {all-zeros all-ones} [crc-enable] no test-pattern
Context	config>service>epipe>spoke-sdp>eth-cfm>mep config>service>epipe>sap>eth-cfm>mep
Description	This command configures the test pattern for eth-test frames. The no form of the command removes the values from the configuration.
Parameters	all-zeros — Specifies to use all zeros in the test pattern. all-ones — Specifies to use all ones in the test pattern. crc-enable — Generates a CRC checksum.
Default	all-zeros

fault-propagation-enable

Syntax	fault-propagation-enable {use-if-tlv suspend-ccm} no fault-propagation-enable
Context	config>service>epipe>sap>eth-cfm>mep config>service>epipe>spoke-sdp>eth-cfm>mep config>service>ipipe>sap>eth-cfm>mep
Description	This command configures the fault propagation for the MEP.
Parameters	use-if-tlv — Specifies to use the interface TLV. suspend-ccm — Specifies to suspend the continuity check messages.

low-priority-defect

Syntax	low-priority-defect {allDef macRemErrXcon remErrXcon errXcon xcon noXcon}								
Context	config>service>epipe>spoke-sdp>eth-cfm>mep config>service>epipe>sap>eth-cfm>mep								
Description	This command specifies the lowest priority defect that is allowed to generate a fault alarm.								
Default	remErrXcon								
Values	<table> <tr> <td>allDef</td><td>DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>macRemErrXconOnly</td><td>DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>remErrXcon</td><td>Only DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>errXcon</td><td>Only DefErrorCCM and DefXconCCM</td></tr> </table>	allDef	DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM	macRemErrXconOnly	DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM	remErrXcon	Only DefRemoteCCM, DefErrorCCM, and DefXconCCM	errXcon	Only DefErrorCCM and DefXconCCM
allDef	DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM								
macRemErrXconOnly	DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM								
remErrXcon	Only DefRemoteCCM, DefErrorCCM, and DefXconCCM								
errXcon	Only DefErrorCCM and DefXconCCM								

xcon	Only DefXconCCM; or
noXcon	No defects DefXcon or lower are to be reported

mac-address

Syntax	mac-address <i>mac-address</i> no mac-address
Context	config>service>epipe>spoke-sdp>eth-cfm>mep config>service>epipe>sap>eth-cfm>mep
Description	This command specifies the MAC address of the MEP. The no form of this command reverts the MAC address of the MEP back to that of the port (if the MEP is on a SAP) or the bridge (if the MEP is on a spoke SDP).
Parameters	<i>mac-address</i> — Specifies the MAC address of the MEP.
Values	6-byte unicast mac-address (xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx) of the MEP. Using the all zeros address is equivalent to the no form of this command.

Service Filter and QoS Policy Commands

egress

Syntax	egress
Context	<pre>config>service>apipe>sap config>service>cpipe>sap config>service>cpipe>spoke-sdp config>service>epipe>spoke-sdp config>service>fpipe>sap config>service>ipipe>sap config>service>epipe>sap</pre>
Description	This command enables the context to configure egress SAP parameters. If no sap-egress QoS policy is defined, the system default sap-egress QoS policy is used for egress processing.

force-vlan-vc-forwarding

Syntax	[no] force-vlan-vc-forwarding
Context	<pre>config>service>epipe>spoke-sdp config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp</pre>
Description	This command forces vc-vlan-type forwarding in the data path for spoke and mesh SDPs which have either vc-type. This comand is not allowed on vlan-vc-type SDPs. The no version of this command sets default behavior.
Default	per default this feature is disabled

ingress

Syntax	ingress
Context	<pre>config>service>apipe>sap config>service>cpipe>sap config>service>epipe>spoke-sdp config>service>fpipe>sap config>service>ipipe>sap config>service>epipe>sap</pre>
Description	This command enables the context to configure ingress SAP Quality of Service (QoS) policies.

If no sap-ingress QoS policy is defined, the system default sap-ingress QoS policy is used for ingress processing.

filter

Syntax	filter [ip <i>ip-filter-id</i>] filter [ipv6 <i>ipv6-filter-id</i>] filter [mac <i>mac-filter-id</i>] no filter [ip <i>ip-filter-id</i>] no filter [ipv6 <i>ipv6-filter-id</i>] no filter [mac <i>mac-filter-id</i>]
Context	config>service>epipe>sap>egress config>service>epipe>sap>ingress config>service>epipe>spoke-sdp>egress config>service>epipe>spoke-sdp>ingress config>service>ipipe>spoke-sdp>egress config>service>ipipe>sap>ingress config>service>ipipe>sap>egress config>service>ipipe>spoke-sdp>ingress config>service>epipe>sap>egress config>service>epipe>sap>ingress
Description	This command associates an IP filter policy with an ingress or egress Service Access Point (SAP) or IP interface. Filter policies control the forwarding and dropping of packets based on IP matching criteria. Only one filter can be applied to a SAP at a time. The filter command is used to associate a filter policy with a specified <i>filter-id</i> with an ingress or egress SAP. The <i>filter-id</i> must already be defined before the filter command is executed. If the filter policy does not exist, the operation will fail and an error message returned. IP filters apply only to RFC 2427-routed IP packets. Frames that do not contain IP packets will not be subject to the filter and will always be passed, even if the filter's default action is to drop. The no form of this command removes any configured filter ID association with the SAP or IP interface. The filter ID itself is not removed from the system unless the scope of the created filter is set to local. To avoid deletion of the filter ID and only break the association with the service object, use scope command within the filter definition to change the scope to local or global. The default scope of a filter is local. Note that IPv6 filters are not supported on a Layer 2 SAP that is configured with QoS MAC criteria. Also, MAC filters are not supported on a Layer 2 SAP that is configured with QoS IPv6 criteria.
Special Cases	Epipe — Both MAC and IP filters are supported on an Epipe service SAP.
Parameters	ip <i>ip-filter-id</i> — Specifies IP filter policy. The filter ID must already exist within the created IP filters. Values 1 — 65535 ipv6 <i>ipv6-filter-id</i> — Specifies the IPv6 filter policy. The filter ID must already exist within the created IPv6 filters. Values 1 — 65535

mac *mac-filter-id* — Specifies the MAC filter policy. The specified filter ID must already exist within the created MAC filters. The filter policy must already exist within the created MAC filters.

Values 1 — 65535

hsmda-queue-override

Syntax	[no] hsmda-queue-override
Context	config>service>epipe>sap>egress config>service>epipe>sap>ingress config>service>ipipe>sap>egress config>service>ipipe>sap>ingress
Description	This command configures HSMDA egress and ingress queue overrides.

packet-byte-offset

Syntax	packet-byte-offset {add <i>add-bytes</i> subtract <i>sub-bytes</i>} no packet-byte-offset
Context	config>service>epipe>sap>egress>hsmda-queue-over config>service>epipe>sap>ingress>hsmda-queue-over config>service>ipipe>sap>egress>hsmda-queue-over config>service>ipipe>sap>ingress>hsmda-queue-over
Description	This command adds or subtracts the specified number of bytes to the accounting function for each packet handled by the HSMDA queue. Normally, the accounting and leaky bucket functions are based on the Ethernet DLC header, payload and the 4-byte CRC (everything except the preamble and inter-frame gap). For example, this command can be used to add the frame encapsulation overhead (20 bytes) to the queues accounting functions. The accounting functions affected include: • Offered High Priority / In-Profile Octet Counter • Offered Low Priority / Out-of-Profile Octet Counter • Discarded High Priority / In-Profile Octet Counter • Discarded Low Priority / Out-of-Profile Octet Counter • Forwarded In-Profile Octet Counter • Forwarded Out-of-Profile Octet Counter • Peak Information Rate (PIR) Leaky Bucket Updates • Committed Information Rate (CIR) Leaky Bucket Updates • Queue Group Aggregate Rate Limit Leaky Bucket Updates The secondary shaper leaky bucket, scheduler priority level leaky bucket and the port maximum rate updates are not affected by the configured packet-byte-offset. Each of these accounting functions are

frame based and always include the preamble, DLC header, payload and the CRC regardless of the configured byte offset.

The packet-byte-offset command accepts either add or subtract as valid keywords which define whether bytes are being added or removed from each packet traversing the queue. Up to 20 bytes may be added to the packet and up to 43 bytes may be removed from the packet. An example use case for subtracting bytes from each packet is an IP based accounting function. Given a Dot1Q encapsulation, the command packet-byte-offset subtract 14 would remove the DLC header and the Dot1Q header from the size of each packet for accounting functions only. The 14 bytes are not actually removed from the packet, only the accounting size of the packet is affected.

As mentioned above, the variable accounting size offered by the packet-byte-offset command is targeted at the queue and queue group level. When the queue group represents the last-mile bandwidth constraints for a subscriber, the offset allows the HSMDA queue group to provide an accurate accounting to prevent overrun and underrun conditions for the subscriber. The accounting size of the packet is ignored by the secondary shapers, the scheduling priority level shapers and the scheduler maximum rate. The actual on-the-wire frame size is used for these functions to allow an accurate representation of the behavior of the subscriber's packets on an Ethernet aggregation network.

The packet-byte-offset value can be overridden for the HSMDA queue at the SAP or subscriber profile level.

The **no** form of the command removes any accounting size changes to packets handled by the queue. The command does not effect overrides that may exist on SAPs or subscriber profiles associated with the queue.

Parameters **add** *add-bytes* — The **add** keyword is mutually exclusive with the subtract keyword. Either the add or subtract keyword must be specified. The add keyword is used to indicate that the following byte value should be added to the packet for queue and queue group level accounting functions. The corresponding byte value must be specified when executing the packet-byte-offset command.

Values 0 — 31

subtract *sub-bytes* — The **subtract** keyword is mutually exclusive with the add keyword. Either the add or subtract keyword must be specified. The subtract keyword is used to indicate that the following byte value should be subtracted from the packet for queue and queue group level accounting functions. The corresponding byte value must be specified when executing the packet-byte-offset command.

Values 1 — 32

queue

Syntax **queue** *queue-id* [**create**]
no queue *queue-id*

Context config>service>epipe>sap>egress>hsmda-queue-over
 config>service>epipe>sap>ingress>hsmda-queue-over
 config>service>ipipe>sap>egress>hsmda-queue-over
 config>service>ipipe>sap>ingress>hsmda-queue-over

Description This command, within the QoS policy hsmdda-queue context, is a container for the configuration parameters controlling the behavior of an HSMDDA queue. Unlike the standard QoS policy queue command, this command is not used to actually create or dynamically assign the queue to the object which the policy is applied. The queue identified by queue-id always exists on the SAP or subscriber context whether the command is executed or not. In the case of HSMDDA SAPs and subscribers, all eight queues exist at the moment the system allocates an HSMDDA queue group to the object (both ingress and egress).

Best-Effort, Expedited and Auto-Expedite Queue Behavior Based on Queue-ID

With standard service queues, the scheduling behavior relative to other queues is based on two items, the queues Best-Effort or Expedited nature and the dynamic rate of the queue relative to the defined CIR. HSMDDA queues are handled differently. The create time auto-expedite and explicit expedite and best-effort qualifiers have been eliminated and instead the scheduling behavior is based solely on the queues identifier. Queues with a queue-id equal to 1 are placed in scheduling class 1. Queues with queue-id 2 are placed in scheduling class 2. And so on up to scheduling class 8. Each scheduling class is either mapped directly to a strict scheduling priority level based on the class ID, or the class may be placed into a weighted scheduling class group providing byte fair weighted round robin scheduling between the members of the group. Two weighted groups are supported and each may contain up to three consecutive scheduling classes. The weighed group assumes its highest member class's inherent strict scheduling level for scheduling purposes. Strict priority level 8 has the highest priority while strict level 1 has the lowest. When grouping of scheduling classes is defined, some of the strict levels will not be in use.

Single Type of HSMDDA Queues

Another difference between HSMDDA queues and standard service queues is the lack of Multipoint queues. At ingress, an HSMDDA SAP or subscriber does not require Multipoint queues since all forwarding types (broadcast, multicast, unicast and unknown) forward to a single destination in the ingress forwarding plane on the IOM. Instead of a possible eight queues per forwarding type (for a total of up to 32) within the SAP ingress QoS policy, the hsmdda-queues node supports a maximum of eight queues.

Every HSMDDA Queue Supports Profile Mode Implicitly

Unlike standard service queues, the HSMDDA queues do not need to be placed into the special mode profile at create time in order to support ingress color aware policing. Each queue may handle in-profile, out-of-profile and profile undefined packets simultaneously. As with standard queues, the explicit profile of a packet is dependant on ingress sub-forwarding class to which the packet is mapped.

The **no** form of the command restores the defined queue-id to its default parameters. All HSMDDA queues having the queue-id and associated with the QoS policy are re-initialized to default parameters.

Parameters *queue-id* — Specifies the HSMDDA queue to use for packets in this forwarding class. This mapping is used when the SAP is on a HSMDDA MDA.

Values 1 — 8

rate

Syntax **rate** *pir-rate* [*cir cir-rate*]
no rate

Context	config>service>epipe>sap>egress>hsmda-queue-over config>service>epipe>sap>ingress>hsmda-queue-over config>service>ipipe>sap>egress>hsmda-queue-over config>service>ipipe>sap>ingress>hsmda-queue-over
Description	This command specifies the administrative PIR and CIR by the user.
Parameters	<i>pir-rate</i> — Configures the administrative PIR specified by the user. Values 1 — 40000000, max <i>cir cir-rate</i> — Configures the administrative CIR specified by the user. Values 0 — 40000000, max

slope-policy

Syntax	slope-policy <i>hsmda-slope-policy-name</i> no slope-policy
Context	config>service>epipe>sap>egress>hsmda-queue-over config>service>epipe>sap>ingress>hsmda-queue-over config>service>ipipe>sap>egress>hsmda-queue-over config>service>ipipe>sap>ingress>hsmda-queue-over
Description	This command assigns an HSMDBA slope policy to the SAP. The policy may be assigned to an ingress or egress HSMDBA queue. The policy contains the Maximum Buffer Size (MBS) that will be applied to the queue and the high and low priority RED slope definitions. The function of the MBS and RED slopes is to provide congestion control for an HSMDBA queue. The MBS parameter defines the maximum depth a queue may reach when accepting packets. The low and high priority RED slopes provides for random early detection of congestion and slope based discards based on queue depth. An HSMDBA slope policy can be applied to queues defined in the SAP ingress and SAP egress QoS policy HSMDBA queues context. Once an HSMDBA slope policy is applied to a SAP QoS policy queue, it cannot be deleted. Any edits to the policy are updated to all HSMDBA queues indirectly associated with the policy. Default HSMDBA Slope Policy An HSMDBA slope policy named “default” always exists on the system and does not need to be created. The default policy is automatically applied to all HSMDBA queues unless another HSMDBA slope policy is specified for the queue. The default policy cannot be modified or deleted. Attempting to execute the no hsmdb-slope-policy default command results in an error. The no form of the command removes the specified HSMDBA slope policy from the configuration. If the HSMDBA slope policy is currently associated with an HSMDBA queue, the command will fail.
Parameters	<i>hsmda-slope-policy-name</i> — Specifies a HSMDBA slope policy up to 32 characters in length. The HSMDBA slope policy must be exist prior to applying the policy name to an HSMDBA queue.

secondary-shaper

Syntax	secondary-shaper <i>secondary-shaper-name</i> no secondary-shaper
Context	config>service>epipe>sap>egress>hsmda-queue-over config>service>epipe>sap>ingress>hsmda-queue-over config>service>ipipe>sap>egress>hsmda-queue-over config>service>ipipe>sap>ingress>hsmda-queue-over
Description	This command configures an HSM DA egress secondary shaper.
Parameters	<i>secondary-shaper-name</i> — Specifies a secondary shaper name up to 32 characters in length.

filter

Syntax	filter [ip <i>ip-filter-id</i>] filter [ipv6 <i>ipv6-filter-id</i>] no filter [ip <i>ip-filter-id</i>] [ipv6 <i>ipv6-filter-id</i>]	
	config>service>fpipe>sap>egress config>service>fpipe>sap>ingress config>service>cpipe>spoke-sdp>egress config>service>cpipe>spoke-sdp>ingress config>service>fpipe>spoke-sdp>egress config>service>fpipe>spoke-sdp>ingress config>service>ipipe>spoke-sdp>egress config>service>ipipe>sap>ingress config>service>ipipe>sap>egress config>service>ipipe>spoke-sdp>ingress	Context
Description	This command associates a filter policy with an ingress or egress Service Access Point (SAP) or IP interface. Filter policies control the forwarding and dropping of packets based on IP matching criteria. Only one filter can be applied to a SAP at a time. The filter command is used to associate a filter policy with a specified <i>ip-filter-id</i> with an ingress or egress SAP. The <i>ip-filter-id</i> must already be defined before the filter command is executed. If the filter policy does not exist, the operation will fail and an error message returned. IP filters apply only to RFC 2427-routed IP packets. Frames that do not contain IP packets will not be subject to the filter and will always be passed, even if the filter's default action is to drop. The no form of this command removes any configured filter ID association with the SAP or IP interface. The filter ID itself is not removed from the system unless the scope of the created filter is set to local. To avoid deletion of the filter ID and only break the association with the service object, use scope command within the filter definition to change the scope to local or global. The default scope of a filter is local.	
Parameters	ip <i>ip-filter-id</i> — Specifies IP filter policy. The filter ID must already exist within the created IP filters.	
	Values	1 — 65535

ipv6 *ipv6-filter-id* — Specifies the IPv6 filter policy. The filter ID must already exist within the created IPv6 filters.

Values 1 — 65535

qos

Syntax	qos <i>policy-id</i> [shared-queuing] no qos
Context	config>service>apipe>sap>egress config>service>apipe>sap>ingress config>service>cpipe>sap>egress config>service>cpipe>sap>ingress config>service>fpipe>sap>egress config>service>fpipe>sap>ingress config>service>ipipe>sap>egress config>service>ipipe>sap>ingress config>service>epipe>sap>egress config>service>epipe>sap>ingress
Description	This command associates a Quality of Service (QoS) policy with an ingress or egress Service Access Point (SAP) or IP interface. QoS ingress and egress policies are important for the enforcement of SLA agreements. The policy ID must be defined prior to associating the policy with a SAP or IP interface. If the <i>policy-id</i> does not exist, an error will be returned. The qos command is used to associate both ingress and egress QoS policies. The qos command only allows ingress policies to be associated on SAP or IP interface ingress and egress policies on SAP or IP interface egress. Attempts to associate a QoS policy of the wrong type returns an error. Only one ingress and one egress QoS policy can be associated with a SAP or IP interface at one time. Attempts to associate a second QoS policy of a given type will return an error. By default, if no specific QoS policy is associated with the SAP or IP interface for ingress or egress, so the default QoS policy is used. The no form of this command removes the QoS policy association from the SAP or IP interface, and the QoS policy reverts to the default. <i>policy-id</i> — The ingress/egress policy ID to associate with SAP or IP interface on ingress/egress. The policy ID must already exist. Values 1 — 65535 shared-queuing — This keyword can only be specified on SAP ingress. The shared-queueing keyword specifies the shared queue policy will be used by this SAP. When the value of this object is null, the SAP will use individual ingress QoS queues, instead of the shared ones.

queue-override

Syntax [no] **queue-override**

Context config>service>apipe>sap>egress
 config>service>apipe>sap>ingress
 config>service>cpipe>sap>egress
 config>service>cpipe>sap>ingress
 config>service>fpipe>sap>egress
 config>service>fpipe>sap>ingress
 config>service>ipipe>sap>egress
 config>service>ipipe>sap>ingress
 config>service>epipe>sap>egress
 config>service>epipe>sap>ingress

Description This command enables the context to configure override values for the specified SAP egress or ingress QoS queue. These values override the corresponding ones specified in the associated SAP egress or ingress QoS policy. If the policy was created as a template policy, this command overrides the parameter and its description and queue parameters in the policy.

queue

Syntax [no] queue *queue-id*

Context config>service>apipe>sap>egress>queue-override
 config>service>apipe>sap>ingress>queue-override
 config>service>cpipe>sap>egress>queue-override
 config>service>cpipe>sap>ingress>queue-override
 config>service>fpipe>sap>egress>queue-override
 config>service>fpipe>sap>ingress>queue-override
 config>service>ipipe>sap>egress>queue-override
 config>service>ipipe>sap>ingress>queue-override
 config>service>epipe>sap>egress>queue-override
 config>service>epipe>sap>ingress>queue-override

Description This command specifies the ID of the queue whose parameters are to be overridden.

Parameters *queue-id* — The queue ID whose parameters are to be overridden.

Values 1 — 32

adaptation-rule

Syntax adaptation-rule [pir *adaptation-rule*]] [cir *adaptation-rule*]]
 no adaptation-rule

Context config>service>apipe>sap>egress>queue-override>queue
 config>service>apipe>sap>ingress>queue-override>queue
 config>service>fpipe>sap>egress>queue-override>queue
 config>service>fpipe>sap>ingress>queue-override>queue
 config>service>ipipe>sap>egress>queue-override>queue
 config>service>ipipe>sap>ingress>queue-override>queue
 config>service>epipe>sap>egress>queue-override>queue
 config>service>epipe>sap>ingress>queue-override>queue

Description	This command can be used to override specific attributes of the specified queue's adaptation rule parameters. The adaptation rule controls the method used by the system to derive the operational CIR and PIR settings when the queue is provisioned in hardware. For the CIR and PIR parameters individually, the system attempts to find the best operational rate depending on the defined constraint. The no form of the command removes any explicitly defined constraints used to derive the operational CIR and PIR created by the application of the policy. When a specific adaptation-rule is removed, the default constraints for rate and cir apply.
Default	no adaptation-rule
Parameters	pir — The pir parameter defines the constraints enforced when adapting the PIR rate defined within the queue queue-id rate command. The pir parameter requires a qualifier that defines the constraint used when deriving the operational PIR for the queue. When the rate command is not specified, the default applies. cir — The cir parameter defines the constraints enforced when adapting the CIR rate defined within the queue queue-id rate command. The cir parameter requires a qualifier that defines the constraint used when deriving the operational CIR for the queue. When the cir parameter is not specified, the default constraint applies. adaptation-rule — Specifies the criteria to use to compute the operational CIR and PIR values for this queue, while maintaining a minimum offset. Values max — The max (maximum) keyword is mutually exclusive with the min and closest options. When max is defined, the operational PIR for the queue will be equal to or less than the administrative rate specified using the rate command. min — The min (minimum) keyword is mutually exclusive with the max and closest options. When min is defined, the operational PIR for the queue will be equal to or greater than the administrative rate specified using the rate command. closest — The closest parameter is mutually exclusive with the min and max parameter. When closest is defined, the operational PIR for the queue will be the rate closest to the rate specified using the rate command.

avg-frame-overhead

Syntax	avg-frame-overhead percent no avg-frame-overhead
Context	config>service>apipe>sap>egress>queue-override>queue config>service>cpipe>sap>egress>queue-override>queue config>service>epipe>sap>egress>queue-override>queue
Description	This command configures the average frame overhead to define the average percentage that the offered load to a queue will expand during the frame encapsulation process before sending traffic on-the-wire. While the avg-frame-overhead value may be defined on any queue, it is only used by the system for queues that egress a Sonet or SDH port or channel. Queues operating on egress Ethernet ports automatically calculate the frame encapsulation overhead based on a 20 byte per packet rule (8 bytes for preamble and 12 bytes for Inter-Frame Gap). When calculating the frame encapsulation overhead for port scheduling purposes, the system determines the following values:

- **Offered-load** — The offered-load of a queue is calculated by starting with the queue depth in octets, adding the received octets at the queue and subtracting queue discard octets. The result is the number of octets the queue has available to transmit. This is the packet based offered-load.
- **Frame encapsulation overhead** — Using the avg-frame-overhead parameter, the frame encapsulation overhead is simply the queue's current offered-load (how much has been received by the queue) multiplied by the avg-frame-overhead. If a queue had an offered load of 10000 octets and the avg-frame-overhead equals 10%, the frame encapsulation overhead would be 10000×0.1 or 1000 octets.

For egress Ethernet queues, the frame encapsulation overhead is calculated by multiplying the number of offered-packets for the queue by 20 bytes. If a queue was offered 50 packets then the frame encapsulation overhead would be 50×20 or 1000 octets.

- **Frame based offered-load** — The frame based offered-load is calculated by adding the offered-load to the frame encapsulation overhead. If the offered-load is 10000 octets and the encapsulation overhead was 1000 octets, the frame based offered-load would equal 11000 octets.
- **Packet to frame factor** — The packet to frame factor is calculated by dividing the frame encapsulation overhead by the queue's offered-load (packet based). If the frame encapsulation overhead is 1000 octets and the offered-load is 10000 octets then the packet to frame factor would be $1000 / 10000$ or 0.1. When in use, the avg-frame-overhead will be the same as the packet to frame factor making this calculation unnecessary.
- **Frame based CIR** — The frame based CIR is calculated by multiplying the packet to frame factor with the queue's configured CIR and then adding that result to that CIR. If the queue CIR is set at 500 octets and the packet to frame factor equals 0.1, the frame based CIR would be 500×1.1 or 550 octets.
- **Frame based within-cir offered-load** — The frame based within-cir offered-load is the portion of the frame based offered-load considered to be within the frame-based CIR. The frame based within-cir offered-load is the lesser of the frame based offered-load and the frame based CIR. If the frame based offered-load equaled 11000 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would be limited to 550 octets. If the frame based offered-load equaled 450 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would equal 450 octets (or the entire frame based offered-load).

As a special case, when a queue or associated intermediate scheduler is configured with a CIR-weight equal to 0, the system automatically sets the queue's frame based within-cir offered-load to 0, preventing it from receiving bandwidth during the port scheduler's within-cir pass.

- **Frame based PIR** — The frame based PIR is calculated by multiplying the packet to frame factor with the queue's configured PIR and then adding the result to that PIR. If the queue PIR is set to 7500 octets and the packet to frame factor equals 0.1, the frame based PIR would be 7500×1.1 or 8250 octets.
- **Frame based within-pir offered-load** — The frame based within-pir offered-load is the portion of the frame based offered-load considered to be within the frame based PIR. The frame based within-pir offered-load is the lesser of the frame based offered-load and the frame based PIR. If the frame based offered-load equaled 11000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered-load would be limited to 8250 octets. If the frame based offered-load equaled 7000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered load would equal 7000 octets.

Port scheduler operation using frame transformed rates — The port scheduler uses the frame based rates to figure the maximum rates that each queue may receive during the within-cir and above-cir

bandwidth allocation passes. During the within-cir pass, a queue may receive up to its frame based within-cir offered-load. The maximum it may receive during the above-cir pass is the difference between the frame based within-pir offered load and the amount of actual bandwidth allocated during the within-cir pass.

SAP and subscriber SLA-profile average frame overhead override — The average frame overhead parameter on a sap-egress may be overridden at an individual egress queue basis. On each SAP and within the sla-profile policy used by subscribers an avg-frame-overhead command may be defined under the queue-override context for each queue. When overridden, the queue instance will use its local value for the average frame overhead instead of the sap-egress defined overhead.

The **no** form of this command restores the average frame overhead parameter for the queue to the default value of 0 percent. When set to 0, the system uses the packet based queue statistics for calculating port scheduler priority bandwidth allocation. If the no avg-frame-overhead command is executed in a queue-override queue id context, the avg-frame-overhead setting for the queue within the sap-egress QoS policy takes effect.

Default 0

Parameters *percent* — This parameter sets the average amount of packet-to-frame encapsulation overhead expected for the queue. This value is not used by the system for egress Ethernet queues.

Values 0.00 — 100.00

cbs

Syntax **cbs** *size-in-kbytes*
no cbs

Context config>service>apipe>sap>egress>queue-override>queue
config>service>apipe>sap>ingress>queue-override>queue
config>service>cpipe>sap>egress>queue-override>queue
config>service>cpipe>sap>ingress>queue-override>queue
config>service>fpipe>sap>egress>queue-override>queue
config>service>fpipe>sap>ingress>queue-override>queue
config>service>ipipe>sap>egress>queue-override>queue
config>service>ipipe>sap>ingress>queue-override>queue
config>service>epipe>sap>egress>queue-override>queue
config>service>epipe>sap>ingress>queue-override>queue

Description This command can be used to override specific attributes of the specified queue's CBS parameters.

It is permissible, and possibly desirable, to oversubscribe the total CBS reserved buffers for a given access port egress buffer pool. Oversubscription may be desirable due to the potential large number of service queues and the economy of statistical multiplexing the individual queue's CBS setting into the defined reserved total.

When oversubscribing the reserved total, it is possible for a queue depth to be lower than its CBS setting and still not receive a buffer from the buffer pool for an ingress frame. As more queues are using their CBS buffers and the total in use exceeds the defined reserved total, essentially the buffers are being removed from the shared portion of the pool without the shared in use average and total counts being decremented. This can affect the operation of the high and low priority RED slopes on the pool,

causing them to miscalculate when to start randomly to drop packets. If the CBS value is larger than the MBS value, an error will occur, preventing the CBS change.

The **no** form of this command returns the CBS size to the default value.

Default no cbs

Parameters *size-in-kbytes* — The size parameter is an integer expression of the number of kilobytes reserved for the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that no reserved buffers are required by the queue (a minimal reserved size can still be applied for scheduling purposes).

Values 0 — 131072, default

high-prio-only

Syntax **high-prio-only** *percent*
no high-prio-only

Context config>service>apipe>sap>egress>queue-override>queue
config>service>apipe>sap>ingress>queue-override>queue
config>service>cpipe>sap>egress>queue-override>queue
config>service>cpipe>sap>ingress>queue-override>queue
config>service>fpipe>sap>egress>queue-override>queue
config>service>fpipe>sap>ingress>queue-override>queue
config>service>ipipe>sap>egress>queue-override>queue
config>service>ipipe>sap>ingress>queue-override>queue
config>service>epipe>sap>egress>queue-override>queue
config>service>epipe>sap>ingress>queue-override>queue

Description This command can be used to override specific attributes of the specified queue's high-prio-only parameters. The **high-prio-only** command configures the percentage of buffer space for the queue, used exclusively by high priority packets.

The priority of a packet can only be set in the SAP ingress QoS policy and is only applicable on the ingress queues for a SAP. The **high-prio-only** parameter is used to override the default value derived from the **network-queue** command.

The defined **high-prio-only** value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the **high-prio-only** value larger than the current MBS size will also result in an error and fail execution.

The **no** form of this command restores the default high priority reserved size.

Parameters *percent* — The *percent* parameter is the percentage reserved for high priority traffic on the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that none of the MBS of the queue will be reserved for high priority traffic. This does not affect RED slope operation for packets attempting to be queued.

Values 0 — 100, default

mbs

Syntax	mbs { <i>size-in-kbytes</i> default } no mbs
Context	config>service>apipe>sap>ingress>queue-override>queue config>service>cpipe>sap>ingress>queue-override>queue config>service>fpipe>sap>ingress>queue-override>queue config>service>ipipe>sap>ingress>queue-override>queue config>service>epipe>sap>ingress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's MBS parameters. The MBS value is used by a queue to determine whether it has exhausted all of its buffers while enqueueing packets. Once the queue has exceeded the amount of buffers allowed by MBS, all packets are discarded until packets have been drained from the queue. The sum of the MBS for all queues on an ingress access port can oversubscribe the total amount of buffering available. When congestion occurs and buffers become scarce, access to buffers is controlled by the RED slope a packet is associated with. A queue that has not exceeded its MBS size is not guaranteed that a buffer will be available when needed or that the packet's RED slope will not force the discard of the packet. Setting proper CBS parameters and controlling CBS oversubscription is one major safeguard to queue starvation (when a queue does not receive its fair share of buffers). Another is properly setting the RED slope parameters for the needs of services on this port or channel. If the CBS value is larger than the MBS value, an error will occur, preventing the MBS change. The defined high-prio-only value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the high-prio-only value larger than the current MBS size will also result in an error and fail execution. The no form of this command returns the MBS size assigned to the queue to the default value.
Default	default
Parameters	<i>size-in-kbytes</i> — The size parameter is an integer expression of the maximum number of kilobytes of buffering allowed for the queue. For a value of 100 kbps, enter the value 100. A value of 0 causes the queue to discard all packets. Values 0 — 131072 or default

rate

Syntax	rate <i>pir-rate</i> [<i>cir cir-rate</i>] no rate
Context	config>service>apipe>sap>egress>queue-override>queue config>service>apipe>sap>ingress>queue-override>queue config>service>cpipe>sap>egress>queue-override>queue config>service>cpipe>sap>ingress>queue-override>queue config>service>fpipe>sap>egress>queue-override>queue config>service>fpipe>sap>ingress>queue-override>queue config>service>ipipe>sap>egress>queue-override>queue

```
config>service>ipipe>sap>ingress>queue-override>queue
config>service>epipe>sap>egress>queue-override>queue
config>service>epipe>sap>ingress>queue-override>queue
```

Description	This command can be used to override specific attributes of the specified queue's Peak Information Rate (PIR) and the Committed Information Rate (CIR) parameters. The PIR defines the maximum rate that the queue can transmit packets out an egress interface (for SAP egress queues). Defining a PIR does not necessarily guarantee that the queue can transmit at the intended rate. The actual rate sustained by the queue can be limited by oversubscription factors or available egress bandwidth. The CIR defines the rate at which the system prioritizes the queue over other queues competing for the same bandwidth. In-profile packets are preferentially queued by the system at egress and at subsequent next hop nodes where the packet can traverse. To be properly handled as in- or out-of-profile throughout the network, the packets must be marked accordingly for profiling at each hop. The CIR can be used by the queue's parent commands <i>cir-level</i> and <i>cir-weight</i> parameters to define the amount of bandwidth considered to be committed for the child queue during bandwidth allocation by the parent scheduler. The rate command can be executed at any time, altering the PIR and CIR rates for all queues created through the association of the SAP egress QoS policy with the <i>queue-id</i>. The no form of the command returns all queues created with the <i>queue-id</i> by association with the QoS policy to the default PIR and CIR parameters (max, 0).
Default	rate max cir 0 — The max default specifies the amount of bandwidth in kilobits per second (thousand bits per second). The max value is mutually exclusive to the pir-rate value.
Parameters	<i>pir-rate</i> — Defines the administrative PIR rate, in kilobits, for the queue. When the rate command is executed, a valid PIR setting must be explicitly defined. When the rate command has not been executed, the default PIR of max is assumed. Fractional values are not allowed and must be given as a positive integer. The actual PIR rate is dependent on the queue's adaptation-rule parameters and the actual hardware where the queue is provisioned. Values 1 — 100000000 Default max <i>cir-rate</i> — The cir parameter overrides the default administrative CIR used by the queue. When the rate command is executed, a CIR setting is optional. When the rate command has not been executed or the cir parameter is not explicitly specified, the default CIR (0) is assumed. Fractional values are not allowed and must be given as a positive integer. The sum keyword specifies that the CIR be used as the summed CIR values of the children schedulers or queues. Values 0 — 100000000, max, sum Default 0

scheduler-override

Syntax [no] scheduler-override

Context config>service>apipe>sap>egress
 config>service>apipe>sap>ingress
 config>service>cpipe>sap>egress
 config>service>cpipe>sap>ingress
 config>service>fpipe>sap>egress
 config>service>fpipe>sap>ingress
 config>service>ipipe>sap>egress
 config>service>ipipe>sap>ingress
 config>service>epipe>sap>egress
 config>service>epipe>sap>ingress

Description This command specifies the set of attributes whose values have been overridden via management on this virtual scheduler. Clearing a given flag will return the corresponding overridden attribute to the value defined on the SAP's ingress scheduler policy.

scheduler

Syntax	[no] scheduler <i>scheduler-name</i>
Context	config>service>apipe>sap>egress>sched-override config>service>apipe>sap>ingress>sched-override config>service>cpipe>sap>egress>sched-override config>service>cpipe>sap>ingress>sched-override config>service>fpipe>sap>egress>sched-override config>service>fpipe>sap>ingress>sched-override config>service>ipipe>sap>egress>sched-override config>service>ipipe>sap>ingress>sched-override config>service>epipe>sap>egress>sched-override config>service>epipe>sap>ingress>sched-override
Description	This command can be used to override specific attributes of the specified scheduler name. A scheduler defines bandwidth controls that limit each child (other schedulers and queues) associated with the scheduler. Scheduler objects are created within the hierarchical tiers of the policy. It is assumed that each scheduler created will have queues or other schedulers defined as child associations. The scheduler can be a child (take bandwidth from a scheduler in a higher tier, except for schedulers created in tier 1). A total of 32 schedulers can be created within a single scheduler policy with no restriction on the distribution between the tiers. Each scheduler must have a unique name within the context of the scheduler policy; however the same name can be reused in multiple scheduler policies. If <i>scheduler-name</i> already exists within the policy tier level (regardless of the inclusion of the keyword create), the context changes to that scheduler name for the purpose of editing the scheduler parameters. Modifications made to an existing scheduler are executed on all instantiated schedulers created through association with the policy of the edited scheduler. This can cause queues or schedulers to become orphaned (invalid parent association) and adversely affect the ability of the system to enforce service level agreements (SLAs). If the <i>scheduler-name</i> exists within the policy on a different tier (regardless of the inclusion of the keyword create), an error occurs and the current CLI context will not change. If the <i>scheduler-name</i> does not exist in this or another tier within the scheduler policy, it is assumed that an attempt is being made to create a scheduler of that name. The success of the command execution is dependent on the following: 1. The maximum number of schedulers has not been configured. 2. The provided <i>scheduler-name</i> is valid. 3. The create keyword is entered with the command if the system is configured to require it (enabled in the environment create command). When the maximum number of schedulers has been exceeded on the policy, a configuration error occurs and the command will not execute, nor will the CLI context change. If the provided scheduler-name is invalid according to the criteria below, a name syntax error will occur, the command will not execute, and the CLI context will not change.

Parameters	<i>scheduler-name</i> — The name of the scheduler.
Values	Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.
Default	None. Each scheduler must be explicitly created.
create	— This optional keyword explicitly specifies that it is acceptable to create a scheduler with the given <i>scheduler-name</i> . If the create keyword is omitted, scheduler-name is not created when the system environment variable <i>create</i> is set to true. This safeguard is meant to avoid accidental creation of system objects (such as schedulers) while attempting to edit an object with a mistyped name or ID. The keyword has no effect when the object already exists.

rate

Syntax	rate <i>pir-rate</i> [cir <i>cir-rate</i>] no rate
Context	config>service>apipe>sap>egress>sched-override>scheduler config>service>apipe>sap>ingress>sched-override>scheduler config>service>cpipe>sap>egress>sched-override>scheduler config>service>cpipe>sap>ingress>sched-override>scheduler config>service>fpipe>sap>egress>sched-override>scheduler config>service>fpipe>sap>ingress>sched-override>scheduler config>service>ipipe>sap>egress>sched-override>scheduler config>service>ipipe>sap>ingress>sched-override>scheduler config>service>epipe>sap>egress>sched-override>scheduler config>service>epipe>sap>ingress>sched-override>scheduler
Description	This command can be used to override specific attributes of the specified scheduler rate. The rate command defines the maximum bandwidth that the scheduler can offer its child queues or schedulers. The maximum rate is limited to the amount of bandwidth the scheduler can receive from its parent scheduler. If the scheduler has no parent, the maximum rate is assumed to be the amount available to the scheduler. When a parent is associated with the scheduler, the CIR parameter provides the amount of bandwidth to be considered during the parent scheduler's 'within CIR' distribution phase. The actual operating rate of the scheduler is limited by bandwidth constraints other than its maximum rate. The scheduler's parent scheduler may not have the available bandwidth to meet the scheduler's needs or the bandwidth available to the parent scheduler could be allocated to other child schedulers or child queues on the parent based on higher priority. The children of the scheduler may not need the maximum rate available to the scheduler due to insufficient offered load or limits to their own maximum rates. When a scheduler is defined without specifying a rate, the default rate is max. If the scheduler is a root scheduler (no parent defined), the default maximum rate must be changed to an explicit value. Without this explicit value, the scheduler will assume that an infinite amount of bandwidth is available and allow all child queues and schedulers to operate at their maximum rates. The no form of this command returns all queues created with this <i>queue-id</i> by association with the QoS policy to the default PIR and CIR parameters.

Parameters	<i>pir-rate</i> — The pir parameter accepts a step multiplier value that specifies the multiplier used to determine the PIR rate at which the queue will operate. A value of 0 to 100000000 or the keyword max or sum is accepted. Any other value will result in an error without modifying the current PIR rate. To calculate the actual PIR rate, the rate described by the queue's rate is multiplied by the <i>pir-rate</i>. The SAP ingress context for PIR is independent of the defined forwarding class (fc) for the queue. The default pir and definable range is identical for each class. The PIR in effect for a queue defines the maximum rate at which the queue will be allowed to forward packets in a given second, thus shaping the queue's output. The PIR parameter for SAP ingress queues do not have a negate (no) function. To return the queues PIR rate to the default value, that value must be specified as the PIR value. Values 1 — 100000000, max Default max
	<i>cir</i> <i>cir-rate</i> — The cir parameter accepts a step-multiplier value that specifies the multiplier used to determine the CIR rate at which the queue will operate. A value of 0 to 250 or the keyword max is accepted. Any other value will result in an error without modifying the current CIR rate. To calculate the actual CIR rate, the rate described by the rate pir <i>pir-rate</i> is multiplied by the <i>cir</i> <i>cir-rate</i>. If the cir is set to max, then the CIR rate is set to infinity. The SAP ingress context for CIR is dependent on the defined forwarding class (fc) for the queue. The default CIR and definable range is different for each class. The CIR in effect for a queue defines both its profile (in or out) marking level as well as the relative importance compared to other queues for scheduling purposes during congestion periods. Values 0 — 100000000, max, sum Default sum

scheduler-policy

Syntax	scheduler-policy <i>scheduler-policy-name</i> no scheduler-policy
Context	<pre> config>service>apipe>sap>ingress config>service>apipe>sap>egress config>service>cpipe>sap>ingress config>service>cpipe>sap>egress config>service>fpipe>sap>ingress config>service>fpipe>sap>egress config>service>ipipe>sap>ingress config>service>ipipe>sap>egress config>service>epipe>sap>ingress config>service>epipe>sap>egress </pre>
Description	This command applies an existing scheduler policy to an ingress or egress scheduler used by SAP queues associated with this multi-service customer site. The schedulers defined in the scheduler policy can only be created once the customer site has been appropriately assigned to a chassis port,

channel or slot. Scheduler policies are defined in the **config>qos>scheduler-policy** *scheduler-policy-name* context.

The **no** form of this command removes the configured ingress or egress scheduler policy from the multi-service customer site. When the policy is removed, the schedulers created due to the policy are removed also making them unavailable for the ingress SAP queues associated with the customer site. Queues that lose their parent scheduler association are deemed to be orphaned and are no longer subject to a virtual scheduler. The SAPs that have ingress queues reliant on the removed schedulers enter into an operational state depicting the orphaned status of one or more queues. When the **no scheduler-policy** command is executed, the customer site ingress or egress node will not contain an applied scheduler policy.

scheduler-policy-name — The *scheduler-policy-name* parameter applies an existing scheduler policy that was created in the **config>qos>scheduler-policy** *scheduler-policy-name* context to create the hierarchy of ingress or egress virtual schedulers. The scheduler names defined within the policy are created and made available to any ingress or egress queues created on associated SAPs.

vlan-translation

Syntax	vlan-translation { <i>vlan-id</i> copy-outer } no vlan-translation
Context	config>service>epipe>sap>ingress
Description	This command configures ingress VLAN translation. If enabled with an explicit VLAN value, the preserved vlan-id will be overwritten with this value. This setting is applicable to dot1q encapsulated ports. If enabled with “copy-outer” keyword, the outer vlan-id will be copied to inner position on QinQ encapsulated ports. The feature is not supported on default-dot1q saps (1/1/1:* and 1/1/1:0), nor on TopQ saps. The no version of the command sets the default value and no action will be taken.
Default	Per default, the preserved VLAN values will not be overwritten.
Parameters	<i>vlan-id</i> — Specifies that the preserved vlan-id will be overwritten with this value. Values 0 — 4094 outer-copy — Keyword specifies to use the outer VLAN ID.

match-qinq-dot1p

Syntax	match-qinq-dot1p { top bottom } no match-qinq-dot1p de
Context	config>service>ipipe>sap>ingress config>service>epipe>sap>ingress
Description	This command specifies which Dot1Q tag position Dot1P bits in a QinQ encapsulated packet should be used to evaluate Dot1P QoS classification.

The **match-qinq-dot1p** command allows the top or bottom PBits to be used when evaluating the applied sap-ingress QoS policy's Dot1P entries. The **top** and **bottom** keywords specify which position should be evaluated for QinQ encapsulated packets.

The mandatory **de** keyword is added to the above command line to specify on a per SAP basis the source for the DE bit. The **de** keyword is effective if there is an explicit command in the sap ingress policy that specifies the use of DE bit for QoS Classification – for example, **de-1-out-profile**.

Otherwise the rules for the matching of dot1p bits will apply the same way for the DE bit whenever the usage is activated explicitly. The text is updated to include the DE bit in the header of the tables next to the dot1p bits.

The **no** form of this command reverts the dot1p and de bits matching to the default tag.

By default, the bottom most service delineating Dot1Q tags Dot1P bits are used. [Table 10](#) defines the default behavior for Dot1P evaluation when the **match-qinq-dot1p** command is not executed.

Table 10: Default QinQ and TopQ SAP Dot1P Evaluation

Port / SAP Type	Existing Packet Tags	PBits Used for Match
Null	None	None
Null	Dot1P (VLAN-ID 0)	Dot1P PBits
Null	Dot1Q	Dot1Q PBits
Null	TopQ BottomQ	TopQ PBits
Null	TopQ (No BottomQ)	TopQ PBits
Dot1Q	None (Default SAP)	None
Dot1Q	Dot1P (Default SAP VLAN-ID 0)	Dot1P PBits
Dot1Q	Dot1Q	Dot1Q PBits
QinQ / TopQ	TopQ	TopQ PBits
QinQ / TopQ	TopQ BottomQ	TopQ PBits
QinQ / QinQ	TopQ BottomQ	BottomQ PBits

Default no match-qinq-dot1p (no filtering based on p-bits)
(top or bottom must be specified to override the default QinQ dot1p behavior)

Parameters **top** — The top parameter is mutually exclusive to the bottom parameter. When the top parameter is specified, the top most PBits are used (if existing) to match any dot1p dot1p-value entries. The following table defines the dot1p evaluation behavior when the top parameter is specified.

Port / SAP Type	Existing Packet Tags	PBits Used for Match
Null	None	None
Null	Dot1P (VLAN-ID 0)	Dot1P PBits
Null	Dot1Q	Dot1Q PBits
Null	TopQ BottomQ	TopQ PBits

Port / SAP Type	Existing Packet Tags	PBits Used for Match
Null	TopQ (No BottomQ)	TopQ PBits
Dot1Q	None (Default SAP)	None
Dot1Q	Dot1P (Default SAP VLAN-ID 0)	Dot1P PBits
Dot1Q	Dot1Q	Dot1Q PBits
QinQ / TopQ	TopQ	TopQ PBits
QinQ / TopQ	TopQ BottomQ	TopQ PBits
QinQ / TopQ	TopQ BottomQ	TopQ PBits

bottom — The bottom parameter is mutually exclusive to the top parameter. When the bottom parameter is specified, the bottom most PBits are used (if existing) to match any dot1p dot1p-value entries. The following table defines the dot1p evaluation behavior when the bottom parameter is specified.

Table 11: Bottom Position QinQ and TopQ SAP Dot1P Evaluation

Port / SAP Type	Existing Packet Tags	PBits Used for Match
Null	None	None
Null	Dot1P (VLAN-ID 0)	Dot1P PBits
Null	Dot1Q	Dot1Q PBits
Null	TopQ BottomQ	BottomQ PBits
Null	TopQ (No BottomQ)	TopQ PBits
Dot1Q	None (Default SAP)	None
Dot1Q	Dot1P (Default SAP VLAN-ID 0)	Dot1P PBits
Dot1Q	Dot1Q	Dot1Q PBits
QinQ / TopQ	TopQ	TopQ PBits
QinQ / TopQ	TopQ BottomQ	BottomQ PBits
QinQ / QinQ	TopQ BottomQ	BottomQ PBits

Egress SAP Type	Ingress Packet Preserved Dot1P State	Marked (or Remarked) PBits
Null	No preserved Dot1P bits	None
Null	Preserved Dot1P bits	Preserved tag PBits remarked using dot1p-value
Dot1Q	No preserved Dot1P bits	New PBits marked using dot1p-value

Egress SAP Type	Ingress Packet Preserved Dot1P State	Marked (or Remarked) PBits
Dot1Q	Preserved Dot1P bits	Preserved tag PBits remarked using dot1p-value
TopQ	No preserved Dot1P bits	TopQ PBits marked using dot1p-value
TopQ	Preserved Dot1P bits (used as TopQ and BottomQ PBits)	TopQ PBits marked using dot1p-value, BottomQ PBits preserved
QinQ	No preserved Dot1P bits	TopQ PBits and BottomQ PBits marked using dot1p-value
QinQ	Preserved Dot1P bits (used as TopQ and BottomQ PBits)	TopQ PBits and BottomQ PBits marked using dot1p-value

The QinQ and TopQ SAP PBit marking follows the default behavior defined in the table above when **qinq-mark-top-only** is not specified.

The dot1p *dot1p-value* command must be configured without the qinq-mark-top-only parameter to remove the TopQ PBits only marking restriction.

VLL Frame Relay Commands

frame-relay

Syntax	frame-relay
Context	config>service>apipe>sap config>service>fpipe>sap config>service>ipipe>sap config>service>epipe>sap
Description	This command enables the context to configure Frame Relay parameters.

frf-12

Syntax	[no] frf-12
Context	config>service>fpipe>sap>frame-relay config>service>ipipe>sap>frame-relay config>service>epipe>sap>frame-relay
Description	This command enables the use of FRF12 headers. The no form of the command disables the use of FRF12 headers.

ete-fragment-threshold

Syntax	ete-fragment-threshold <i>threshold</i> no ete-fragment-threshold
Context	config>service>fpipe>sap>frame-relay>frf-12 config>service>ipipe>sap>frame-relay>frf-12 config>service>epipe>sap>frame-relay>frf-12
Description	This command specifies the maximum length of a fragment to be transmitted. The no form of the command reverts to the default.
Parameters	<i>threshold</i> — The maximum length of a fragment to be transmitted.
Values	128 — 512
Default	0

interleave

Syntax	[no] interleave
Context	config>service>epipe>sap>frame-relay>frf.12 config>service>ipipe>sap>frame-relay>frf.12
Description	This command enables interleaving of high priority frames and low-priority frame fragments within a FR SAP using FRF.12 end-to-end fragmentation. When this option is enabled, only frames of the FR SAP non expedited forwarding class queues are subject to fragmentation. The frames of the FR SAP expedited queues are interleaved, with no fragmentation header, among the fragmented frames. In effect, this provides a behavior like in MLPPP Link Fragment Interleaving (LFI). When this option is disabled, frames of all the FR SAP forwarding class queues are subject to fragmentation. The fragmentation header is however not included when the frame size is smaller than the user configured fragmentation size. In this mode, the SAP transmits all fragments of a frame before sending the next full or fragmented frame. The receive direction of the FR SAP supports both modes of operation concurrently, with and without fragment interleaving. The no form of this command restores the default mode of operation.
Default	no interleave

scheduling-class

Syntax	scheduling-class <i>class-id</i>
Description	config>service>apipe>sap>frame-relay config>service>fpipe>sap>frame-relay config>service>ipipe>sap>frame-relay

config>service>epipe>sap>frame-relay

Description This command specifies the scheduling class to use for this SAP.

Parameters *class-id* — Specifies the scheduling class to use for this sap.

Values 0 — 3

Default 0

VLL SDP Commands

spoke-sdp

Syntax	spoke-sdp <i>sdp-id[:vc-id]</i> [vc-type { ether vlan }] [no-endpoint] spoke-sdp <i>sdp-id[:vc-id]</i> [vc-type { ether vlan }] endpoint <i>endpoint-name</i> [icb] no spoke-sdp <i>sdp-id[:vc-id]</i>
Context	config>service>epipe
Description	This command binds a service to an existing Service Distribution Point (SDP). A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received. The SDP has an operational state which determines the operational state of the SDP within the service. For example, if the SDP is administratively or operationally down, the SDP for the service will be down. The SDP must already be defined in the config>service>sdp context in order to associate an SDP with an Epipe, VPLS, VPRN, VPRN service. If the sdp sdp-id is not already configured, an error message is generated. If the <i>sdp-id</i> does exist, a binding between that <i>sdp-id</i> and the service is created. SDPs must be explicitly associated and bound to a service. If an SDP is not bound to a service, no far-end 7750 SR devices can participate in the service. The no form of this command removes the SDP binding from the service. The SDP configuration is not affected; only the binding of the SDP to a service. Once removed, no packets are forwarded to the far-end router.
Default	No <i>sdp-id</i> is bound to a service.
Special Cases	Epipe — At most, only one <i>sdp-id</i> can be bound to an Epipe service. Since an Epipe is a point-to-point service, it can have, at most, two end points. The two end points can be one SAP and one SDP or two SAPs. Vc-switching VLLs are an exception. If the VLL is a “vc-switching” VLL, then the two endpoints must both be SDPs.
Parameters	<i>sdp-id</i> — The SDP identifier. Allowed values are integers in the range of 1 to 17407 for existing SDPs. <i>vc-id</i> — The virtual circuit identifier. Values 1 — 4294967295 vc-type — This command overrides the default VC type signaled for the spoke or mesh binding to the far end of the SDP. The VC type is a 15 bit-quantity containing a value which represents the type of VC. The actual signaling of the VC type depends on the signaling parameter defined for the SDP. If signaling is disabled, the vc-type command can still be used to define the dot1q value expected by the far-end provider equipment. A change of the bindings VC type causes the binding to signal the new VC type to the far end when signaling is enabled. VC types are derived according to IETF <i>draft-martini-l2circuit-trans-mpls</i>. • The VC type value for Ethernet is 0x0005.

- The VC type value for an Ethernet VLAN is 0x0004.
- The VC type value for a VPLS service is defined as 0x000B.

Values ethernet

ether — Defines the VC type as Ethernet. The **ethernet** and **vlan** keywords are mutually exclusive. When the VC type is not defined then the default is Ethernet for spoke SDP bindings. Defining Ethernet is the same as executing **no vc-type** and restores the default VC type for the spoke SDP binding.

vlan — Defines the VC type as VLAN. The **ethernet** and **vlan** keywords are mutually exclusive. When the VC type is not defined then the default is Ethernet for spoke SDP bindings. The VLAN VC-type requires at least one dot1Q tag within each encapsulated Ethernet packet transmitted to the far end.

no endpoint — Removes the association of a spoke SDP with an explicit endpoint name.

endpoint *endpoint-name* — Specifies the name of the service endpoint.

icb — Configures the spoke SDP as an inter-chassis backup SDP binding.

spoke-sdp

Syntax	spoke-sdp <i>sdp-id[:vc-id]</i> [no-endpoint] spoke-sdp <i>sdp-id[:vc-id]</i> endpoint <i>endpoint-name</i> [icb] no spoke-sdp <i>sdp-id[:vc-id]</i>
Context	config>service>apipe config>service>cpipe config>service>fpipe config>service>ipipe
Description	This command binds a service to an existing Service Distribution Point (SDP). A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received. The SDP has an operational state which determines the operational state of the SDP within the service. For example, if the SDP is administratively or operationally down, the SDP for the service will be down. The SDP must already be defined in the config>service>sdp context in order to associate an SDP with a service. If the sdp <i>sdp-id</i> is not already configured, an error message is generated. If the <i>sdp-id</i> does exist, a binding between that <i>sdp-id</i> and the service is created. SDPs must be explicitly associated and bound to a service. If an SDP is not bound to a service, no far-end SR/ESS devices can participate in the service. The no form of this command removes the SDP binding from the service. The SDP configuration is not affected; only the binding of the SDP to a service. Once removed, no packets are forwarded to the far-end router.
Default	No <i>sdp-id</i> is bound to a service.

Parameters	<i>sdp-id</i> — The SDP identifier. Allowed values are integers in the range of 1 to 17407 for existing SDPs. <i>vc-id</i> — The virtual circuit identifier. Values 1 — 4294967295 no endpoint — Adds or removes a spoke SDP association. endpoint <i>endpoint-name</i> — Specifies the name of the service endpoint. icb — Configures the spoke SDP as an inter-chassis backup SDP binding.

cell-concatenation

Syntax	cell-concatenation
Context	config>service>apipe>spoke-sdp
Description	This command enables the context to provide access to the various options that control the termination of ATM cell concatenation into an MPLS frame. Several options can be configured simultaneously. The concatenation process for a given MPLS packet ends when the first concatenation termination condition is met. The concatenation parameters apply only to ATM N:1 cell mode VLL.

aal5-frame-aware

Syntax	[no] aal5-frame-aware
Context	config>service>apipe>spoke-sdp>cell-concat
Description	This command enables the configuration of AAL5 end-of-message (EOM) to be an indication to complete the cell concatenation operation. The no form of the command resets the configuration to ignore the AAL5 EOM as an indication to complete the cell concatenation.

clp-change

Syntax	[no] clp-change
Context	config>service>apipe>spoke-sdp>cell-concat
Description	This command enables the configuration of CLP change to be an indication to complete the cell concatenation operation. The no form of the command resets the configuration to ignore the CLP change as an indication to complete the cell concatenation.

max-cells

Syntax	max-cells <i>cell-count</i> no max-cells [<i>cell-count</i>]
Context	config>service>apipe>spoke-sdp>cell-concat
Description	This command enables the configuration of the maximum number of ATM cells to accumulate into an MPLS packet. The remote peer will also signal the maximum number of concatenated cells it is willing to accept in an MPLS packet. When the lesser of (the configured value and the signaled value) number of cells is reached, the MPLS packet is queued for transmission onto the pseudowire. It is ensured that the MPLS packet MTU conforms to the configured service MTU. The no form of this command sets max-cells to the value '1' indicating that no concatenation will be performed.
Parameters	<i>cell-count</i> — Specify the maximum number of ATM cells to be accumulated into an MPLS packet before queueing the packet for transmission onto the pseudowire. Values 1 — 128 Default 1

max-delay

Syntax	max-delay <i>delay-time</i> no max-delay [<i>delay-time</i>]
Context	config>service>apipe>spoke-sdp>cell-concat
Description	This command enables the configuration of the maximum amount of time to wait while performing ATM cell concatenation into an MPLS packet before transmitting the MPLS packet. This places an upper bound on the amount of delay introduced by the concatenation process. When this amount of time is reached from when the first ATM cell for this MPLS packet was received, the MPLS packet is queued for transmission onto the pseudowire. The no form of this command resets max-delay to its default value.
Parameters	<i>delay-time</i> — Specify the maximum amount of time, in hundreds of microseconds, to wait before transmitting the MPLS packet with whatever ATM cells have been received. For example, to bound the delay to 1 ms the user would configure 10 (hundreds of microseconds). The delay-time is rounded up to one of the following values 1, 5, 10, 50, 100, 200, 300 and 400. Values 1 — 400 Default 400

control-word

Syntax	[no] control-word
Context	<pre>config>service>apipe>spoke-sdp config>service>epipe>spoke-sdp config>service>fpipe>spoke-sdp config>service>ipipe>spoke-sdp config>service>cpipe>spoke-sdp</pre>
Default	The control word command provides the option to add a control word as part of the packet encapsulation for pseudowire types for which the control word is optional. These are Ethernet pseudowires (Epipe). ATM N:1 cell mode pseudowires (apipe vc-types atm-vcc and atm-vpc) and VT pseudowire (apipe vc-type atm-cell). The configuration for the two directions of the pseudowire must match because the control word negotiation procedures described in Section 6.2 of RFC 4447 are not supported. The C-bit in the pseudowire FEC sent in the label mapping message is set to 1 when the control word is enabled. Otherwise, it is set to 0. The service will only come up if the same C-bit value is signaled in both directions. If a spoke-sdp is configured to use the control word but the node receives a label mapping message with a C-bit clear, the node releases the label with the an “Illegal C-bit” status code as per Section 6.1 of RFC 4447. As soon as the user also enabled the control the remote peer, the remote peer will withdraw its original label and will send a label mapping with the C-bit set to 1 and the VLL service will be up in both nodes.

egress

Syntax	egress <pre>config>service>apipe>spoke-sdp config>service>cpipe>spoke-sdp config>service>fpipe>spoke-sdp config>service>ipipe>spoke-sdp</pre>
Description	This command configures the egress SDP context.

hash-label

Syntax	[no] hash-label
Context	<pre>config>service>epipe>spoke-sdp config>service>fpipe>spoke-sdp config>service>ipipe>spoke-sdp</pre>
Description	This command enables the use of the hash label on a VLL, VPLS, or VPRN service bound to LDP or RSVP SDP as well as to a VPRN service using the autobind mode with the with the ldp, rsvp-te, or mpls options. This feature is not supported on a service bound to a GRE SDP or for a VPRN service using the autobind mode with the gre option..

When this feature is enabled, the ingress data path is modified such that the result of the hash on the packet header is communicated to the egress data path for use as the value of the label field of the hash label. The egress data path appends the hash label at the bottom of the stack (BoS) and sets the S-bit to 1 to indicate that.

In order to allow for applications whereby the egress LER infers the presence of the Hash Label implicitly from the value of the label, the Most Significant Bit (MSB) of the result of the hash is set before copying into the Hash Label. This means that the value of the hash label will always be in the range [524,288 - 1,048,575] and will not overlap with the signaled/static LSP and signaled/static service label ranges. This also guarantees that the hash label will not match a value in the reserved label range.

The (unmodified) result of the hash continues to be used for the purpose of ECMP and LAG spraying of packets locally on the ingress LER. Note however that for VLL services, the result of the hash is overwritten and the ECMP and LAG spraying will be based on service-id when ingress SAP shared queuing is not enabled. However, the hash label will still reflect the result of the hash such that an LSR can use it to perform fine grained load balancing of VLL pseudowire packets.

Packets that are generated in CPM and forwarded labeled within the context of a service (for example, OAM packets) must also include a Hash Label at the BoS and set the S-bit accordingly.

The TTL of the Hash Label is set to a value of 1.

The **no** form of this command disables the use of the hash label.

Default no hash-label

ingress

Syntax ingress

Context config>service>fpipe>spoke-sdp
config>service>apipe>spoke-sdp
config>service>cpipe>spoke-sdp

Description This command configures the ingress SDP context.

filter

Syntax	filter [ip <i>ip-filter-id</i>] no filter
Context	config>service>fpipe>spoke-sdp>egress config>service>fpipe>spoke-sdp>ingress
Description	This command associates an IP filter policy with an ingress or egress Service Distribution Point (SDP). Filter policies control the forwarding and dropping of packets based on IP matching criteria. Only one filter can be applied to a spoke SDP at a time. The filter command is used to associate a filter policy with a specified <i>ip-filter-id</i> with an ingress or egress spoke SDP. The <i>ip-filter-id</i> must already be defined before the filter command is executed. If the filter policy does not exist, the operation will fail and an error message returned. IP filters apply only to RFC 2427-routed IP packets. Frames that do not contain IP packets will not be subject to the filter and will always be passed, even if the filter's default action is to drop. The no form of this command removes any configured filter ID association with the SDP. The filter ID itself is not removed from the system unless the scope of the created filter is set to local. To avoid deletion of the filter ID and only break the association with the service object, use the scope command within the filter definition to change the scope to local or global. The default scope of a filter is local.
Parameters	ip — Keyword indicating the filter policy is an IP filter. <i>ip-filter-id</i> — The filter name acts as the ID for the IP filter policy. The filter ID must already exist within the created IP filters. Values 1 — 65535

vc-label

Syntax	[no] vc-label <i>vc-label</i>
Context	config>service>fpipe>spoke-sdp>egress config>service>apipe>spoke-sdp>egress config>service>cpipe>spoke-sdp>egress config>service>ipipe>spoke-sdp>egress
Description	This command configures the egress VC label.
Parameters	<i>vc-label</i> — A VC egress value that indicates a specific connection. Values 16 — 1048575

vc-label

Syntax	[no] vc-label <i>vc-label</i>
Context	config>service>apipe>spoke-sdp>ingress config>service>cpipe>spoke-sdp>ingress config>service>fpipe>spoke-sdp>ingress config>service>ipipe>spoke-sdp>ingress
Description	This command configures the ingress VC label.
Parameters	<i>vc-label</i> — A VC ingress value that indicates a specific connection.
Values	2048 — 18431

precedence

Syntax	precedence [<i>precedence-value</i> primary] no precedence
Context	config>service>apipe>spoke-sdp config>service>cpipe>spoke-sdp config>service>fpipe>spoke-sdp config>service>ipipe>spoke-sdp config>service>epipe>spoke-sdp
Description	This command specifies the precedence of the SDP binding when there are multiple SDP bindings attached to one service endpoint. The value of zero can only be assigned to one SDP bind making it the primary SDP bind. When an SDP binding goes down, the next highest precedence SDP binding will begin to forward traffic. The no form of the command returns the precedence value to the default.
Default	4
Parameters	<i>precedence-value</i> — Specifies the spoke SDP precedence.
Values	1 — 4
	primary — Specifies to make this the primary spoke SDP.

vc-label

Syntax	[no] vc-label <i>vc-label</i>
Context	config>service>epipe>spoke-sdp>egress
Description	This command configures the egress VC label.
Parameters	<i>vc-label</i> — A VC egress value that indicates a specific connection.
Values	16 — 1048575

vc-label

Syntax	[no] vc-label <i>vc-label</i>
Context	config>service>epipe>spoke-sdp>ingress
Description	This command configures the ingress VC label.
Parameters	<i>vc-label</i> — A VC ingress value that indicates a specific connection.
Values	2048 — 18431

vlan-vc-tag

Syntax	vlan-vc-tag <i>0..4094</i> no vlan-vc-tag [<i>0..4094</i>]
Context	config>service>epipe>spoke-sdp
Description	This command specifies an explicit dot1q value used when encapsulating to the SDP far end. When signaling is enabled between the near and far end, the configured dot1q tag can be overridden by a received TLV specifying the dot1q value expected by the far end. This signaled value must be stored as the remote signaled dot1q value for the binding. The provisioned local dot1q tag must be stored as the administrative dot1q value for the binding. When the dot1q tag is not defined, the default value of zero is stored as the administrative dot1q value. Setting the value to zero is equivalent to not specifying the value. The no form of this command disables the command
Default	no vlan-vc-tag
Parameters	<i>0..4094</i> — Specifies a valid VLAN identifier to bind an 802.1Q VLAN tag ID.

ATM Commands

atm

Syntax	atm
Context	config>service>epipe>sap config>service>apipe>sap config>service>ipipe>sap config>service>epipe>sap
Description	This command enables access to the context to configure ATM-related attributes. This command can only be used when a given context (for example, a channel or SAP) supports ATM functionality such as: • Configuring ATM port or ATM port-related functionality on MDAs supporting ATM functionality • Configuring ATM-related configuration for ATM-based SAPs that exist on MDAs supporting ATM functionality. If ATM functionality is not supported for a given context, the command returns an error.

egress

Syntax	egress
Context	config>service>epipe>sap config>service>epipe>sap>atm config>service>apipe>sap>atm config>service>fpipe>sap
	This command configures egress ATM attributes for the SAP.

ingress

Syntax	ingress
Context	config>service>epipe>sap config>service>epipe>sap>atm config>service>epipe>sap config>service>apipe>sap>atm
Description	This command configures ingress ATM attributes for the SAP.

encapsulation

Syntax	encapsulation <i>atm-encap-type</i>
Context	config>service>epipe>sap>atm config>service>ipipe>sap>atm
Description	This command specifies the data encapsulation for an ATM PVCC delimited SAP. The definition references RFC 2684, <i>Multiprotocol Encapsulation over ATM AAL5</i> , and to the ATM Forum LAN Emulation specification. Ingress traffic that does not match the configured encapsulation will be dropped.
Default	The encapsulation is driven by the services for which the SAP is configured. For IES and VPRN service SAPs, the default is aal5snap-routed .
Parameters	<i>atm-encap-type</i> — Specify the encapsulation type. Values aal5snap-routed — Routed encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684. aal5mux-ip — Routed IP encapsulation for VC multiplexed circuit as defined in RFC 2684

traffic-desc

Syntax	traffic-desc <i>traffic-desc-profile-id</i> no traffic-desc
Context	config>service>epipe>sap config>service>apipe>sap>atm>egress config>service>apipe>sap>atm>ingress config>service>epipe>sap>atm>egress config>service>epipe>sap>atm>ingress
Description	This command assigns an ATM traffic descriptor profile to a given context (for example, a SAP). When configured under the ingress context, the specified traffic descriptor profile defines the traffic contract in the forward direction. When configured under the egress context, the specified traffic descriptor profile defines the traffic contract in the backward direction. The no form of the command reverts the traffic descriptor to the default traffic descriptor profile.
Default	The default traffic descriptor (trafficDescProfileId. = 1) is associated with newly created PVCC-delimited SAPs.
Parameters	<i>traffic-desc-profile-id</i> — Specify a defined traffic descriptor profile (see the QoS atm-td-profile command).

OAM Commands

oam

Syntax	oam
Context	config>service>epipe>sap config>service>apipe>sap>atm
Description	This command enables the context to configure OAM functionality for a PVCC delimiting a SAP. • The ATM-capable MDAs support end-to-end and segment OAM functionality (AIS, RDI, Loop-back) over both F5 (VC) and end-to-end F4 (VP) OAM: • ITU-T Recommendation I.610 - B-ISDN Operation and Maintenance version 11/95 • GR-1248-CORE - Generic Requirements for Operations of ATM N3 June 1996 • GR-1113-CORE - Bellcore, Asynchronous Transfer Mode (ATM) (AAL) Protocols Generic Requirements, Issue 1, July 1994

alarm-cells

Syntax	[no] alarm-cells
Context	config>service>epipe>sap>oam config>service>epipe>sap>oam config>service>apipe>sap>atm>oam
Description	This command configures AIS/RDI fault management on a PVCC. Fault management allows PVCC terminations to monitor and report the status of their connection by propagating fault information through the network and by driving PVCC's operational status. When alarm-cells functionality is enabled, a PVCC's operational status is affected when a PVCC goes into an AIS or RDI state because of an AIS/RDI processing (assuming nothing else affects PVCC's operational status, for example, if the PVCC goes DOWN, or enters a fault state and comes back UP, or exits that fault state). RDI cells are generated when PVCC is operationally DOWN. No OAM-specific SNMP trap is raised whenever an endpoint enters/exits an AIS or RDI state, however, if as result of an OAM state change, the PVCC changes operational status, then a trap is expected from an entity the PVCC is associated with (for example a SAP). The no command disables alarm-cells functionality for a PVCC. When alarm-cells functionality is disabled, a PVCC's operational status is no longer affected by a PVCC's OAM state changes due to AIS/RDI processing (Note that when alarm-cells is disabled, a PVCC will change operational status to UP due to alarm-cell processing) and RDI cells are not generated as result of the PVCC going into AIS or RDI state. The PVCC's OAM status, however, will record OAM faults as described above.
Default	Enabled for PVCCs delimiting IES SAPs

terminate

Syntax	[no] terminate
Context	config>service>apipe>sap>atm>oam
Description	This command specifies whether this SAP will act as an OAM termination point. ATM SAPs can be configured to tunnel or terminate OAM cells. When configured to not terminate (the default is no terminate), the SAP will pass OAM cells through the VLL without inspecting them. The SAP will respond to OAM loopback requests that are directed to the local node by transmitting a loopback reply. Other loopback requests are transparently tunneled through the pseudowire. In this mode, it is possible to launch a loopback request towards the directly-attached ATM equipment and see the results of the reply. When configured to terminate, the SAP will respond to AIS by transmitting RDI and will signal the change of operational status to the other endpoint (for example, through LDP status notifications). The SAP will respond to OAM loopback requests by transmitting a loopback reply. In this mode, it is possible to launch a loopback request towards the directly-attached ATM equipment and see the results of the reply. This option is available only for ATM-SDU pseudowire connections, and it is not supported for VT and port pseudowire connections.
Default	no terminate

Cpipe Commands

endpoint

Syntax	[no] endpoint <i>endpoint-name</i>
Context	config>service>cpipe
Description	This command configures a service endpoint.
Parameters	<i>endpoint-name</i> — Specifies an endpoint name.

active-hold-delay

Syntax	active-hold-delay <i>active-hold-delay</i> no active-hold-delay
Context	config>service>cpipe>endpoint
Description	This command specifies that the node will delay sending the change in the T-LDP status bits for the service endpoint when the MC-LAG transitions the LAG subgroup which hosts the SAP for this VLL endpoint from "active" to "standby" or when any object in the endpoint. For example., SAP, ICB, or regular spoke SDP, transitions from up to down operational state. By default, when the MC-LAG transitioned the LAG subgroup which hosts the SAP for this VLL endpoint from "active" to "standby", the node sends immediately new T-LDP status bits indicating the new value of "standby" over the spoke SDPs which are on the mate-endpoint of the VLL. The same applies when any object in the endpoint changes an operational state from up to down. There is no delay applied to the VLL endpoint status bit advertisement when the MC-LAG transitions the LAG subgroup which hosts the SAP from "standby" to "active" or when any object in the endpoint transitions to an operationally up state.
Default	0 — A value of zero means that when the MC-LAG transitioned the LAG subgroup which hosts the SAP for this VLL endpoint from "active" to "standby", the node sends immediately new T-LDP status bits indicating the new value of "standby" over the spoke SDPs which are on the mate-endpoint of the VLL. The same applies when any object in the endpoint changes an operational state from up to down.
Parameters	<i>active-hold-delay</i> — Specifies the active hold delay in 100s of milliseconds.
Values	0 — 60

revert-time

Syntax	revert-time <i>revert-time</i> no revert-time

Context	config>service>cpipe>endpoint
Description	This command configures the time to wait before reverting back to the primary spoke SDP defined on this service endpoint, after having failed over to a backup spoke SDP.
Parameters	<i>revert-time</i> — Specify the time, in seconds, to wait before reverting to the primary SDP. Values 0 — 600 infinite — Causes the endpoint to be non-revertive.

CES SAP Commands

sap

Syntax	sap <i>sap-id</i> [no-endpoint] [create] sap <i>sap-id endpoint endpoint-name</i> [create] no sap <i>sap-id</i>
Context	config>service>cpipe
Description	This command creates a Service Access Point (SAP) within a service. A SAP is a combination of port and encapsulation parameters which identifies the service access point on the interface and within the service router. Each SAP must be unique. All SAPs must be explicitly created. If no SAPs are created within a service or on an IP interface, a SAP will not exist on that object. Enter an existing SAP without the create keyword to edit SAP parameters. The SAP is owned by the service in which it was created. A SAP can only be associated with a single service. A SAP can only be defined on a port that has been configured as an access port using the config router interface port-type port-id mode access command. Channelized TDM ports are always access ports. If a port is shutdown, all SAPs on that port become operationally down. When a service is shutdown, SAPs for the service are not displayed as operationally down although all traffic traversing the service will be discarded. The operational state of a SAP is relative to the operational state of the port on which the SAP is defined. The no form of this command deletes the SAP with the specified port. When a SAP is deleted, all configuration parameters for the SAP will also be deleted.
Default	No SAPs are defined.
Special Cases	A SAP can be defined with Ethernet ports, SONET/SDH or TDM channels. At most, only one sdp-id can be bound to an VLL service. Since a VLL is a point-to-point service, it can have, at most, two end points. The two end points can be one SAP and one SDP or two SAPs. Up to 49 SDPs can be associated with a service in a single router. Each SDP must have a unique router destination or an error will be generated. A default SAP has the following format: port-id:*. This type of SAP is supported only on Ethernet MDAs and its creation is allowed only in the scope of Layer 2 services. This type of SAP is mutually exclusive with a SAP defined by explicit null encapsulation (for example, 1/1/1:0).
Parameters	<i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax. <i>port-id</i> — Specifies the physical port ID in the <i>slot/mda/port</i> format.

If the card in the slot has Media Dependent Adapters (MDAs) installed, the *port-id* must be in the slot_number/MDA_number/port_number format. For example 6/2/3 specifies port 3 on MDA 2 in slot 6.

The *port-id* must reference a valid port type. When the *port-id* parameter represents SONET/SDH and TDM channels, the port ID must include the channel ID. A period “.” separates the physical port from the *channel-id*. The port must be configured as an access port.

If the SONET/SDH port is configured as clear-channel then only the port is specified.

bundle-id — Specifies the multilink bundle to be associated with this IP interface. The **bundle** keyword must be entered at the beginning of the parameter.

The command syntax must be configured as follows:

bundle-id: **bundle-type-slot-id/mda-slot.bundle-num**

bundle-id value range: 1 — 128

For example:

```
*A:ALA-12>config# port bundle-ppp-5/1.1
```

```
*A:ALA-12>config>port# multilink-bundle
```

bpgrp-id — Specifies the bundle protection group ID to be associated with this IP interface. The **bpgrp** keyword must be entered at the beginning of the parameter.

The command syntax must be configured as follows:

bpgrp-id: **bpgrp-type-bpgrp-num**

type: ima

bpgrp-num value range: 1 — 1280

For example:

```
*A:ALA-12>config# port bpgrp-ima-1
```

```
*A:ALA-12>config>service>cpipe$ sap bpgrp-ima-1
```

qtag1, qtag2 — Specifies the encapsulation value used to identify the SAP on the port or sub-port. If this parameter is not specifically defined, the default value is 0.

Values qtag1: * | 0 — 4094
 qtag2 : * | 0 — 4094

The values depends on the encapsulation type configured for the interface. The following table describes the allowed values for the port and encapsulation types.

Port Type	Encap-Type	Allowed Values	Comments
Ethernet	Null	0	The SAP is identified by the port.
Ethernet	Dot1q	0 — 4094	The SAP is identified by the 802.1Q tag on the port. Note that a 0 qtag1 value also accepts untagged packets on the dot1q port.
Ethernet	QinQ	qtag1: 0 — 4094 qtag2: 0 — 4094	The SAP is identified by two 802.1Q tags on the port. Note that a 0 qtag1 value also accepts untagged packets on the dot1q port.

VLL Service Configuration Commands

SONET/SDH	IPCP	-	The SAP is identified by the channel. No BCP is deployed and all traffic is IP.
SONET/SDH TDM	BCP-Null	0	The SAP is identified with a single service on the channel. Tags are assumed to be part of the customer packet and not a service delimiter.
SONET/SDH TDM	BCP-Dot1q	0 — 4094	The SAP is identified by the 802.1Q tag on the channel.
SONET/SDH TDM	Frame Relay	16 — 991	The SAP is identified by the data link connection identifier (DLCI).
SONET/SDH ATM	ATM	vpi (NNI) 0 — 4095 vpi (UNI) 0 — 255 vci 1, 2, 5 — 65535 -	The SAP is identified by port or by PVPC or PVCC identifier (vpi, vpi/vci, or vpi range)

endpoint — Adds a SAP endpoint association.

no endpoint — Removes the association of a SAP or a spoke-sdp with an explicit endpoint name.

create — Keyword used to create a SAP instance. The **create** keyword requirement can be enabled/disabled in the **environment>create** context.

cem

Syntax	cem
Context	config>service>cpipe>sap
Description	This command enables the context to specify circuit emulation (CEM) properties.

packet

Syntax	packet jitter-buffer <i>milliseconds</i> [payload-size <i>bytes</i>] packet <i>payload-size</i> <i>bytes</i> no packet
Context	config>service>cpipe>sap
Description	This command specifies the jitter buffer size, in milliseconds, and payload size, in bytes.
Default	The default value depends on the CEM SAP endpoint type, and if applicable, the number of timeslots:

Endpoint Type	Timeslots	Default Jitter Buffer (in ms)
unstructuredE1	n/a	5
unstructuredT1	n/a	5

Endpoint Type	Timeslots	Default Jitter Buffer (in ms)
unstructuredE3	n/a	5
unstructuredT3	n/a	5
nxDS0 (E1/T1)	N = 1	32
	N = 2..4	16
	N = 5..15	8
	N >= 16	5
nxDS0WithCas (E1)	N	8
nxDS0WithCas (T1)	N	12

Parameters *milliseconds* — specifies the jitter buffer size in milliseconds (ms).

Configuring the payload size and jitter buffer to values that result in less than 2 packet buffers or greater than 32 packet buffers is not allowed.

Setting the jitter buffer value to 0 sets it back to the default value.

Values 1 — 250

payload-size bytes — Specifies the payload size (in bytes) of packets transmitted to the packet service network (PSN) by the CEM SAP. This determines the size of the data that will be transmitted over the service. If the size of the data received is not consistent with the payload size then the packet is considered malformed.

Default The default value depends on the CEM SAP endpoint type, and if applicable, the number of timeslots:

Endpoint Type	Timeslots	Default Payload Size (in bytes)
unstructuredE1	n/a	256
unstructuredT1	n/a	192
unstructuredE3	n/a	1024
unstructuredT3	n/a	1024
nxDS0 (E1/T1)	N = 1	64
	N = 2..4	N x 32
	N = 5..15	N x 16
	N >= 16	N x 8
nxDS0WithCas (E1)	N	N x 16
nxDS0WithCas (T1)	N	N x 24

For all endpoint types except for nxDS0WithCas, the valid payload size range is from the default to 2048 bytes.

For nxDS0WithCas, the payload size divide by the number of timeslots must be an integer factor of the number of frames per trunk multi-frame (for example, 16 for E1 trunk and 24 for T1 trunk).

For 1xDS0, the payload size must be a multiple of 2.

For NxDS0, where $N > 1$, the payload size must be a multiple of the number of timeslots.

For unstructuredE1, unstructuredT1, unstructuredE3 and unstructuredT3, the payload size must be a multiple of 32 bytes.

Configuring the payload size and jitter buffer to values that result in less than 2 packet buffers or greater than 32 packet buffer is not allowed.

Setting the payload size to 0 sets it back to the default value.

Values 0, 16 — 2048

report-alarm

Syntax	[no] report-alarm [stray] [malformed] [pktloss] [overrun] [underrun] [rpktloss] [rfault] [rrdi]
Context	config>service>cpipe>sap>cem
Description	This command indicates the type of CEM SAP alarm. The no form of the command removes the parameter from the configuration.
Parameters	stray — Reports the reception of packets not destined for this CES circuit. malformed — Reports the reception of packet not properly formatted as CES packets. pktloss — Reports the lack of reception of CES packets. overrun — Reports reports the reception of too many CES packets resulting in a overrun of the receive jitter buffer. underrun — Reportsreports the reception of too few CES packets resulting in a overrun of the receive jitter buffer. rpktloss — Reports hat the remote peer is currently in packet loss status. rfault — Reports that the remote TDM interface is currently not in service. rrdi — Reports that the remote TDM interface is currently in RDI status.

rtp-header

Syntax	[no] rtp-header
Context	config>service>cpipe>sap>cem
Description	This command specifies whether an RTP header is used when packets are transmitted to the packet service network (PSN) by the CEM SAP.
Default	no rtp-header

Service Filter and QoS Policy Commands

egress

Syntax	egress
Context	config>service>cpipe>sap config>service>cpipe>spoke-sdp
Description	This command enables the context to configure egress SAP Quality of Service (QoS) policies. If no sap-egress QoS policy is defined, the system default sap-egress QoS policy is used for egress processing.

ingress

Syntax	ingress
Context	config>service>cpipe>sap
Description	This command enables the context to configure ingress SAP Quality of Service (QoS) policies. If no sap-ingress QoS policy is defined, the system default sap-ingress QoS policy is used for ingress processing.

agg-rate-limit

Syntax	agg-rate-limit <i>agg-rate</i> no agg-rate-limit
Context	config>service>cpipe>sap>egress
Description	This command defines a maximum total rate for all egress queues on a service SAP or multi-service site. The agg-rate-limit command is mutually exclusive with the egress scheduler policy. When an egress scheduler policy is defined, the agg-rate-limit command will fail. If the agg-rate-limit command is specified, an attempt to bind a scheduler-policy to the SAP or multi-service site will fail. A multi-service site must have a port scope defined that ensures all queues associated with the site are on the same port or channel. If the scope is not set to a port, the agg-rate-limit command will fail. Once an agg-rate-limit has been assigned to a multi-service site, the scope cannot be changed to card level. A port scheduler policy must be applied on the egress port or channel the SAP or multi-service site are bound to in order for the defined agg-rate-limit to take effect. The egress port scheduler enforces the aggregate queue rate as it distributes its bandwidth at the various port priority levels. The port scheduler stops offering bandwidth to member queues once it has detected that the aggregate rate limit has been reached.

If a port scheduler is not defined on the egress port, the queues are allowed to operate based on their own bandwidth parameters.

The **no** form of the command removes the aggregate rate limit from the SAP or multi-service site.

Parameters *agg-rate* — Defines the rate, in kilobits-per-second, that the maximum aggregate rate the queues on the SAP or MSS can operate.

Values 1 — 40000000, max

qinq-mark-top-only

Syntax [**no**] **qinq-mark-top-only**

Context config>service>cpipe>sap>egress

Description When enabled (the encapsulation type of the access port where this SAP is defined as qinq), the **qinq-mark-top-only** command specifies which P-bits to mark during packet egress. When disabled, both set of P-bits are marked. When the enabled, only the P-bits in the top Q-tag are marked.

Default no qinq-mark-top-only

qos

Syntax **qos** *policy-id*
no qos

Context config>service>cpipe>sap>egress
config>service>cpipe>sap>ingress

Description This command associates a Quality of Service (QoS) policy with an ingress or egress Service Access Point (SAP) or IP interface.

QoS ingress and egress policies are important for the enforcement of SLA agreements. The policy ID must be defined prior to associating the policy with a SAP or IP interface. If the *policy-id* does not exist, an error will be returned.

The **qos** command is used to associate both ingress and egress QoS policies. The **qos** command only allows ingress policies to be associated on SAP or IP interface ingress and egress policies on SAP or IP interface egress. Attempts to associate a QoS policy of the wrong type returns an error.

Only one ingress and one egress QoS policy can be associated with a SAP or IP interface at one time. Attempts to associate a second QoS policy of a given type will return an error.

By default, no specific QoS policy is associated with the SAP or IP interface for ingress or egress, so the default QoS policy is used.

The **no** form of this command removes the QoS policy association from the SAP or IP interface, and the QoS policy reverts to the default.

policy-id — The ingress/egress policy ID to associate with SAP or IP interface on ingress/egress. The policy ID must already exist.

Values 1 — 65535

shared-queueing — This keyword can **only** be specified on SAP ingress. The **shared-queueing** keyword specifies the shared queue policy will be used by this SAP. When the value of this object is null, the SAP will use individual ingress QoS queues, instead of the shared ones.

queue-override

Syntax	[no] queue-override
Context	config>service>cpipe>sap>egress config>service>cpipe>sap>ingress
Description	This command enables the context to configure override values for the specified SAP egress or ingress QoS queue. These values override the corresponding ones specified in the associated SAP egress or ingress QoS policy. If the policy was created as a template policy, this command overrides the parameter and its description and queue parameters in the policy.

queue

Syntax	[no] queue <i>queue-id</i> [create]
Context	config>service>cpipe>sap>egress>queue-override config>service>cpipe>sap>ingress>queue-override
Description	This command specifies the ID of the queue whose parameters are to be overridden.
Parameters	<i>queue-id</i> — The queue ID whose parameters are to be overridden. create — Keyword used to create the queue. The create keyword requirement can be enabled/disabled in the environment>create context.

adaptation-rule

Syntax	adaptation-rule [pir <i>adaptation-rule</i>]] [cir <i>adaptation-rule</i>]]
Context	config>service>cpipe>sap>egress>queue-override>queue config>service>cpipe>sap>ingress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's adaptation rule parameters. The adaptation rule controls the method used by the system to derive the operational CIR and PIR settings when the queue is provisioned in hardware. For the CIR and PIR parameters individually, the system attempts to find the best operational rate depending on the defined constraint.
Default	no adaptation-rule
Parameters	pir — The pir parameter defines the constraints enforced when adapting the PIR rate defined within the queue <i>queue-id</i> rate command. The pir parameter requires a qualifier that defines the constraint used when deriving the operational PIR for the queue. When the rate command is not specified, the default applies.

cir — The **cir** parameter defines the constraints enforced when adapting the CIR rate defined within the **queue queue-id rate** command. The **cir** parameter requires a qualifier that defines the constraint used when deriving the operational CIR for the queue. When the **cir** parameter is not specified, the default constraint applies.

adaptation-rule — Specifies the criteria to use to compute the operational CIR and PIR values for this queue, while maintaining a minimum offset.

Values

max — The **max** (maximum) keyword is mutually exclusive with the **min** and **closest** options. When **max** is defined, the operational PIR for the queue will be equal to or less than the administrative rate specified using the **rate** command.

min — The **min** (minimum) keyword is mutually exclusive with the **max** and **closest** options. When **min** is defined, the operational PIR for the queue will be equal to or greater than the administrative rate specified using the **rate** command.

closest — The **closest** parameter is mutually exclusive with the **min** and **max** parameter. When **closest** is defined, the operational PIR for the queue will be the rate closest to the rate specified using the **rate** command.

avg-frame-overhead

Syntax	avg-frame-overhead percent no avg-frame-overhead
Context	config>service>cpipe>sap>egress>queue-override>queue config>service>cpipe>sap>ingress>queue-override>queue
Description	This command configures the average frame overhead to define the average percentage that the offered load to a queue will expand during the frame encapsulation process before sending traffic on-the-wire. While the avg-frame-overhead value may be defined on any queue, it is only used by the system for queues that egress a Sonet or SDH port or channel. Queues operating on egress Ethernet ports automatically calculate the frame encapsulation overhead based on a 20 byte per packet rule (8 bytes for preamble and 12 bytes for Inter-Frame Gap). When calculating the frame encapsulation overhead for port scheduling purposes, the system determines the following values: • Offered-load — The offered-load of a queue is calculated by starting with the queue depth in octets, adding the received octets at the queue and subtracting queue discard octets. The result is the number of octets the queue has available to transmit. This is the packet based offered-load. • Frame encapsulation overhead — Using the avg-frame-overhead parameter, the frame encapsulation overhead is simply the queue's current offered-load (how much has been received by the queue) multiplied by the avg-frame-overhead. If a queue had an offered load of 10000 octets and the avg-frame-overhead equals 10%, the frame encapsulation overhead would be 10000 x 0.1 or 1000 octets. For egress Ethernet queues, the frame encapsulation overhead is calculated by multiplying the number of offered-packets for the queue by 20 bytes. If a queue was offered 50 packets then the frame encapsulation overhead would be 50 x 20 or 1000 octets.

- **Frame based offered-load** — The frame based offered-load is calculated by adding the offered-load to the frame encapsulation overhead. If the offered-load is 10000 octets and the encapsulation overhead was 1000 octets, the frame based offered-load would equal 11000 octets.
- **Packet to frame factor** — The packet to frame factor is calculated by dividing the frame encapsulation overhead by the queue's offered-load (packet based). If the frame encapsulation overhead is 1000 octets and the offered-load is 10000 octets then the packet to frame factor would be $1000 / 10000$ or 0.1. When in use, the avg-frame-overhead will be the same as the packet to frame factor making this calculation unnecessary.
- **Frame based CIR** — The frame based CIR is calculated by multiplying the packet to frame factor with the queue's configured CIR and then adding that result to that CIR. If the queue CIR is set at 500 octets and the packet to frame factor equals 0.1, the frame based CIR would be 500×1.1 or 550 octets.
- **Frame based within-cir offered-load** — The frame based within-cir offered-load is the portion of the frame based offered-load considered to be within the frame-based CIR. The frame based within-cir offered-load is the lesser of the frame based offered-load and the frame based CIR. If the frame based offered-load equaled 11000 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would be limited to 550 octets. If the frame based offered-load equaled 450 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would equal 450 octets (or the entire frame based offered-load).

As a special case, when a queue or associated intermediate scheduler is configured with a CIR-weight equal to 0, the system automatically sets the queue's frame based within-cir offered-load to 0, preventing it from receiving bandwidth during the port scheduler's within-cir pass.

- **Frame based PIR** — The frame based PIR is calculated by multiplying the packet to frame factor with the queue's configured PIR and then adding the result to that PIR. If the queue PIR is set to 7500 octets and the packet to frame factor equals 0.1, the frame based PIR would be 7500×1.1 or 8250 octets.
- **Frame based within-pir offered-load** — The frame based within-pir offered-load is the portion of the frame based offered-load considered to be within the frame based PIR. The frame based within-pir offered-load is the lesser of the frame based offered-load and the frame based PIR. If the frame based offered-load equaled 11000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered-load would be limited to 8250 octets. If the frame based offered-load equaled 7000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered load would equal 7000 octets.

Port scheduler operation using frame transformed rates — The port scheduler uses the frame based rates to figure the maximum rates that each queue may receive during the within-cir and above-cir bandwidth allocation passes. During the within-cir pass, a queue may receive up to its frame based within-cir offered-load. The maximum it may receive during the above-cir pass is the difference between the frame based within-pir offered load and the amount of actual bandwidth allocated during the within-cir pass.

SAP and subscriber SLA-profile average frame overhead override — The average frame overhead parameter on a sap-egress may be overridden at an individual egress queue basis. On each SAP and within the sla-profile policy used by subscribers an avg-frame-overhead command may be defined under the queue-override context for each queue. When overridden, the queue instance will use its local value for the average frame overhead instead of the sap-egress defined overhead.

The **no** form of this command restores the average frame overhead parameter for the queue to the default value of 0 percent. When set to 0, the system uses the packet based queue statistics for calculating port scheduler priority bandwidth allocation. If the no avg-frame-overhead command is exe-

cuted in a queue-override queue id context, the avg-frame-overhead setting for the queue within the sap-egress QoS policy takes effect.

Default	0
Parameters	<i>percent</i> — This parameter sets the average amount of packet-to-frame encapsulation overhead expected for the queue. This value is not used by the system for egress Ethernet queues.
Values	0.00 — 100.00

cbs

Syntax	cbs <i>size-in-kbytes</i> no cbs
Context	config>service>cpipe>sap>egress>queue-override>queue config>service>cpipe>sap>ingress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's CBS parameters. It is permissible, and possibly desirable, to oversubscribe the total CBS reserved buffers for a given access port egress buffer pool. Oversubscription may be desirable due to the potential large number of service queues and the economy of statistical multiplexing the individual queue's CBS setting into the defined reserved total. When oversubscribing the reserved total, it is possible for a queue depth to be lower than its CBS setting and still not receive a buffer from the buffer pool for an ingress frame. As more queues are using their CBS buffers and the total in use exceeds the defined reserved total, essentially the buffers are being removed from the shared portion of the pool without the shared in use average and total counts being decremented. This can affect the operation of the high and low priority RED slopes on the pool, causing them to miscalculate when to start randomly drop packets. If the CBS value is larger than the MBS value, an error will occur, preventing the CBS change. The no form of this command returns the CBS size to the default value.
Default	no cbs
Parameters	<i>size-in-kbytes</i> — The size parameter is an integer expression of the number of kilobytes reserved for the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that no reserved buffers are required by the queue (a minimal reserved size can still be applied for scheduling purposes). Values 0 — 131072 or default

high-prio-only

Syntax	high-prio-only <i>percent</i> no high-prio-only
Context	config>service>cpipe>sap>egress>queue-override>queue config>service>cpipe>sap>ingress>queue-override>queue

Description	This command can be used to override specific attributes of the specified queue's high-prio-only parameters. The high-prio-only command configures the percentage of buffer space for the queue, used exclusively by high priority packets. The priority of a packet can only be set in the SAP ingress QoS policy and is only applicable on the ingress queues for a SAP. The high-prio-only parameter is used to override the default value derived from the network-queue command. The defined high-prio-only value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the high-prio-only value larger than the current MBS size will also result in an error and fail execution. The no form of this command restores the default high priority reserved size.
Parameters	<i>percent</i> — The <i>percent</i> parameter is the percentage reserved for high priority traffic on the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that none of the MBS of the queue will be reserved for high priority traffic. This does not affect RED slope operation for packets attempting to be queued. Values 0 — 100 default

mbs

Syntax	mbs <i>size-in-kbytes</i> no mbs
Context	config>service>cpipe>sap>egress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's MBS parameters. The MBS is a mechanism to override the default maximum size for the queue. The sum of the MBS for all queues on an egress access port can oversubscribe the total amount of buffering available. When congestion occurs and buffers become scarce, access to buffers is controlled by the RED slope a packet is associated with. A queue that has not exceeded its MBS size is not guaranteed that a buffer will be available when needed or that the packet's RED slope will not force the discard of the packet. Setting proper CBS parameters and controlling CBS oversubscription is one major safeguard to queue starvation (when a queue does not receive its fair share of buffers). Another is properly setting the RED slope parameters for the needs of services on this port or channel. If the CBS value is larger than the MBS value, an error will occur, preventing the MBS change. The no form of this command returns the MBS size assigned to the queue.
Default	default
Parameters	<i>size-in-kbytes</i> — The <i>size</i> parameter is an integer expression of the maximum number of kilobytes of buffering allowed for the queue. For a value of 100 kbps, enter the value 100. A value of 0 causes the queue to discard all packets. Values 0 — 131072 or default

mbs

Syntax	mbs { <i>size-in-kbytes</i> default } no mbs
Context	config>service>cpipe>sap>ingress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's MBS parameters. The MBS value is used by a queue to determine whether it has exhausted all of its buffers while enqueueing packets. Once the queue has exceeded the amount of buffers allowed by MBS, all packets are discarded until packets have been drained from the queue. The sum of the MBS for all queues on an ingress access port can oversubscribe the total amount of buffering available. When congestion occurs and buffers become scarce, access to buffers is controlled by the RED slope a packet is associated with. A queue that has not exceeded its MBS size is not guaranteed that a buffer will be available when needed or that the packet's RED slope will not force the discard of the packet. Setting proper CBS parameters and controlling CBS oversubscription is one major safeguard to queue starvation (when a queue does not receive its fair share of buffers). Another is properly setting the RED slope parameters for the needs of services on this port or channel. If the CBS value is larger than the MBS value, an error will occur, preventing the MBS change. The defined high-prio-only value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the high-prio-only value larger than the current MBS size will also result in an error and fail execution. The no form of this command returns the MBS size assigned to the queue to the default value.
Default	default
Parameters	<i>size-in-kbytes</i> — The size parameter is an integer expression of the maximum number of kilobytes of buffering allowed for the queue. For a value of 100 kbps, enter the value 100. A value of 0 causes the queue to discard all packets. Values 0 — 131072 or default

rate

Syntax	rate <i>pir-rate</i> [cir <i>cir-rate</i>] no rate
Context	config>service>cpipe>sap>egress>queue-override>queue config>service>cpipe>sap>ingress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's Peak Information Rate (PIR) and the Committed Information Rate (CIR) parameters. The PIR defines the maximum rate that the queue can transmit packets out an egress interface (for SAP egress queues). Defining a PIR does not necessarily guarantee that the queue can transmit at the intended rate. The actual rate sustained by the queue can be limited by oversubscription factors or available egress bandwidth. The CIR defines the rate at which the system prioritizes the queue over other queues competing for the same bandwidth. In-profile packets are preferentially queued by the system at egress and at subsequent next hop nodes where the packet can traverse. To be properly handled as in- or out-of-profile throughout the network, the packets must be marked accordingly for profiling at each hop.

The CIR can be used by the queue's parent commands *cir-level* and *cir-weight* parameters to define the amount of bandwidth considered to be committed for the child queue during bandwidth allocation by the parent scheduler.

The **rate** command can be executed at any time, altering the PIR and CIR rates for all queues created through the association of the SAP egress QoS policy with the *queue-id*.

The **no** form of the command returns all queues created with the *queue-id* by association with the QoS policy to the default PIR and CIR parameters (**max**, 0).

Default	rate max cir 0 — The max default specifies the amount of bandwidth in kilobits per second (thousand bits per second). The max value is mutually exclusive to the pir-rate value.
Parameters	<i>pir-rate</i> — Defines the administrative PIR rate, in kilobits, for the queue. When the rate command is executed, a valid PIR setting must be explicitly defined. When the rate command has not been executed, the default PIR of max is assumed. Fractional values are not allowed and must be given as a positive integer. The actual PIR rate is dependent on the queue's adaptation-rule parameters and the actual hardware where the queue is provisioned. Values 1 — 100000000 Default max <i>cir-rate</i> — The cir parameter overrides the default administrative CIR used by the queue. When the rate command is executed, a CIR setting is optional. When the rate command has not been executed or the cir parameter is not explicitly specified, the default CIR (0) is assumed. Fractional values are not allowed and must be given as a positive integer. The sum keyword specifies that the CIR be used as the summed CIR values of the children schedulers or queues. Values 0 — 100000000, max, sum Default 0

scheduler-override

Syntax	[no] scheduler-override
Context	config>service>cpipe>sap>egress config>service>cpipe>sap>ingress
Description	This command specifies the set of attributes whose values have been overridden via management on this virtual scheduler. Clearing a given flag will return the corresponding overridden attribute to the value defined on the SAP's ingress scheduler policy.

scheduler

Syntax	scheduler scheduler-name [create] no scheduler scheduler-name

Context	config>service>cpipe>sap>egress>sched-override config>service>cpipe>sap>ingress>sched-override
Description	This command can be used to override specific attributes of the specified scheduler name. A scheduler defines bandwidth controls that limit each child (other schedulers and queues) associated with the scheduler. Scheduler objects are created within the hierarchical tiers of the policy. It is assumed that each scheduler created will have queues or other schedulers defined as child associations. The scheduler can be a child (take bandwidth from a scheduler in a higher tier, except for schedulers created in tier 1). A total of 32 schedulers can be created within a single scheduler policy with no restriction on the distribution between the tiers. Each scheduler must have a unique name within the context of the scheduler policy; however the same name can be reused in multiple scheduler policies. If <i>scheduler-name</i> already exists within the policy tier level (regardless of the inclusion of the keyword create), the context changes to that scheduler name for the purpose of editing the scheduler parameters. Modifications made to an existing scheduler are executed on all instantiated schedulers created through association with the policy of the edited scheduler. This can cause queues or schedulers to become orphaned (invalid parent association) and adversely affect the ability of the system to enforce service level agreements (SLAs). If the <i>scheduler-name</i> exists within the policy on a different tier (regardless of the inclusion of the keyword create), an error occurs and the current CLI context will not change. If the <i>scheduler-name</i> does not exist in this or another tier within the scheduler policy, it is assumed that an attempt is being made to create a scheduler of that name. The success of the command execution is dependent on the following: 1. The maximum number of schedulers has not been configured. 2. The provided <i>scheduler-name</i> is valid. 3. The create keyword is entered with the command if the system is configured to require it (enabled in the environment create command). When the maximum number of schedulers has been exceeded on the policy, a configuration error occurs and the command will not execute, nor will the CLI context change. If the provided scheduler-name is invalid according to the criteria below, a name syntax error will occur, the command will not execute, and the CLI context will not change.
Parameters	<i>scheduler-name</i> — The name of the scheduler. Values Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Default None. Each scheduler must be explicitly created. create — This keyword creates a scheduler with the given <i>scheduler-name</i>. If the create keyword is omitted, scheduler-name is not created when the system environment variable create is set to true. This safeguard is meant to avoid accidental creation of system objects (such as schedulers) while attempting to edit an object with a mistyped name or ID. The keyword has no effect when the object already exists.

rate

Syntax	rate <i>pir-rate</i> [cir <i>cir-rate</i>] no rate
Context	config>service>cpipe>sap>egress>sched-override>scheduler config>service>cpipe>sap>ingress>sched-override>scheduler
Description	This command can be used to override specific attributes of the specified scheduler rate. The rate command defines the maximum bandwidth that the scheduler can offer its child queues or schedulers. The maximum rate is limited to the amount of bandwidth the scheduler can receive from its parent scheduler. If the scheduler has no parent, the maximum rate is assumed to be the amount available to the scheduler. When a parent is associated with the scheduler, the CIR parameter provides the amount of bandwidth to be considered during the parent scheduler's 'within CIR' distribution phase. The actual operating rate of the scheduler is limited by bandwidth constraints other than its maximum rate. The scheduler's parent scheduler may not have the available bandwidth to meet the scheduler's needs or the bandwidth available to the parent scheduler could be allocated to other child schedulers or child queues on the parent based on higher priority. The children of the scheduler may not need the maximum rate available to the scheduler due to insufficient offered load or limits to their own maximum rates. When a scheduler is defined without specifying a rate, the default rate is max. If the scheduler is a root scheduler (no parent defined), the default maximum rate must be changed to an explicit value. Without this explicit value, the scheduler will assume that an infinite amount of bandwidth is available and allow all child queues and schedulers to operate at their maximum rates. The no form of this command returns all queues created with this <i>queue-id</i> by association with the QoS policy to the default PIR and CIR parameters.
Parameters	<i>pir-rate</i> — The pir parameter accepts a step multiplier value that specifies the multiplier used to determine the PIR rate at which the queue will operate. A value of 0 to 100000000 or the keyword max or sum is accepted. Any other value will result in an error without modifying the current PIR rate. To calculate the actual PIR rate, the rate described by the queue's rate is multiplied by the <i>pir-rate</i>. The SAP ingress context for PIR is independent of the defined forwarding class (fc) for the queue. The default pir and definable range is identical for each class. The PIR in effect for a queue defines the maximum rate at which the queue will be allowed to forward packets in a given second, thus shaping the queue's output. The PIR parameter for SAP ingress queues do not have a negate (no) function. To return the queues PIR rate to the default value, that value must be specified as the PIR value. Values 1 — 100000000, max Default max <i>cir cir-rate</i> — The cir parameter accepts a step-multiplier value that specifies the multiplier used to determine the CIR rate at which the queue will operate. A value of 0 to 250 or the keyword max is accepted. Any other value will result in an error without modifying the current CIR rate. To calculate the actual CIR rate, the rate described by the rate pir pir-rate is multiplied by the <i>cir cir-rate</i>. If the cir is set to max, then the CIR rate is set to infinity. The SAP ingress context for CIR is dependent on the defined forwarding class (fc) for the queue. The default CIR and definable range is different for each class. The CIR in effect for a queue

defines both its profile (in or out) marking level as well as the relative importance compared to other queues for scheduling purposes during congestion periods.

Values 0 — 10000000, max, sum

Default sum

scheduler-policy

Syntax	scheduler-policy <i>scheduler-policy-name</i> no scheduler-policy
Context	config>service>cpipe>sap>ingress config>service>cpipe>sap>egress
Description	This command applies an existing scheduler policy to an ingress or egress scheduler used by SAP queues associated with this multi-service customer site. The schedulers defined in the scheduler policy can only be created once the customer site has been appropriately assigned to a chassis port, channel or slot. Scheduler policies are defined in the config>qos>scheduler-policy <i>scheduler-policy-name</i> context. The no form of this command removes the configured ingress or egress scheduler policy from the multi-service customer site. When the policy is removed, the schedulers created due to the policy are removed also making them unavailable for the ingress SAP queues associated with the customer site. Queues that lose their parent scheduler association are deemed to be orphaned and are no longer subject to a virtual scheduler. The SAPs that have ingress queues reliant on the removed schedulers enter into an operational state depicting the orphaned status of one or more queues. When the no scheduler-policy command is executed, the customer site ingress or egress node will not contain an applied scheduler policy. <i>scheduler-policy-name</i>: — The <i>scheduler-policy-name</i> parameter applies an existing scheduler policy that was created in the config>qos>scheduler-policy <i>scheduler-policy-name</i> context to create the hierarchy of ingress or egress virtual schedulers. The scheduler names defined within the policy are created and made available to any ingress or egress queues created on associated SAPs. Values Any existing valid scheduler policy name.

multi-service-site

Syntax	multi-service-site <i>customer-site-name</i> no multi-service-site
Context	config>service>cpipe>sap
Description	This command associates the SAP with a <i>customer-site-name</i>. If the specified <i>customer-site-name</i> does not exist in the context of the service customer ID an error occurs and the command will not execute. If <i>customer-site-name</i> exists, the current and future defined queues on the SAP (ingress and egress) will attempt to use the scheduler hierarchies created within <i>customer-site-name</i> as parent schedulers. See multi-service-site on page 134.

The **no** form of the command removes the SAP from any multi-service customer site the SAP belongs to. Removing the site can cause existing or future queues to enter an orphaned state.

Default None

customer-site-name — The customer-site-name must exist in the context of the customer-id defined as the service owner. If customer-site-name exists and local scheduler policies have not been applied to the SAP, the current and future queues defined on the SAP will look for their parent schedulers within the scheduler hierarchies defined on customer-site-name.

Values Any valid customer-site-name created within the context of the customer-id.

tod-suite

Syntax **tod-suite** *tod-suite-name*
no tod-suite

Context config>service>cpipe>sap

Description This command applies a time-based policy (filter or QoS policy) to the service SAP. The suite name must already exist in the **config>cron** context.

Default no tod-suite

Parameters *tod-suite-name* — Specifies collection of policies (ACLs, QoS) including time-ranges that define the full or partial behavior of a SAP. The suite can be applied to more than one SAP.

service-mtu

Syntax **service-mtu** *octets*
no service-mtu

Context config>service>cpipe

Description This command configures the service payload (Maximum Transmission Unit – MTU), in bytes, for the service. This MTU value overrides the service-type default MTU. The **service-mtu** defines the payload capabilities of the service. It is used by the system to validate the SAP and SDP binding's operational state within the service.

The service MTU and a SAP's service delineation encapsulation overhead (i.e., 4 bytes for a dot1q tag) is used to derive the required MTU of the physical port on which the SAP was created. If the required payload is larger than the port or channel MTU, then the SAP will be placed in an inoperative state. If the required MTU is equal to or less than the port or channel MTU, the SAP will be able to transition to the operative state.

When binding an SDP to a service, the service MTU is compared to the path MTU associated with the SDP. The path MTU can be administratively defined in the context of the SDP. The default or administrative path MTU can be dynamically reduced due to the MTU capabilities discovered by the tunneling mechanism of the SDP or the egress interface MTU capabilities based on the next hop in the tunnel path.

If the service MTU is larger than the path MTU minus control word length (if applicable), the SDP binding for the service will be placed in an inoperative state with sdp-bind oper flag PathMTUTooSmall.

If the CEM SAP's packet size is larger than the service MTU then the service will be placed in an inoperative state with service oper flag ServiceMTUTooSmall . The CEM SAP packet size is defined as CEM SAP payload-size plus rtp-header size (if applicable).

In the event that a service MTU, port or channel MTU, or path MTU is dynamically or administratively modified, then all associated SAP and SDP binding operational states are automatically re-evaluated.

The **no** form of this command returns the default **service-mtu** for the indicated service type to the default value.

Default cpipe: 1514

octets — The size of the MTU in octets, expressed as a decimal integer, between 1 — 9194.

service-name

Syntax **service-name** *service-name*
no service-name

Context config>service>cpipe

Description This command configures an optional service name, up to 64 characters in length, which adds a name identifier to a given service to then use that service name in configuration references as well as display and use service names in show commands throughout the system. This helps the service provider/administrator to identify and manage services within the 7750 SR and 7710 SR platforms.

All services are required to assign a service ID to initially create a service. However, either the service ID or the service name can be used to identify and reference a given service once it is initially created.

Parameters *service-name* — Specifies a unique service name to identify the service. Service names may not begin with an integer (0-9).

SDP Commands

spoke-sdp

Syntax	spoke-sdp <i>sdp-id[:vc-id]</i> [no-endpoint] [create] spoke-sdp <i>sdp-id:vc-id</i> [create] endpoint <i>endpoint-name</i> [icb] no spoke-sdp <i>sdp-id[:vc-id]</i>
Context	config>service>cpipe
Description	This command binds a service to an existing Service Distribution Point (SDP). A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received. The SDP has an operational state which determines the operational state of the SDP within the service. For example, if the SDP is administratively or operationally down, the SDP for the service will be down. The SDP must already be defined in the config>service>sdp context. If the sdp <i>sdp-id</i> is not already configured, an error message is generated. If the <i>sdp-id</i> does exist, a binding between that <i>sdp-id</i> and the service is created. SDPs must be explicitly associated and bound to a service. If an SDP is not bound to a service, no far-end 7750 SR devices can participate in the service. The no form of this command removes the SDP binding from the service. The SDP configuration is not affected; only the binding of the SDP to a service. Once removed, no packets are forwarded to the far-end router.
Default	No <i>sdp-id</i> is bound to a service.
Parameters	<i>sdp-id</i> — The SDP identifier. Allowed values are integers in the range of 1 to 17407 for existing SDPs. <i>vc-id</i> — The virtual circuit identifier. Values 1 — 4294967295 vc-type — This command overrides the default VC type signaled for the spoke or mesh binding to the far end of the SDP. The VC type is a 15 bit-quantity containing a value which represents the type of VC. The actual signaling of the VC type depends on the signaling parameter defined for the SDP. If signaling is disabled, the vc-type command can still be used to define the dot1q value expected by the far-end provider equipment. A change of the bindings VC type causes the binding to signal the new VC type to the far end when signaling is enabled. VC types are derived according to IETF <i>draft-martini-l2circuit-trans-mpls</i>. • The VC type value for Ethernet is 0x0005. • The VC type value for an Ethernet VLAN is 0x0004. • The VC type value for a VPLS service is defined as 0x000B. Values ethernet

no endpoint — removes the association of a spoke SDP with an explicit endpoint name.

endpoint *endpoint-name* — Specifies the name of the service endpoint.

icb — Configures the spoke SDP as an inter-chassis backup SDP binding.

egress

Syntax	egress
Context	config>service>cpipe>spoke-sdp
Description	This command enables the context to configure egress spoke-SDP context.

ingress

Syntax	ingress
Context	config>service>cpipe>spoke-sdp
Description	This command enables the context to configure ingress spoke-SDP context.

vc-label

Syntax	vc-label <i>egress-vc-label</i> no vc-label [<i>egress-vc-label</i>]
Context	config>service>cpipe>spoke-sdp>egress
Description	This command configures the spoke-SDP egress VC label.
Parameters	<i>egress-vc-label</i> — A VC egress value that indicates a specific connection. Values 16 — 1048575

vc-label

Syntax	vc-label <i>ingress-vc-label</i> no vc-label [<i>ingress-vc-label</i>]
Context	config>service>cpipe>spoke-sdp>ingress
Description	This command configures the spoke-SDP ingress VC label.
Parameters	<i>ingress-vc-label</i> — A VC ingress value that indicates a specific connection. Values 2048 — 18431

precedence

Syntax	precedence [<i>precedence-value</i>] primary no precedence
Context	config>service>cpipe>spoke-sdp
Description	This command specifies the precedence of the SDP binding when there are multiple SDP bindings attached to one service endpoint. The value of zero can only be assigned to one SDP bind making it the primary SDP bind. When an SDP binding goes down, the next highest precedence SDP binding will begin to forward traffic. The no form of the command returns the precedence value to the default.
Default	4
Parameters	<i>precedence-value</i> — Specifies the spoke SDP precedence. Values 1 — 4 primary — Specifies to make this the primary spoke SDP.

Virtual Private LAN Service

In This Chapter

This chapter provides information about Virtual Private LAN Service (VPLS), process overview, and implementation notes.

Topics in this chapter include:

- [VPLS Service Overview on page 419](#)
- [VPLS Features on page 424](#)
 - [VPLS Packet Walkthrough on page 420](#)
 - [VPLS Enhancements on page 424](#)
 - [VPLS over MPLS on page 425](#)
 - [VPLS MAC Learning and Packet Forwarding on page 425](#)
 - [VPLS Using G.8031 Protected Ethernet Tunnels on page 429](#)
 - [Pseudowire Control Word on page 430](#)
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 - [VPLS and Spanning Tree Protocol on page 435](#)
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 - [Egress Multicast Groups on page 444](#)
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VPLS Service Overview

Virtual Private LAN Service (VPLS) as described in Internet Draft *draft-ietf-ppvpn-vpls-ldp-01.txt*, is a class of virtual private network service that allows the connection of multiple sites in a single bridged domain over a provider-managed IP/MPLS network. The customer sites in a VPLS instance appear to be on the same LAN, regardless of their location. VPLS uses an Ethernet interface on the customer-facing (access) side which simplifies the LAN/WAN boundary and allows for rapid and flexible service provisioning.

VPLS offers a balance between point-to-point Frame Relay service and outsourced routed services (VPRN). VPLS enables each customer to maintain control of their own routing strategies. All customer routers in the VPLS service are part of the same subnet (LAN) which simplifies the IP addressing plan, especially when compared to a mesh constructed from many separate point-to-point connections. The VPLS service management is simplified since the service is not aware of nor participates in the IP addressing and routing.

A VPLS service provides connectivity between two or more SAPs on one (which is considered a local service) or more (which is considered a distributed service) service routers. The connection appears to be a bridged domain to the customer sites so protocols, including routing protocols, can traverse the VPLS service.

Other VPLS advantages include:

- VPLS is a transparent, protocol-independent service.
- There is no Layer 2 protocol conversion between LAN and WAN technologies.
- There is no need to design, manage, configure, and maintain separate WAN access equipment, thus, eliminating the need to train personnel on WAN technologies such as Frame Relay.

VPLS Packet Walkthrough

This section provides an example of VPLS processing of a customer packet sent across the network (Figure 57) from site-A, which is connected to PE-Router-A, to site-B, which is connected to PE-Router-C (Figure 58).

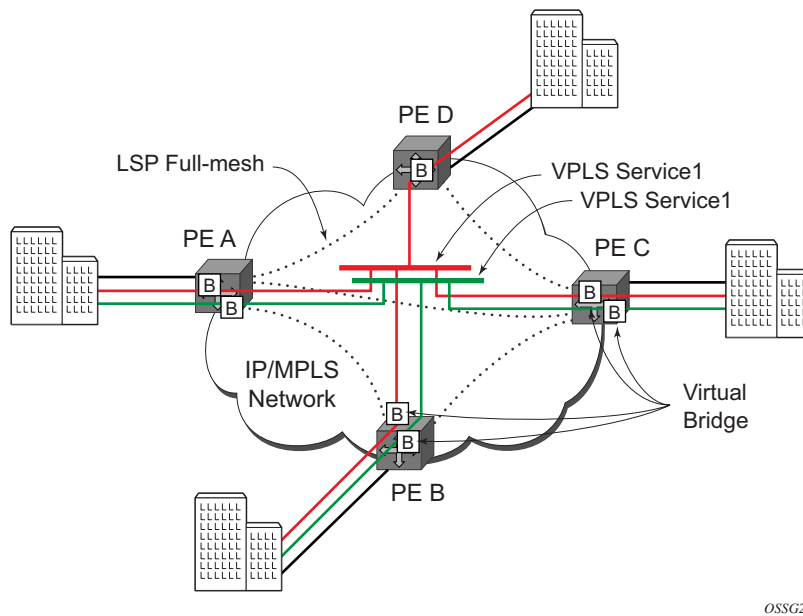


Figure 57: VPLS Service Architecture

1. PE-Router-A (Figure 58)
 - a. Service packets arriving at PE-Router-A are associated with a VPLS service instance based on the combination of the physical port and the IEEE 802.1Q tag (VLAN-ID) in the packet.

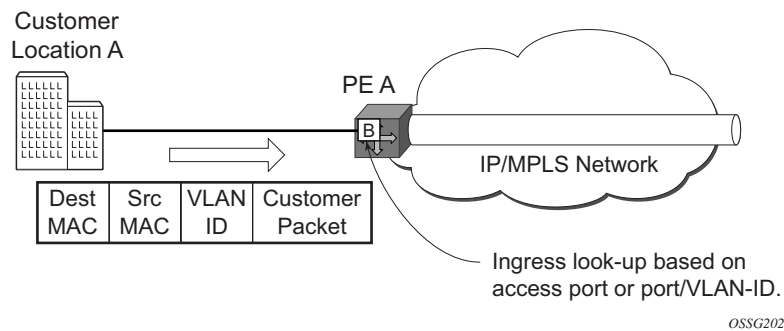


Figure 58: Access Port Ingress Packet Format and Lookup

- b. PE-Router-A learns the source MAC address in the packet and creates an entry in the FIB table that associates the MAC address to the service access point (SAP) on which it was received.
- c. The destination MAC address in the packet is looked up in the FIB table for the VPLS instance. There are two possibilities: either the destination MAC address has already been learned (known MAC address) or the destination MAC address is not yet learned (unknown MAC address).

For a Known MAC Address (Figure 59):

- d. If the destination MAC address has already been learned by PE-Router-A, an existing entry in the FIB table identifies the far-end PE-router and the service VC-label (inner label) to be used before sending the packet to far-end PE-Router-C.
- e. PE-Router-A chooses a transport LSP to send the customer packets to PE-Router-C. The customer packet is sent on this LSP once the IEEE 802.1Q tag is stripped and the service VC-label (inner label) and the transport label (outer label) are added to the packet.

For an Unknown MAC Address (Figure 59):

- f. If the destination MAC address has not been learned, PE-Router-A will flood the packet to both PE-Router-B and PE-Router-C that are participating in the service by using the VC-labels that each PE-Router previously signaled for the VPLS instance. Note that the packet is not sent to PE-Router-D since this VPLS service does not exist on that PE-router.

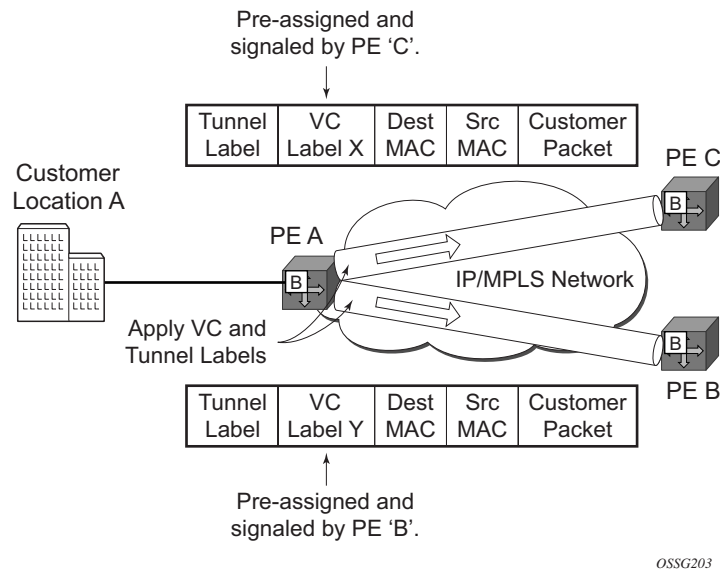


Figure 59: Network Port Egress Packet Format and Flooding

2. Core Router Switching

- All the core routers ('P' routers in IETF nomenclature) between PE-Router-A and PE-Router-B and PE-Router-C are Label Switch Routers (LSRs) that switch the packet based on the transport (outer) label of the packet until the packet arrives at far-end PE-Router. All core routers are unaware that this traffic is associated with a VPLS service.

3. PE-Router-C

- PE-Router-C strips the transport label of the received packet to reveal the inner VC-label. The VC-label identifies the VPLS service instance to which the packet belongs.
- PE-Router-C learns the source MAC address in the packet and creates an entry in the FIB table that associates the MAC address to PE-Router-A and the VC-label that PE-Router-A signaled it for the VPLS service .
- The destination MAC address in the packet is looked up in the FIB table for the VPLS instance. Again, there are two possibilities: either the destination MAC address has already been learned (known MAC address) or the destination MAC address has not been learned on the access side of PE-Router-C (unknown MAC address).

Known MAC address (Figure 60)

- If the destination MAC address has been learned by PE-Router-C, an existing entry in the FIB table identifies the local access port and the IEEE 802.1Q tag to be added before sending the packet to customer Location-C. The egress Q tag may be different than the ingress Q tag.

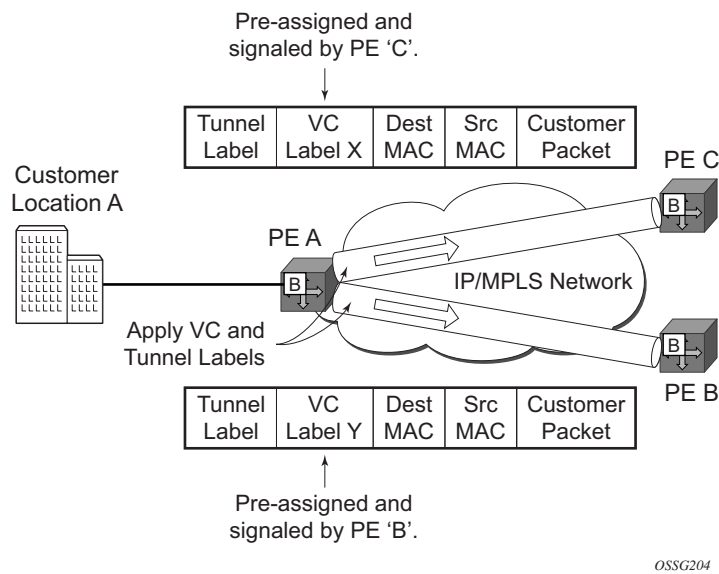


Figure 60: Access Port Egress Packet Format and Lookup

VPLS Features

This section features:

- [VPLS Enhancements on page 424](#)
 - [Pseudowire Control Word on page 430](#)
 - [Split Horizon SAP Groups and Split Horizon Spoke SDP Groups on page 434](#)
 - [VPLS and Spanning Tree Protocol on page 435](#)
 - [VPLS Redundancy on page 455](#)
 - [VPLS Access Redundancy on page 471](#)
-

VPLS Enhancements

Alcatel-Lucent's VPLS implementation includes several enhancements beyond basic VPN connectivity. The following VPLS features can be configured individually for each VPLS service instance:

- Extensive MAC and IP filter support (up to Layer 4). Filters can be applied on a per SAP basis.
- Forwarding Information Base (FIB) management features on a per service level including:
 - Configurable FIB size limit
 - FIB size alarms
 - MAC learning disable
 - Discard unknown
 - Separate aging timers for locally and remotely learned MAC addresses.
- Ingress rate limiting for broadcast, multicast, and destination unknown flooding on a per SAP basis.
- Implementation of Spanning Tree Protocol (STP) parameters on a per VPLS, per SAP and per spoke SDP basis.
- A split horizon group on a per-SAP and per-spoke SDP basis.
- DHCP snooping and anti-spoofing on a per-SAP and per-SDP basis.
- IGMP snooping on a per-SAP and per-SDP basis.
- Optional SAP and/or spoke SDP redundancy to protect against node failure.

VPLS over MPLS

The VPLS architecture proposed in *draft-ietf-ppvpn-vpls-ldp-0x.txt* specifies the use of provider equipment (PE) that is capable of learning, bridging, and replication on a per-VPLS basis. The PE routers that participate in the service are connected using MPLS Label Switched Path (LSP) tunnels in a full-mesh composed of mesh SDPs or based on an LSP hierarchy (Hierarchical VPLS (H-VPLS)) composed of mesh SDPs and spoke SDPs.

Multiple VPLS services can be offered over the same set of LSP tunnels. Signaling specified in *draft-martini-l2circuit-encap-mpls-0x.txt* is used to negotiate a set of ingress and egress VC labels on a per-service basis. The VC labels are used by the PE routers for de-multiplexing traffic arriving from different VPLS services over the same set of LSP tunnels.

VPLS is provided over MPLS by:

- Connecting bridging-capable provider edge routers with a full mesh of MPLS LSP (label switched path) tunnels.
- Negotiating per-service VC labels using *draft-Martini* encapsulation.
- Replicating unknown and broadcast traffic in a service domain.
- Enabling MAC learning over tunnel and access ports (see [VPLS MAC Learning and Packet Forwarding](#)).
- Using a separate forwarding information base (FIB) per VPLS service.

VPLS MAC Learning and Packet Forwarding

The 7750 SR edge devices perform the packet replication required for broadcast and multicast traffic across the bridged domain. MAC address learning is performed by the 7750 SR to reduce the amount of unknown destination MAC address flooding.

7750 SR routers learn the source MAC addresses of the traffic arriving on their access and network ports.

Each 7750 SR maintains a Forwarding Information Base (FIB) for each VPLS service instance and learned MAC addresses are populated in the FIB table of the service. All traffic is switched based on MAC addresses and forwarded between all participating nodes using the LSP tunnels. Unknown destination packets (for example, the destination MAC address has not been learned) are forwarded on all LSPs to all participating nodes for that service until the target station responds and the MAC address is learned by the 7750 SR associated with that service.

MAC Learning Protection

In a Layer 2 environment, subscribers connected to SAPs A, B, C can create a denial of service attack by sending packets sourcing the gateway MAC address. This will move the learned gateway MAC from the uplink SDP/SAP to the subscriber's SAP causing all communication to the gateway to be disrupted. If local content is attached to the same VPLS (D), a similar attack can be launched against it. Communication between subscribers must also be disallowed but split-horizon will not be sufficient in the topology depicted in [Figure 61](#).

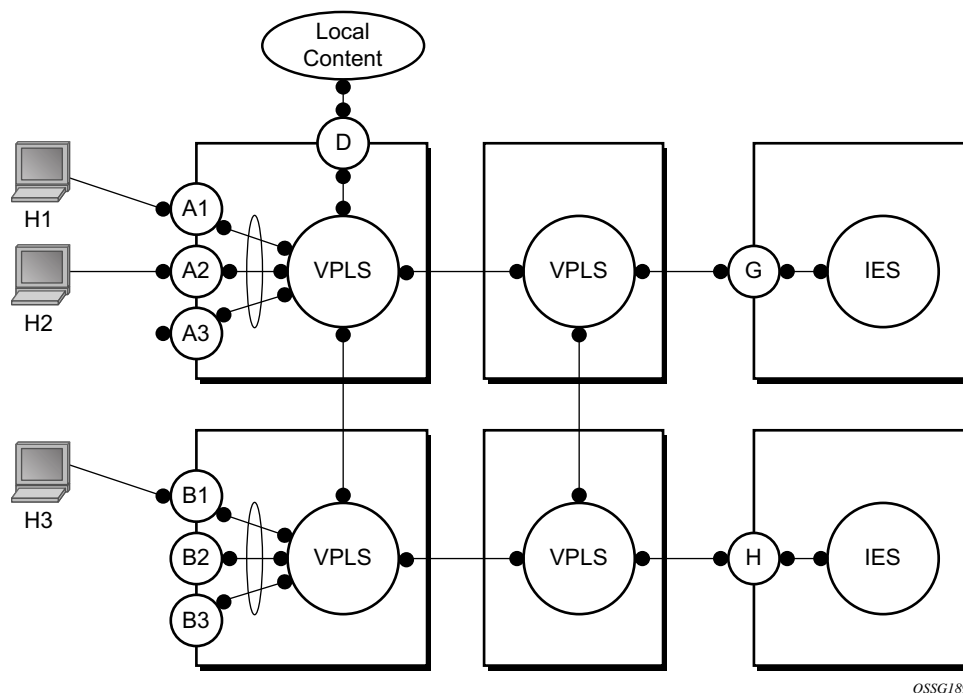


Figure 61: MAC Learning Protection

7750 SRs enable MAC learning protection capability for SAPs and SDPs. With this mechanism, forwarding and learning rules apply to the non-protected SAPs. Assume hosts H1, H2 and H3 ([Figure 61](#)) are non-protected while IES interfaces G and H are protected. When a frame arrives at a protected SAP/SDP the MAC is learned as usual. When a frame arrives from a non-protected SAP or SDP the frame must be dropped if the source MAC address is protected and the MAC address is not relearned. The system allows only packets with a protected MAC destination address.

The system can be configured statically. The addresses of all protected MACs are configured. Only the IP address can be included and use a dynamic mechanism to resolve the MAC address (cpe-ping). All protected MACs in all VPLS instances in the network must be configured.

In order to eliminate the ability of a subscriber to cause a DOS attack, the node restricts the learning of protected MAC addresses based on a statically defined list. In addition the destination MAC address is checked against the protected MAC list to verify that a packet entering a restricted SAP has a protected MAC as a destination.

DEI in IEEE 802.1ad

IEEE 802.1ad-2005 standard allows drop eligibility to be conveyed separately from priority in Service VLAN TAGs (STAGs) so that all of the previously introduced traffic types can be marked as drop eligible. The Service VLAN TAG has a new format where the priority and discard eligibility parameters are conveyed in the three bit Priority Code Point (PCP) field and respectively in the DE Bit (Figure 62).

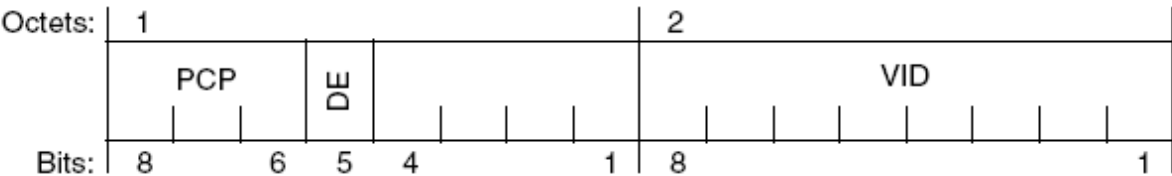


Figure 62: DE Bit in the 802.1ad S-TAG

The DE bit allows the S-TAG to convey eight forwarding classes/distinct emission priorities, each with a drop eligible indication.

When DE bit is set to 0 (DE=FALSE), the related packet is **not** discard eligible. This is the case for the packets that are within the CIR limits and must be given priority in case of congestion. If the DEI is not used or backwards compliance is required the DE bit should be set to zero on transmission and ignored on reception.

When the DE bit is set to 1 (DE=TRUE), the related packet is discard eligible. This is the case for the packets that are sent above the CIR limit (but below the PIR). In case of congestion these packets will be the first ones to be dropped.

VPLS Using G.8031 Protected Ethernet Tunnels

The use of MPLS tunnels provides a way to scale the core while offering fast failover times using MPLS FRR. In environments where Ethernet services are deployed using native Ethernet backbones Ethernet tunnels are provided to achieve the same fast failover times as in the MPLS FRR case. There are still service provider environments where Ethernet services are deployed using native Ethernet backbones..

The Alcatel-Lucent VPLS implementation offers the capability to use core Ethernet tunnels compliant with ITU-T G.8031 specification to achieve 50 ms resiliency for backbone failures. This is required to comply with the stringent SLAs provided by service providers in the current competitive environment. The implementation also allows a LAG-emulating Ethernet Tunnel providing a complimentary native Ethernet ELAN capability. The LAG-emulating Ethernet tunnels and G.8031 protected Ethernet tunnels operate independently. (refer to LAG emulation using Ethernet Tunnels)

When using Ethernet Tunnels, the Ethernet Tunnel logical interface is created first. The Ethernet tunnel has member ports which are the physical ports supporting the links. The Ethernet tunnel control SAPs carries G.8031 and 802.1ag control traffic and user data traffic. Ethernet Service SAPs are configured on the Ethernet tunnel. Optionally when tunnels follow the same paths end to end services may be configured with, Same-fate Ethernet tunnel SAPs which carry only user data traffic and shares the fate of the Ethernet tunnel port (if properly configured).

When configuring VPLS and BVPLS using Ethernet tunnels the services are very similar Refer to [PBB Using G.8031 Protected Ethernet-Tunnels on page 786](#) for examples.

Pseudowire Control Word

The control word command enables the use of the control word individually on each mesh-sdp or spoke-sdp. By default, the control word is disabled. When the control word is enabled, all VPLSpackets, including the BPDU frames are encapsulated with the control word. The T-LDP control plane behavior will be the same as the control word for VLL services. The configuration for the two directions of the Ethernet pseudowire should match.

Table Management

The following sections describe VPLS features related to management of the Forwarding Information Base (FIB).

FIB Size

The following MAC table management features are required for each instance of a SAP or spoke SDP within a particular VPLS service instance:

- **MAC FIB size limits** — Allows users to specify the maximum number of MAC FIB entries that are learned locally for a SAP or remotely for a spoke SDP. If the configured limit is reached, then no new addresses will be learned from the SAP or spoke SDP until at least one FIB entry is aged out or cleared.
 - When the limit is reached on a SAP or spoke SDP, packets with unknown source MAC addresses are still forwarded (this default behavior can be changed via configuration). By default, if the destination MAC address is known, it is forwarded based on the FIB, and if the destination MAC address is unknown, it will be flooded. Alternatively, if discard unknown is enabled at the VPLS service level, any packets from unknown source MAC addresses are discarded at the SAP.
 - The log event SAP MAC limit reached is generated when the limit is reached. When the condition is cleared, the log event SAP MAC Limit Reached Condition Cleared is generated.
 - Disable learning allows users to disable the dynamic learning function on a SAP or a spoke SDP of a VPLS service instance.
 - Disable aging allows users to turn off aging for learned MAC addresses on a SAP or a spoke SDP of a VPLS service instance.
-

FIB Size Alarms

The size of the VPLS FIB can be configured with a low watermark and a high watermark, expressed as a percentage of the total FIB size limit. If the actual FIB size grows above the configured high watermark percentage, an alarm is generated. If the FIB size falls below the configured low watermark percentage, the alarm is cleared by the system.

Local and Remote Aging Timers

Like a Layer 2 switch, learned MACs within a VPLS instance can be aged out if no packets are sourced from the MAC address for a specified period of time (the aging time). In each VPLS service instance, there are independent aging timers for locally learned MAC and remotely learned MAC entries in the forwarding database (FIB). A local MAC address is a MAC address associated with a SAP because it ingressed on a SAP. A remote MAC address is a MAC address received via an SDP from another router for the VPLS instance. The local-age timer for the VPLS instance specifies the aging time for locally learned MAC addresses, and the remote-age timer specifies the aging time for remotely learned MAC addresses.

In general, the remote-age timer is set to a longer period than the local-age timer to reduce the amount of flooding required for destination unknown MAC addresses. The aging mechanism is considered a low priority process. In most situations, the aging out of MAC addresses can happen in within tens of seconds beyond the age time. To minimize overhead, local MAC addresses on a LAG port and remote MAC addresses, in some circumstances, can take up to two times their respective age timer to be aged out.

Disable MAC Aging

The MAC aging timers can be disabled which will prevent any learned MAC entries from being aged out of the FIB. When aging is disabled, it is still possible to manually delete or flush learned MAC entries. Aging can be disabled for learned MAC addresses on a SAP or a spoke SDP of a VPLS service instance.

Disable MAC Learning

When MAC learning is disabled for a service, new source MAC addresses are not entered in the VPLS FIB, whether the MAC address is local or remote. MAC learning can be disabled for individual SAPs or spoke SDPs.

Unknown MAC Discard

Unknown MAC discard is a feature which discards all packets ingressing the service where the destination MAC address is not in the FIB. The normal behavior is to flood these packets to all end points in the service.

Unknown MAC discard can be used with the disable MAC learning and disable MAC aging options to create a fixed set of MAC addresses allowed to ingress and traverse the service.

VPLS and Rate Limiting

Traffic that is normally flooded throughout the VPLS can be rate limited on SAP ingress through the use of service ingress QoS policies. In a service ingress QoS policy, individual queues can be defined per forwarding class to provide shaping of broadcast traffic, MAC multicast traffic and unknown destination MAC traffic.

MAC Move

The MAC move feature is useful to protect against undetected loops in a VPLS topology as well as the presence of duplicate MACs in a VPLS service.

If two clients in the VPLS have the same MAC address, the VPLS will experience a high re-learn rate for the MAC. When MAC move is enabled, the 7750 SR will shut down the SAP or spoke SDP and create an alarm event when the threshold is exceeded.

MAC move allows sequential order port blocking. By configuration, some VPLS ports can be configured as “non-blockable” which allows simple level of control which ports are being blocked during loop occurrence. There are two sophisticated control mechanisms that allow blocking of ports in a sequential order:

1. Configuration capabilities to group VPLS ports and to define the order they should be blocked.
2. Criteria defining when individual groups should be blocked.

For the first, configuration CLI is extended by definition of “primary” and “secondary” ports. Per default, all VPLS ports are considered “tertiary” ports unless they are explicitly declared primary or secondary. The order of blocking will always follow a strict order starting from “tertiary” to secondary and then primary.

The definition of criteria for the second control mechanism is the number of periods during which the given re-learn rate has been exceeded. The mechanism is based on the “cumulative” factor for every group of ports. Tertiary VPLS ports are blocked if the re-learn rate exceeds the configured threshold during one period while secondary ports are blocked only when re-learn rates are exceeded during two consecutive periods, and so forth. The retry timeout period must be larger than the period before blocking the “highest priority port” so it sufficiently spans across the period required to block all ports in sequence. The period before blocking the “highest priority port” is the cumulative factor of the highest configured port multiplied by 5 seconds (the retry timeout can be configured through the CLI).

Split Horizon SAP Groups and Split Horizon Spoke SDP Groups

Within the context of VPLS services, a loop-free topology within a fully meshed VPLS core is achieved by applying a split-horizon forwarding concept that packets received from a mesh SDP are never forwarded to other mesh SDPs within the same service. The advantage of this approach is that no protocol is required to detect loops within the VPLS core network.

In applications such as DSL aggregation, it is useful to extend this split-horizon concept also to groups of SAPs and/or spoke SDPs. This extension is referred to as a split horizon SAP group or residential bridging.

Traffic arriving on a SAP or a spoke SDP within a split horizon group will not be copied to other SAPs and spoke SDPs in the same split horizon group (but will be copied to SAPs / spoke SDPs in other split horizon groups if these exist within the same VPLS).

VPLS and Spanning Tree Protocol

Alcatel-Lucent's VPLS service provides a bridged or switched Ethernet Layer 2 network. Equipment connected to SAPs forward Ethernet packets into the VPLS service. The 7750 SR participating in the service learns where the customer MAC addresses reside, on ingress SAPs or ingress SDPs.

Unknown destinations, broadcasts, and multicasts are flooded to all other SAPs in the service. If SAPs are connected together, either through misconfiguration or for redundancy purposes, loops can form and flooded packets can keep flowing through the network. Alcatel-Lucent's implementation of the Spanning Tree Protocol (STP) is designed to remove these loops from the VPLS topology. This is done by putting one or several SAPs and/or spoke SDPs in the discarding state.

Alcatel-Lucent's implementation of the Spanning Tree Protocol (STP) incorporates some modifications to make the operational characteristics of VPLS more effective.

The STP instance parameters allow the balancing between resiliency and speed of convergence extremes. Modifying particular parameters can affect the behavior. For information on command usage, descriptions, and CLI syntax, refer to [Configuring a VPLS Service with CLI on page 509](#).

Spanning Tree Operating Modes

Per VPLS instance, a preferred STP variant can be configured. The STP variants supported are:

- `rstp` — Rapid Spanning Tree Protocol (RSTP) compliant with IEEE 802.1D-2004 - default mode
- `dot1w` — Compliant with IEEE 802.1w
- `comp-dot1w` — Operation as in RSTP but backwards compatible with IEEE 802.1w (this mode allows interoperability with some MTU types)
- `mstp` — Compliant with the Multiple Spanning Tree Protocol specified in IEEE 802.1Q-REV/D5.0-09/2005. This mode of operation is only supported in an mVPLS.

While the 7750 SR initially uses the mode configured for the VPLS, it will dynamically fall back (on a per-SAP basis) to STP (IEEE 802.1D-1998) based on the detection of a BPDU of a different format. A trap or log entry is generated for every change in spanning tree variant.

Some older 802.1W compliant RSTP implementations may have problems with some of the features added in the 802.1D-2004 standard. Interworking with these older systems is improved with the `comp-dot1w` mode. The differences between the RSTP mode and the `comp-dot1w` mode are:

- The RSTP mode implements the improved convergence over shared media feature, for example, RSTP will transition from discarding to forwarding in 4 seconds when operating over shared media. The comp-dot1w mode does not implement this 802.1D-2004 improvement and transitions conform to 802.1w in 30 seconds (both modes implement fast convergence over point-to-point links).
- In the RSTP mode, the transmitted BPDUs contain the port's designated priority vector (DPV) (conforms to 802.1D-2004). Older implementations may be confused by the DPV in a BPDU and may fail to recognize an agreement BPDU correctly. This would result in a slow transition to a forwarding state (30 seconds). For this reason, in the comp-dot1w mode, these BPDUs contain the port's port priority vector (conforms to 802.1w).

The 7750 SR supports two BPDU encapsulation formats, and can dynamically switch between these (again on a per-SAP basis):

- IEEE 802.1D STP
- Cisco PVST

Multiple Spanning Tree

The Multiple Spanning Tree Protocol (MSTP) extends the concept of the IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) by allowing grouping and associating VLANs to Multiple Spanning Tree Instances (MSTI). Each MSTI can have its own topology, which provides architecture enabling load balancing by providing multiple forwarding paths. At the same time, the number of STP instances running in the network is significantly reduced as compared to Per VLAN STP (PVST) mode of operation. Network fault tolerance is also improved because a failure in one instance (forwarding path) does not affect other instances.

The SR-Series implementation of Management VPLS (mVPLS) is used to group different VPLS instances under single RSTP instance. Introducing MSTP into the mVPLS allows interoperating with traditional Layer 2 switches in access network and provides an effective solution for dual homing of many business Layer 2 VPNs into a provider network.

Redundancy Access to VPLS

The GigE MAN portion of the network is implemented with traditional switches. Using MSTP running on individual switches facilitates redundancy in this part of the network. In order to provide dual homing of all VPLS services accessing from this part of the network, the VPLS PEs must participate in MSTP.

This can be achieved by configuring mVPLS on VPLS-PEs (only PEs directly connected to GigE MAN network) and then assign different managed-vlan ranges to different MSTP instances. Typically, the mVPLS would have SAPs with null encapsulations (to receive, send, and transmit MSTP BPDUs) and a mesh SDP to interconnect a pair of VPLS PEs.

Different access scenarios are displayed in [Figure 63](#) as example network diagrams dually connected to the PBB PEs:

- **Access Type A** — Source devices connected by null or Dot1q SAPs
- **Access Type B** — One QinQ switch connected by QinQ/801ad SAPs
- **Access Type C** — Two or more ES devices connected by QinQ/802.1ad SAPs

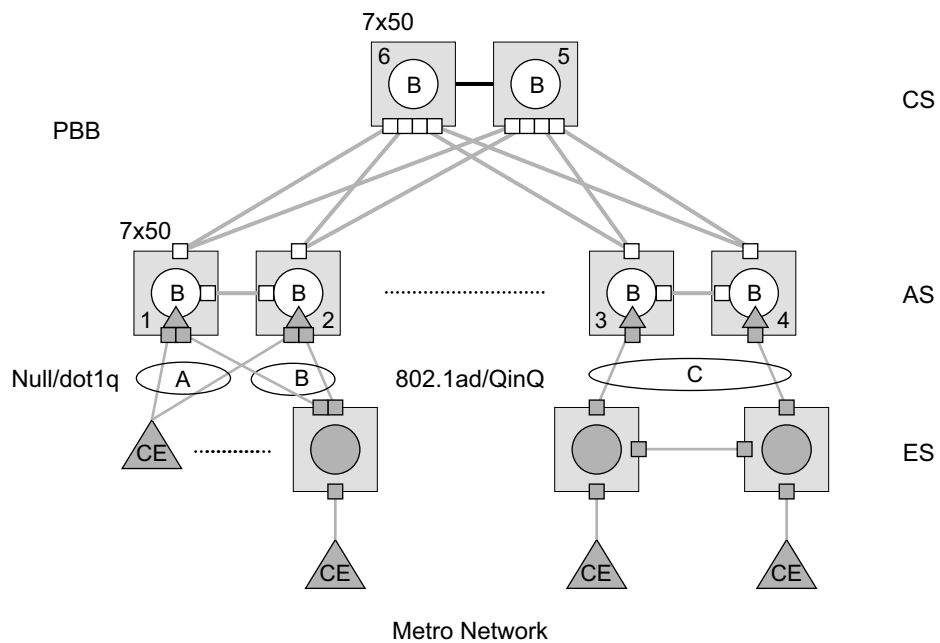


Figure 63: Access Resiliency

The following mechanisms are supported for the I-VPLS:

- **STP/RSTP** can be used for all access types
- **M-VPLS with MSTP** can be used as is just for access Type A. MSTP is required for access type B and C.
- **LAG and MC-LAG** can be used for access Type A and B/
- **Split-horizon-group** does not require residential.

PBB I-VPLS inherits current STP configurations from the regular VPLS and MVPLS.

MSTP for QinQ SAPs

MSTP runs in a MVPLS context and can control SAPs from source VPLS instances. QinQ SAPs are supported. The outer tag is considered by MSTP as part of VLAN range control

Provider MSTP

Provider MSTP is specified in (IEEE-802.1ad-2005). It uses a provider bridge group address instead of a regular bridge group address used by STP, RSTP, MSTP BPDUs. This allows for implicit separation of source and provider control planes.

The 802.1ad access network sends PBB PE P-MSTP BPDUs using the specified MAC address and also works over QinQ interfaces. P-MSTP mode is used in PBBN for core resiliency and loop avoidance.

Similar to regular MSTP, the STP mode (for example, PMSTP) is only supported in VPLS services where the m-VPLS flag is configured.

MSTP General Principles

MSTP represents modification of RSTP which allows the grouping of different VLANs into multiple MSTIs. To enable different devices to participate in MSTIs, they must be consistently configured. A collection of interconnected devices that have the same MST configuration (region-name, revision and VLAN-to-instance assignment) comprises an MST region.

There is no limit to the number of regions in the network, but every region can support a maximum of 16 MSTIs. Instance 0 is a special instance for a region, known as the Internal Spanning Tree (IST) instance. All other instances are numbered from 1 to 4094. IST is the only spanning-tree instance that sends and receives BPDUs (typically BPDUs are untagged). All other spanning-tree instance information is included in MSTP records (M-records), which are encapsulated within MSTP BPDUs. This means that single BPDU carries information for multiple MSTI which reduces overhead of the protocol.

Any given MSTI is local to an MSTP region and completely independent from an MSTI in other MST regions. Two redundantly connected MST regions will use only a single path for all traffic flows (no load balancing between MST regions or between MST and SST region).

Traditional L2 switches running MSTP protocol assign all VLANs to the IST instance per default. The operator may then “re-assign” individual VLANs to a given MSTI by configuring per VLAN assignment. This means that a SR-Series PE can be considered as the part of the same MST region only if the VLAN assignment to IST and MSTIs is identical to the one of Layer 2 switches in access network.

MSTP in the SR-Series Platform

The SR-Series platform uses a concept of mVPLS to group different SAPs under a single STP instance. The VLAN range covering SAPs to be managed by a given mVPLS is declared under a specific mVPLS SAP definition. MSTP mode-of-operation is only supported in an mVPLS.

When running MSTP, by default, all VLANs are mapped to the CIST. On the VPLS level VLANs can be assigned to specific MSTIs. When running RSTP, the operator must explicitly indicate, per SAP, which VLANs are managed by that SAP.

Enhancements to the Spanning Tree Protocol

To interconnect 7750 SR routers (PE devices) across the backbone, service tunnels (SDPs) are used. These service tunnels are shared among multiple VPLS instances. Alcatel-Lucent's implementation of the Spanning Tree Protocol (STP) incorporates some enhancements to make the operational characteristics of VPLS more effective. The implementation of STP on the router is modified in order to guarantee that service tunnels will not be blocked in any circumstance without imposing artificial restrictions on the placement of the root bridge within the network. The modifications introduced are fully compliant with the 802.1D-2004 STP specification.

When running MSTP, spoke SDPs cannot be configured. Also, ensure that all bridges connected by mesh SDPs are in the same region. If not, the mesh will be prevented from becoming active (trap is generated).

In order to achieve this, all mesh SDPs are dynamically configured as either root ports or designated ports. The PE devices participating in each VPLS mesh determine (using the root path cost learned as part of the normal protocol exchange) which of the 7750 SR devices is closest to the root of the network. This PE device is internally designated as the primary bridge for the VPLS mesh. As a result of this, all network ports on the primary bridges are assigned the designated port role and therefore remain in the forwarding state.

The second part of the solution ensures that the remaining PE devices participating in the STP instance see the SDP ports as a lower cost path to the root rather than a path that is external to the mesh. Internal to the PE nodes participating in the mesh, the SDPs are treated as zero cost paths towards the primary bridge. As a consequence, the path through the mesh are seen as lower cost than any alternative and the PE node will designate the network port as the root port. This approach ensures that network ports always remain in forwarding state.

In combination, these two features ensure that network ports will never be blocked and will maintain interoperability with bridges external to the mesh which are running STP instances.

L2PT Termination

L2PT is used to transparently transport protocol data units (PDUs) of Layer 2 protocols such as STP, CDP, VTP and PAGP and UDLD. This allows running these protocols between customer CPEs without involving backbone infrastructure.

7750 SR routers allow transparent tunneling of PDUs across the VPLS core. However, in some network designs, the VPLS PE is connected to CPEs through a legacy Layer 2 network, rather than having direct connections. In such environments termination of tunnels through such infrastructure is required.

L2PT tunnels protocol PDUs by overwriting MAC destination addresses at the ingress of the tunnel to a proprietary MAC address such as 01-00-0c-cd-cd-d0. At the egress of the tunnel, this MAC address is then overwritten back to MAC address of the respective Layer 2 protocol.

7750 SR routers support L2PT termination for STP BPDUs. More specifically:

- At ingress of every SAP/spoke SDP which is configured as L2PT termination, all PDUs with a MAC destination address, 01-00-0c-cd-cd-d0 will be intercepted and their MAC destination address will be overwritten to MAC destination address used for the corresponding protocol (PVST, STP, RSTP). The type of the STP protocol can be derived from LLC and SNAP encapsulation.
- In egress direction, all STP PDUs received on all VPLS ports will be intercepted and L2PT encapsulation will be performed for SAP/spoke SDPs configured as L2PT termination points. Because of the implementation reasons, PDU interception and redirection to CPM can be performed only at ingress. Therefore, to comply with the above requirement, as soon as at least 1 port of a given VPLS service is configured as L2PT termination port, redirection of PDUs to CPM will be set on all other ports (SAPs, spoke SDPs and mesh SDPs) of the VPLS service.

L2PT termination can be enabled only if STP is disabled in a context of the given VPLS service.

BPDU Translation

VPLS networks are typically used to interconnect different customer sites using different access technologies such as Ethernet and bridged-encapsulated ATM PVCs. Typically, different Layer 2 devices can support different types of STP and even if they are from the same vendor. In some cases, it is necessary to provide BPDU translation in order to provide an interoperable e2e solution.

To address these network designs, BPDU format translation is supported on 7750 SR devices. If enabled on a given SAP or spoke SDP, the system will intercept all BPDUs destined to that interface and perform required format translation such as STP-to-PVST or vice versa.

Similarly, BPDU interception and redirection to the CPM is performed only at ingress meaning that as soon as at least 1 port within a given VPLS service has BPDU translation enabled, all BPDUs received on any of the VPLS ports will be redirected to the CPM.

BPDU translation involves all encapsulation actions that the data path would perform for a given outgoing port (such as adding VLAN tags depending on the outer SAP and the SDP encapsulation type) and adding or removing all the required VLAN information in a BPDU payload.

This feature can be enabled on a SAP only if STP is disabled in the context of the given VPLS service.

L2PT and BPDU Translation

Cisco Discovery Protocol (CDP), Digital Trunking Protocol (DTP), Port Aggregation Protocol (PAGP), Uni-directional Link Detection (ULD) and Virtual Trunk Protocol (VTP) are supported. These protocols automatically pass the other protocols tunneled by L2PT towards the CPM and all carry the same specific Cisco MAC.

The existing L2PT limitations apply.

- The protocols apply only to VPLS.
- The protocols are mutually exclusive with running STP on the same VPLS as soon as one SAP has L2PT enabled.
- Forwarding occurs on the CPM.

Egress Multicast Groups

Efficient multicast replication is a method of increasing egress replication performance by combining multiple destinations into a single egress forwarding pass. In standard egress VPLS multicast forwarding, the complete egress forwarding plane is used per destination to provide ACL, mirroring, QoS and accounting for each path with associated receivers. In order to apply the complete set of available egress VPLS features, the egress forwarding plane must loop-back copies of the original packet so that each flooding destination may be processed. While each distributed egress forwarding plane only replicates to the destinations currently reached through its ports, this loop-back and replicate function can be resource intensive. When egress forwarding plane congestion conditions exist, unicast discards may be indiscriminate relative to forwarding priority. Another by-product of this approach is that the ability for the forwarding plane to fill the egress links is affected which could cause under-run conditions on each link while the forwarding plane is looping packets back to itself.

In an effort to provide highly scalable VPLS egress multicast performance for triple play type deployments, an alternative efficient multicast forwarding option is being offered. This method allows the egress forwarding plane to send a multicast packet to a set (called a chain) of destination SAPs with only a single pass through the egress forwarding plane. This minimizes the egress resources (processing and traffic management) used for the set of destinations and allows proper handling of congestion conditions and minimizes line under-run events. However, due to the batch nature of the egress processing, the chain of destinations must share many attributes. Also, egress port and ACL mirroring will be disallowed for packets handled in this manner.

Packets eligible for forwarding by SAP chaining are VPLS flooded packets (broadcast, multicast and unknown destination unicast) and IP multicast packets matching an VPLS Layer 2 (s,g) record (created through IGMP snooping).

Egress Multicast Group Provisioning

To identify SAPs in the chassis that are eligible for egress efficient multicast SAP chaining, an egress multicast group must be created. SAPs from multiple VPLS contexts may be placed in a single group to minimize the number of groups required on the system and to support multicast VPLS registration (MVR) functions.

Some of the parameters associated with the group member SAPs must be configured with identical values. The common parameters are checked as each SAP is provisioned into the group. If the SAP fails to be consistent in one or more parameters, the SAP is not allowed into the egress multicast group. Once a SAP is placed into the group, changing of a common parameter is not permitted.

Required Common SAP Parameters

Only SAPs created on Ethernet ports are allowed into an egress multicast group.

Required common parameters include:

- [SAP Port Encapsulation Type on page 445](#)
 - [SAP Port Dot1Q EtherType on page 445](#)
 - [Egress Multicast Groups on page 446](#)
 - [SAP Egress Filter on page 446](#)
-

SAP Port Encapsulation Type

The access port encapsulation type defines how the system will delineate SAPs from each other on the access port. SAPs placed in the egress multicast group must be of the same type. The supported access port encapsulation types are null and Dot1q. While all SAPs within the egress multicast group share the same encapsulation type, they are allowed to have different encapsulation values defined. The chained replication process will make the appropriate Dot1q value substitution per destination SAP.

The normal behavior of the system is to disallow changing the port encapsulation type once one or more SAPs have been created on the SAP. This being the case, no special effort is required to ensure that a SAP will be changed from null to Dot1q or Dot1q to null while the SAP is a member of a egress multicast group. Deleting the SAP will automatically remove the SAP from the group.

SAP Port Dot1Q EtherType

The access port dot1q-etype parameter defines which EtherType will be expected in ingress dot1q encapsulated frames and the EtherType that will be used to encapsulate egress dot1q frames on the port. SAPs placed in the same egress multicast group must use the same EtherType when dot1q is enabled as the SAPs encapsulation type.

The normal behavior of the system is to allow dynamic changing of the access port dot1q-etype value while SAPs are currently using the port. Once a dot1q SAP on an access port is allowed into an egress multicast group, the port on which the SAP is created will not accept a change of the configured dot1q-etype value. When the port encapsulation type is set to null, the port's dot1q-etype parameter may be changed at any time.

Egress Multicast Groups

Egress multicast groups to QinQ-encapsulated SAPs support includes:

- All SAP members of the given egress-multicast-group must have the same inner tag.
- A configuration flag, indicates, on a per egress-multicast-group basis, whether all member SAPs have the same inner or outer VLAN tag.

Membership rules for egress-multicast-groups in QinQ SAPs include:

- All SAPs that are members of the same egress-multicast-groups must have the same encapsulation type (as defined by `encap-type qinq` statement)
 - All SAP members of the given multicast group, port, or multicast-group must have the same inner Ethertype as well as outer Ethertype.
 - All SAP members of the multicast-group must have the same inner-vlan-tag (the default setting) or must have the same value of outer-vlan-tag as defined by the **qinq-fixed-tag-value** command.
-

SAP Egress Filter

Due to the chaining nature of egress efficient multicast replication, only the IP or MAC filter defined for the first SAP on each chain is used to evaluate the packet. To ensure consistent behavior for all SAPs in the egress multicast group, when an IP or MAC filter is configured on one SAP it must be configured on all. To prevent inconsistencies, each SAP must have the same egress IP or MAC filter configured (or none at all) prior to allowing the SAP into the egress multicast group.

Attempting to change the egress filter configured on the SAP while the SAP is a member of an egress multicast group is not allowed.

If the configured common egress filter is changed on the egress multicast group, the egress filter on all member SAPs will be overwritten by the new defined filter. If the SAP is removed from the group, the previous filter definition is not restored.

SAP Egress QoS Policy

Each SAP placed in the egress multicast group may have a different QoS policy defined. When the egress forwarding plane performs the replication for each destination in a chain, the internal forwarding class associated with the packet is used to map the packet to an egress queue on the SAP.

In the case where subscriber SLA management is enabled on the SAP and the SAP queues are not available, the queues created by the non-sub-addr-traffic SLA-profile instance are used.

One caveat is that egress Dot1P markings for dot1q SAPs in the replication chain are only evaluated for the first SAP in the chain. If the first SAP defines an egress Dot1P override for the packet, all encapsulations in the chain will share the same value. If the first SAP in the chain does not override the egress Dot1P value, either the existing Dot1P value (relative to ingress) will be preserved or the value 0 (zero) will be used for all SAPs in the replication chain. The egress QoS policy Dot1P remark definitions on the other SAPs in the chain are ignored by the system.

Efficient Multicast Egress SAP Chaining

The egress IOM (Input Output Module) automatically creates the SAP chains on each egress forwarding plane (typically all ports on an MDA are part of a single forwarding plane except in the case of the 10 Gigabit IOM which has two MDAs on a single forwarding plane). The size of each chain is based on the dest-chain-limit command defined on the egress multicast group to which the SAPs in the chain belong.

A set of chains is created by the IOM for each egress flooding list managed by the IOM. While SAPs from multiple VPLS contexts are allowed into a single egress multicast group, an egress flooding list is typically based on a subset of these SAPs. For instance, the broadcast/multicast/unknown flooding list for a VPLS context is limited to the SAPs in that VPLS context. With IGMP snooping on a single VPLS context, the flooding list is per Layer 2 IGMP (s,g) record and is basically limited to the destinations where IGMP joins for the multicast stream have been intercepted. When MVR (Multicast VPLS Registration) is enabled, the (s,g) flooding list may include SAPs from various VPLS contexts based on MVR configuration.

The system maintains a unique flooding list for each forwarding plane VPLS context (see section [VPLS Broadcast/Multicast/Unknown Flooding List on page 449](#)). This list will contain all SAPs (except for residential SAPs), spoke SDP and mesh SDP bindings on the forwarding plane that belong to that VPLS context. Each list may contain a maximum of 127 SAPs. In the case where the IOM is able to create an egress multicast chain, the SAPs within the chain are represented in the flooding list by a single SAP entry (the first SAP in the chain).

The system also maintains a unique flooding list for each Layer 2 IP multicast (s,g) record created through IGMP snooping (see sections [VPLS IGMP Snooping \(s,g\) Flooding List on page 450](#) and [MVR IGMP Snooping \(s,g\) Flooding List on page 450](#)). A flooding list created by IGMP snooping is limited to 127 SAPs, although it may contain other entries representing spoke and mesh SDP bindings. Unlike a VPLS flooding list, a residential SAP may be included in a Layer 2 IP multicast flooding list.

While the system may allow 30 SAPs in a chain, the uninterrupted replication to 30 destinations may have a negative effect on other packets waiting to be processed by the egress forwarding plane. Most notably, massive jitter may be seen on real time VoIP or other time-sensitive applications. The dest-chain-limit parameter should be tuned to allow the proper balance between

multicast replication efficiency and the effect on time sensitive application performance. It is expected that the optimum performance for the egress forwarding plane will be found at around 16 SAPs per chain.

VPLS Broadcast/Multicast/Unknown Flooding List

The IOM includes all VPLS destinations in the egress VPLS Broadcast/Multicast/Unknown (BMU) flooding list that exist on a single VPLS context. Whenever a broadcast, multicast or unknown destination MAC is received in the VPLS, the BMU flooding list is used to flood the packet to all destinations. For normal flooding, care is taken at egress to ensure that the packet is not sent back to the source of the packet. Also, if the packet is associated with a split horizon group (mesh or spoke/SAP) the egress forwarding plane will prevent the packet from reaching destinations in the same split horizon context as the source SAP or SDP-binding.

The VPLS BMU flooding list may contain both egress multicast group SAPs and other SAPs or SDP bindings as destinations. The egress IOM will separate the egress multicast group SAPs from the other destinations to create one or more chains. Egress multicast group SAPs are placed into a chain completely at the discretion of the IOM and the order of SAPs in the list will be nondeterministic. When more SAPs exist on the VPLS context within the egress multicast group then are allowed in a single chain, multiple SAP chains will be created. The IOM VPLS egress BMU flooding list will then contain the first SAP in each chain plus all other VPLS destinations.

The SAPs in the same VPLS context must be in the same split horizon group to allow membership into the egress multicast group. The split horizon context is not required to be the same between VPLS contexts.

SAPs within the same VPLS context may be defined in different egress multicast groups, but SAPs in different multicast groups cannot share the same chain.

VPLS IGMP Snooping (s,g) Flooding List

When IGMP snooping is enabled on a VPLS context, a Layer 2 IP multicast record (s,g) is created for each multicast stream entering the VPLS context. Each stream should only be sent to each SAP or SDP binding where either a multicast router exists or a host exists that has requested to receive the stream (known as a receiver). To facilitate egress handling of each stream, the IOM creates a flooding list for each (s,g) record associated with the VPLS context. As with the BMU flooding list, source and split horizon squelching is enforced by the egress forwarding plane.

As with the BMU VPLS flooding list, the egress multicast group SAPs that have either static or dynamic multicast receivers for the (s,g) stream are chained into groups. The chaining is independent of other (s,g) flooding lists and the BMU flooding list on the VPLS instance. As the (s,g) flooding list membership is dynamic, the egress multicast group SAPs in chains in the list are also managed dynamically.

Since all SAPs placed into the egress multicast group for a particular VPLS context are in the same split horizon group, no special function is required for split horizon squelching.

MVR IGMP Snooping (s,g) Flooding List

When IGMP snooping on a SAP is tied to another VPLS context to facilitate cross VPLS context IP multicast forwarding, a Layer 2 IP multicast (s,g) record is maintained on the VPLS context receiving the multicast stream. This is essentially an extension to the VPLS IGMP snooped flooding described in [VPLS IGMP Snooping \(s,g\) Flooding List on page 450](#). The (s,g) list is considered to be owned by the VPLS context that the multicast stream will enter. Any SAP added to the list that is outside the target VPLS context (using the from-vpls command) is handled as an alien SAP. Split horizon squelching is ignored for alien SAPs.

When chaining the egress multicast group SAPs in an MVR (s,g) list, the IOM will keep the native chained SAPs in separate chains from the alien SAPs to prevent issues with split horizon squelching.

Mirroring and Efficient Multicast Replication

As previously stated, efficient multicast replication affects the ability to perform mirroring decisions in the egress forwarding plane. In the egress forwarding plane, mirroring decisions are performed prior to the egress chain replication function. Since mirroring decisions are only evaluated for the first SAP in each chain, applying a mirroring condition to packets that egress other SAPs in the chain has no effect. Also, the IOM manages the chain membership automatically and the user has no ability to provision which SAP is first in a chain. Thus, mirroring is not allowed for SAPs within a chain.

Port Mirroring

A SAP created on an access port that is currently defined as an egress mirror source may not be defined into an egress multicast group.

A port that has a SAP defined in an egress multicast group may not be defined as an egress mirror source. If egress port mirroring is desired, then all SAPs on the port must first be removed from all egress multicast groups.

Filter Mirroring

An IP or MAC filter that is currently defined on an egress multicast group as a common required parameter may not have an entry from the list defined as a mirror source.

An IP or MAC filter that has an entry defined as a mirror source may not be defined as a common required parameter for an egress multicast group.

If IP or MAC based filter mirroring is required for packets that egress an egress multicast group SAP, the SAP must first be removed from the egress multicast group and then an IP or MAC filter that is not associated with an egress multicast group must be assigned to the SAP.

SAP Mirroring

While SAP mirroring is not allowed within an IOM chain of SAPs, it is possible to define an egress multicast group member SAP as an egress mirror source. When the IOM encounters a chained SAP as an egress mirror source, it automatically removes the SAP from its chain, allowing packets that egress the SAP to hit the mirror decision. Once the SAP is removed as an egress mirror source, the SAP will be automatically placed back into a chain by the IOM.

It should be noted that all mirroring decisions affect forwarding plane performance due to the overhead of replicating the frame to the mirror destination. This is especially true for efficient multicast replication as removing the SAP from the chain also eliminates a portion of the replication efficiency along with adding the mirror replication overhead.

OAM Commands with EMG

There are certain limitations with using the OAM commands when egress multicast group (EMG) is enabled. This is because OAM commands work by looping the OAM packet back to ingress instead of sending them out of the SAP. Hence, if EMG is enabled, these OAM packets will be looped back once per chain and hence, will only be processed for the first SAP on each chain. Particularly, the **mac-ping**, **mac-trace** and **mfib-ping** commands will only list the first SAP in each chain.

IOM Chain Management

As previously stated, the IOM automatically creates the chain lists from the available egress multicast group SAPs. The IOM will create chains from the available SAPs based on the following rules:

1. SAPs from different egress multicast groups must be in different chains (a chain can only contain SAPs from the same group)
2. Alien and native SAPs must be in different chains
3. A specific chain cannot be longer than the defined dest-chain-limit parameter for the egress multicast group to which the SAPs belong

Given the following conditions for an IOM creating a multicast forwarding list (List 1) for a Layer 2 IP multicast (s,g) native to VPLS instance 100:

- Egress multicast group A
 - Destination chain length = 16
 - 30 member SAPs on VPLS 100 joined (s,g) (native to VPLS 100)
 - 41 member SAPs on other VPLS instances joined (s,g) (alien to VPLS 100)
- Egress multicast group B
 - Destination chain length = 8
 - 17 member SAPs on VPLS 100 joined (s,g) (native to VPLS 100)
- Egress multicast group C
 - Destination chain length = 12
 - 23 member SAPs on other VPLS instances joined (s,g) (alien to VPLS 100)

The system will build the SAP chains for List 1 according to [Table 12](#).

Table 12: SAP Chain Creation

Egress Forwarding List 1 SAP Chains					
Egress Multicast Group A Destination Chain Length 16		Egress Multicast Group B Destination Chain Length 8		Egress Multicast Group C Destination Chain Length 12	
Native Chains	Alien Chains	Native Chains	Alien Chains	Native Chains	Alien Chains
16	16	8			12
14	16	8			11
	9	1			

Adding a SAP to a Chain

A SAP must meet all the following conditions to be chained in a VPLS BMU flooding list:

1. The SAP is successfully defined as an egress multicast group member
2. The SAP is not currently an egress mirror source

Further, a SAP must meet the following conditions to be chained in an egress IP multicast (s,g) flooding list:

1. The SAP is participating in IGMP snooping
2. A static or dynamic join to the (s,g) record exists for the SAP or the SAP is defined as a multicast router port

Note: While an operationally down SAP is placed into replication chains, the system ignores that SAP while in the process of replication.

Based on the egress multicast group and the native or alien nature of the SAP in the list, a set of chains are selected for the SAP. The IOM will search the chains for the first empty position in an existing chain and place the SAP in that position. If an empty position is not found, the IOM will create a new chain with that SAP in the first position and add the SAP to the flooding list to represent the new chain.

Removing a SAP from a Chain

A SAP will be removed from a chain in a VPLS BMU flooding list or egress IP multicast (s,g) flooding list for any of the following conditions:

1. The SAP is deleted from the VPLS instance
2. The SAP is removed from the egress multicast group of which it was a member
3. The SAP is defined as an egress mirror source

Further, a SAP will be removed from an egress IP multicast (s,g) flooding list for the following conditions:

1. IGMP snooping removes the SAP as an (s,g) destination or the SAP is removed as a multicast router port

When the SAP is only being removed from the efficient multicast replication function, it may still need to be represented as a stand alone SAP in the flooding list. If the removed SAP is the first SAP in the list, the second SAP in the list is added to the flooding list when the first SAP is de-chained. If the removed SAP is not the first SAP, it is first de-chained and then added to the

flooding list. If the removed SAP is the only SAP in the chain, the chain is removed along with removing the SAP from the flooding list.

Moving a SAP from a chain to a stand alone condition or from a stand alone condition to a chain may cause a momentary glitch in the forwarding plane for the time that the SAP is being moved. Care is taken to prevent or minimize the possibility of duplicate packets being replicated to a destination while the chains and flooding lists are being manipulated.

Chain Optimization

Chains are only dynamically managed during SAP addition and removal events. The system does not attempt to automatically optimize existing chains. It is possible that excessive SAP removal may cause multiple chains to exist with lengths less than the maximum chain length. For example, if four chains exist with eight SAPs each, it is possible that seven of the SAPs from each chain are removed. The result would be four chains of one SAP each effectively removing any benefit of egress SAP replication chaining.

While it may appear that optimization would be beneficial each time a SAP is removed, this is not the case. Rearranging the chains each time a SAP is removed may cause either packet duplication or omitting replication to a destination SAP. Also, it could be argued that if the loop back replication load is acceptable before the SAP is removed, continuing with the same loop back replication load once the SAP is removed is also acceptable. It is important to note that the overall replication load is lessened with each SAP removal from a chain.

While dynamic optimization is not supported, a manual optimization command is supported in each egress multicast group context. When executed the system will remove and add each SAP, rebuilding the replication chains.

When the dest-chain-limit is modified for an egress multicast group, the system will reorganize the replication chains that contain SAPs from that group according to the new maximum chain size.

IOM Mode B Capability

Efficient multicast replication uses an egress forwarding plane that supports chassis mode b due to the expanded memory requirements to store the replication chain information. The system does not need to be placed into mode b for efficient multicast replication to be performed. Any IOM that is capable of mode “b” operation automatically performs efficient multicast replication when a flooding list contains SAPs that are members of an egress multicast group.

VPLS Redundancy

The VPLS standard (RFC 4762, *Virtual Private LAN Services Using LDP Signalling*) includes provisions for hierarchical VPLS, using point-to-point spoke SDPs. Two applications have been identified for spoke SDPs:

- To connect to Multi-Tenant Units (MTUs) to PEs in a metro area network;
- To interconnect the VPLS nodes of two metro networks.

In both applications the spoke SDPs serve to improve the scalability of VPLS. While node redundancy is implicit in non-hierarchical VPLS services (using a full mesh of SDPs between PEs), node redundancy for spoke SDPs needs to be provided separately.

Alcatel-Lucent routers have implemented special features for improving the resilience of hierarchical VPLS instances, in both MTU and inter-metro applications.

Spoke SDP Redundancy for Metro Interconnection

When two or more meshed VPLS instances are interconnected by redundant spoke SDPs (as shown in [Figure 64](#)), a loop in the topology results. In order to remove such a loop from the topology, Spanning Tree Protocol (STP) can be run over the SDPs (links) which form the loop such that one of the SDPs is blocked. As running STP in each and every VPLS in this topology is not efficient, the node includes functionality which can associate a number of VPLSes to a single STP instance running over the redundant-SDPs. Node redundancy is thus achieved by running STP in one VPLS, and applying the conclusions of this STP to the other VPLS services. The VPLS instance running STP is referred to as the “management VPLS” or mVPLS.

In the case of a failure of the active node, STP on the management VPLS in the standby node will change the link states from disabled to active. The standby node will then broadcast a MAC flush LDP control message in each of the protected VPLS instances, so that the address of the newly active node can be re-learned by all PEs in the VPLS.

It is possible to configure two management VPLS services, where both VPLS services have different active spokes (this is achieved by changing the path-cost in STP). By associating different user VPLSes with the two management VPLS services, load balancing across the spokes can be achieved.

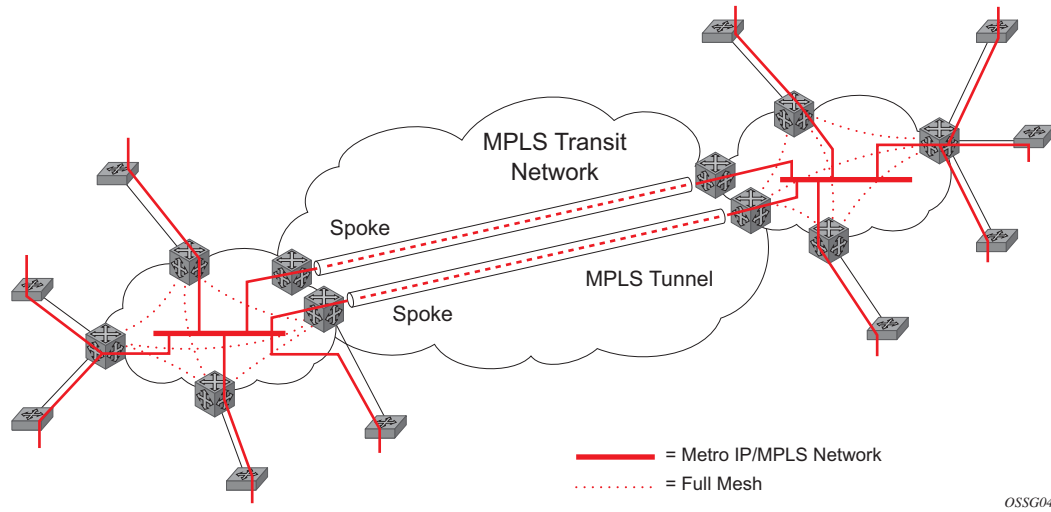


Figure 64: HVPLS with Spoke Redundancy

Spoke SDP Based Redundant Access

This feature provides the ability to have a node deployed as MTUs (Multi-Tenant Unit Switches) to be multi-homed for VPLS to multiple routers deployed as PEs without requiring the use of mVPLS.

In the configuration example displayed in [Figure 64](#), the MTUs have spoke SDPs to two PEs devices. One is designated as the primary and one as the secondary spoke SDP. This is based on a precedence value associated with each spoke.

The secondary spoke is in a blocking state (both on receive and transmit) as long as the primary spoke is available. When the primary spoke becomes unavailable (due to link failure, PEs failure, etc.), the MTU immediately switches traffic to the backup spoke and starts receiving traffic from the standby spoke. Optional revertive operation (with configurable switch-back delay) is supported. Forced manual switchover is also supported.

To speed up the convergence time during a switchover, MAC flush is configured. The MTUs generates a MAC flush message over the newly unblocked spoke when a spoke change occurs. As a result, the PEs receiving the MAC flush will flush all MACs associated with the impacted VPLS service instance and forward the MAC flush to the other PEs in the VPLS network if “propagate-mac-flush” is enabled.

Inter-Domain VPLS Resiliency Using Multi-Chassis Endpoints

Inter-domain VPLS refers to a VPLS deployment where sites may be located in different domains. An example of inter-domain deployment can be where different Metro domains are interconnected over a Wide Area Network (Metro1-WAN-Metro2) or where sites are located in different autonomous systems (AS1-ASBRs-AS2).

Multi-chassis endpoint (MC-EP) provides an alternate solution that does not require RSTP at the gateway VPLS PEs while still using pseudowires to interconnect the VPLS instances located in the two domains. It is supported in both VPLS and PBB-VPLS on the B-VPLS side.

MC-EP expands the single chassis endpoint based on active-standby pseudowires for VPLS shown in [Figure 65](#).

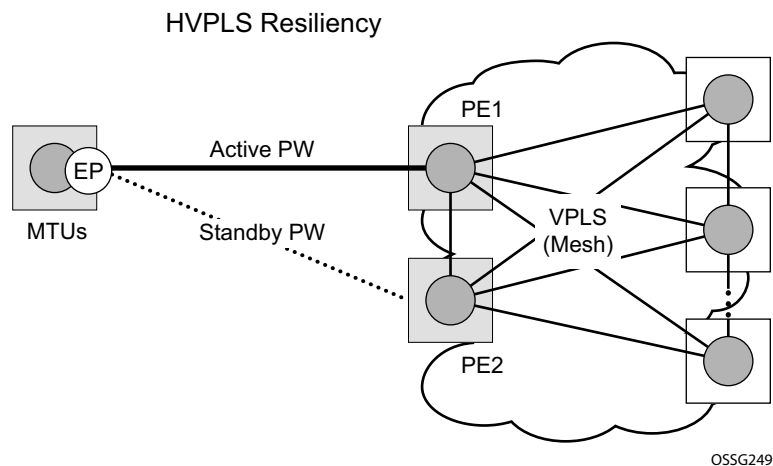


Figure 65: HVPLS Resiliency Based on AS Pseudowires

The active-standby pseudowire solution is appropriate for the scenario when only one VPLS PE (MTU-s) needs to be dual-homed to two core PEs (PE1 and PE2). When multiple VPLS domains need to be interconnected the above solution provides a single point of failure at the MTU-s. The example depicted in [Figure 66](#) can be used.

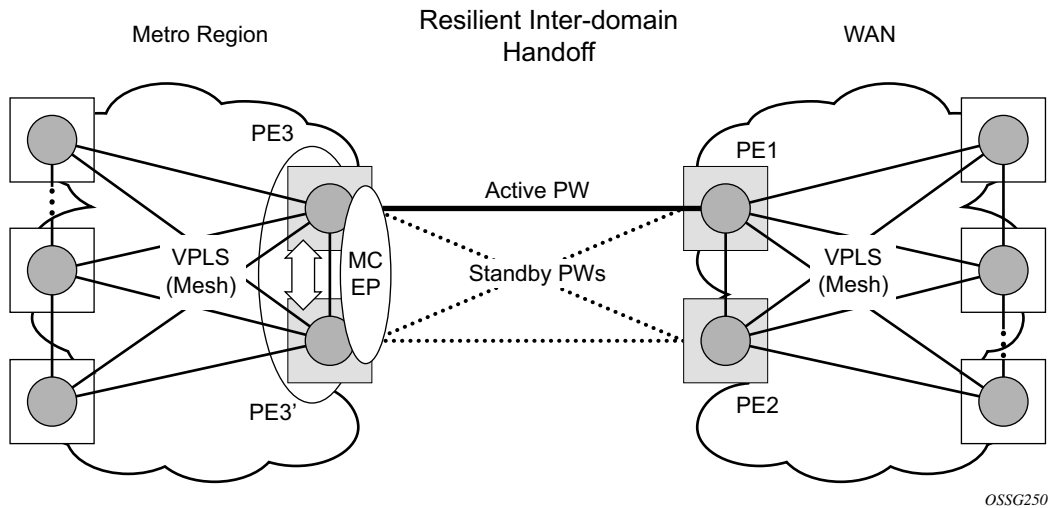


Figure 66: Multi-Chassis Pseudowire Endpoint for VPLS

The two gateway pairs, PE3-PE3 and PE1-PE2, are interconnected using a full mesh of four pseudowires out of which only one pseudowire is active at any point in time.

The concept of pseudowire endpoint for VPLS provides multi-chassis resiliency controlled by the MC-EP pair, PE3-PE3 in this example. This scenario, referred to as multi-chassis pseudowire endpoint for VPLS, provides a way to group pseudowires distributed between PE3 and PE3 chassis in a virtual endpoint that can be mapped to a VPLS instance.

The MC-EP inter-chassis protocol is used to ensure configuration and status synchronization of the pseudowires that belong to the same MC-EP group on PE3 and PE3. Based on the information received from the peer shelf and the local configuration the master shelf will make a decision on which pseudowire will become active.

The MC-EP solution is built around the following components:

- Multi-chassis protocol used to perform the following functions:
 - Selection of master chassis.
 - Synchronization of the pseudowire configuration and status.
 - Fast detection of peer failure or communication loss between MC-EP peers using either centralized BFD if configured or its own keep-alive mechanism.
- T-LDP signaling of pseudowire status:
 - Informs the remote PEs about the choices made by the MC-EP pair
- Pseudowire data plane — Represented by the four pseudowires inter-connecting the gateway PEs.

- Only one of the pseudowires is activated based on the primary/secondary, preference configuration and pseudowire status. In case of a tie the pseudowire located on the master chassis will be chosen.
 - The rest of the pseudowires are blocked locally on the MC-EP pair and on the remote PEs as long as they implement the pseudowire active/standby status.
-

Fast Detection of Peer Failure using BFD

Although the MC-EP protocol has its own keep-alive mechanisms, sharing a common mechanism for failure detection with other protocols (for example, BGP, RSVP-TE) scales better. MC-EP can be configured to use the centralized BFD mechanism.

Similar as other protocols, MC-EP will register with BFD if the “bfd-enable” command is active under “config>redundancy>multi-chassis>peer>mc-ep” object. As soon as the MC-EP application is activated using no shutdown, it tries to open a new BFD session or register automatically with an existing one. The source-ip configuration under redundancy multi-chassis peer-ip is used to determine the local interface while the peer-ip is used as the destination IP for the BFD session. After MC-EP registers with an active BFD session, it will use it for fast detection of MC-EP peer failure. If BFD registration or BFD initialization fails, the MC-EP will keep using its own keep-alive mechanism and it will send a trap to the NMS signaling the failure to register with/open BFD session.

In order to minimize operational mistakes and wrong peer interpretation for the loss of BFD session, the following additional rules are enforced when the MC-EP is registering with a certain BFD session:

- Only the centralized BFD sessions using system or loopback IP interfaces (see source-ip parameter) are accepted in order for MC-EP to minimize the false indication of peer loss.
- If the BFD session associated with MC-EP protocol is using a certain interface (system/loopback) then the following actions are not allowed under the interface: IP address change, “shutdown”, “no bfd” commands. If one of these action is required under the interface, the operator needs to disable BFD using the following procedures:
 - “no bfd-enable” command under “config>redundancy>multi-chassis>peer>mc-ep” object – this is the recommended procedure.
 - shutdown from under “config>redundancy>multi-chassis>peer>mc-ep” or from under “config>redundancy>multi-chassis>peer” objects

MC-EP keep-alives are still exchanged for the following reasons:

- As a backup - if the BFD session does not come up or is disabled, the MC-EP protocol will use its own keep-alives for failure detection.
- To ensure the database is cleared if the remote MC-EP peer is shutdown or miss-configured (each x seconds – one second suggested as default).

If MC-EP de-registers with BFD using the “no bfd-enable” command, the following processing steps occur:

- Local peer indicates to the MC-EP peer the fact that local BFD is being disabled using MC-EP peer-config-TLV fields ([BFD local : BFD remote]). This is done to avoid wrong interpretation of BFD session loss.
- Remote peer acknowledges reception indicating through the same peer-config-TLV fields that it is de-registering with the BFD session.
- Both MC-EP peers de-register and are going to use only keep-alives for failure detection
- There should be no pseudowire status change during this process.

Traps are sent when the status of the monitoring of the MC-EP session through BFD changes in the following instances:

- When red/mc/peer is no shutdown and BFD is not enabled, send a notification indicating BFD is not monitoring MC-EP peering session
- When BFD changes to open, send a notification indicating BFD is monitoring MC-EP peering session
- When BFD changes to down/close, send a notification indicating BFD is not monitoring MC-EP peering session.

MC-EP Passive Mode

The MC-EP mechanisms are built to minimize the possibility of loops. It is possible that human error could create loops through the VPLS service. One way to prevent loops is to enable the MAC move feature in the gateway PEs (PE3, PE3', PE1 and PE2).

An MC-EP passive mode can also be used on the second PE pair, PE1 and PE2, as a second layer of protection to prevent any loops from occurring if the operator introduces operational errors on the MC-EP PE3, PE3 pair.

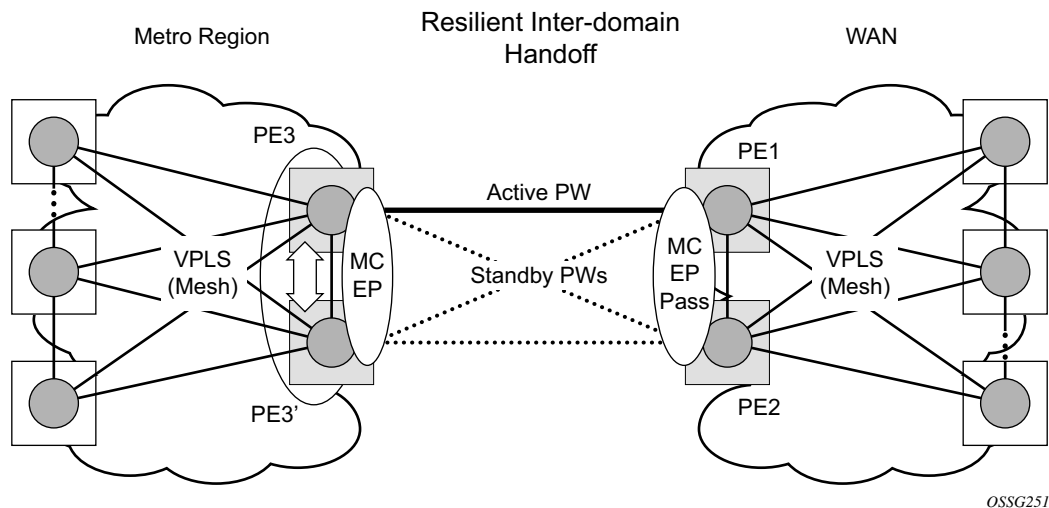


Figure 67: MC-EP in Passive Mode

When in passive mode, the MC-EP peers stay dormant as long as one active pseudowire is signaled from the remote end. If more than one pseudowire belonging to the passive MC-EP becomes active, then the PE1 and PE2 pair applies the MC-EP selection algorithm to select the best choice and blocks all others. No signaling is sent to the remote pair to avoid flip-flop behavior. A trap is generated each time MC-EP in passive mode activates. Every occurrence of this kind of trap should be analyzed by the operator as it is an indication of possible mis-configuration on the remote (active) MC-EP peering.

In order for the MC-EP passive mode to work, the pseudowire status signaling for active/standby pseudowires should be enabled. This involves the following CLI configurations:

For the remote MC-EP PE3, PE3 pair:

```
config>service>vpls>endpoint# no suppress-standby-signaling
```

When MC-EP passive mode is enabled on the PE1 and PE2 pair the following command is always enabled internally, regardless of the actual configuration:

```
config>service>vpls>endpoint no ignore-standby-signaling
```

Support for Single Chassis Endpoint Mechanisms

In cases of SC-EP, there is consistency check to ensure that the configuration of the member pseudowires is the same. For example, mac-pining, mac-limit and ignore standby signaling must

be the same. In the MC-EP case, there is no consistency check between the member endpoints located on different chassis. The operator must verify carefully the configuration of the two endpoints to ensure consistency.

The following rules apply for suppress-standby-signaling and ignore-standby parameters:

- Regular MC-EP mode (non-passive) will follow the suppress-standby-signaling and ignore-standby settings from the related endpoint configuration.
- For MC-EP configured in passive mode, the following settings will be used, regardless of previous configuration: “suppress-standby-sig” and “no ignore-standby-sig”. It is expected that when passive mode is used at one side that the regular MC-EP side will activate signaling with “no suppress-stdby-sig”.
- When passive mode is configured in just one of the nodes in the MC-EP peering, the other node will be forced to change to passive mode. A trap is sent to the operator to signal the wrong configuration.

This section describes also how the main mechanisms used for single chassis endpoint are adapted for the MC-EP solution.

MAC Flush Support in MC-EP

In an MC-EP scenario, failure of a pseudowire or gateway PE will determine activation of one of the next best pseudowire in the MC-EP group. This section describes the MAC flush procedures that can be applied to ensure black-hole avoidance.

[Figure 68](#) depicts a pair of PE gateways (PE3 and PE3) running MC-EP towards PE1 and PE2 where F1 and F2 are used to indicate the possible direction of the MAC flush signaled using T-LDP MAC withdraw message. PE1 and PE2 can only use regular VPLS pseudowires and do not have to use a MC-EP or a regular pseudowire endpoint.

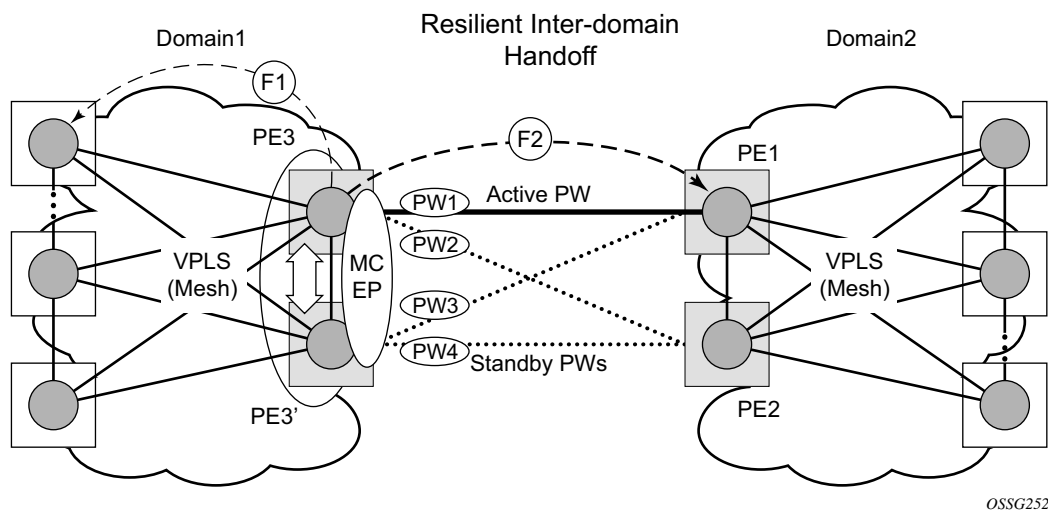


Figure 68: MAC Flush in the MC-EP Solution

Regular MAC flush behavior will apply for the LDP MAC withdraw sent over the T-LDP Sessions associated with the active pseudowire in the MC-EP, for example PE3 to PE1. That is for any TCN events or failures associated with SAPs or pseudowires not associated with the MC-EP.

The following MAC flush behaviors apply to changes in the MC-EP pseudowire selection:

- If the local PW2 becomes active on PE3:
 - On PE3 the MACs mapped to PW1 are moved to PW2.
 - A T-LDP “flush-all-but-mine” message is sent toward PE2 in F2 direction and is propagated by PE2 in the local VPLS mesh.
 - No MAC flush is sent to F1 direction from PE3.
- If one of the pseudowires on the pair PE3 becomes active, for example PW4:
 - On PE3, the MACs mapped to PW1 are flushed, same as a regular endpoint.
 - PE3 must be configured with **send-flush-on-failure** to send a T-LDP “flush-all-from-me” message towards VPLS mesh in the F1 direction.
 - PE3 sends a T-LDP “flush-all-but-mine” message towards PE2 in the F2 direction which is propagated by PE2 in the local VPLS mesh. Note that when MC-EP is in passive mode and the first spoke becomes active, no MAC flush-all-but-mine will be generated.

Block-on-Mesh-Failure Support in MC-EP Scenario

The following rules describe how the block-mesh-on-failure must be ported to the MC-EP solution (see [Figure 68](#)):

- If PE3 does not have any forwarding path towards Domain1 mesh, it should block both PW1 and PW2 and inform PE3 so one of its pseudowires can be activated.
- In order to allow the use of block-on-mesh-failure for MC-EP, a new block-on-mesh-failure parameter can be specified in the **config>service>vpls>endpoint** context with the following rules:
 - The default is **no block-on-mesh-failure** to allow for easy migration from previous releases.
 - For a spoke SDP to be added under an endpoint, the setting for its **block-on-mesh-failure** parameter must be in sync with the endpoint parameter.
 - After the spoke SDP is added to an endpoint, the configuration of its **block-on-mesh-failure** parameter is disabled. A change in endpoint configuration for the **block-on-mesh-failure** parameter is propagated to the individual spoke SDP configuration.
 - When a spoke SDP is removed from the endpoint group, it will inherit the last configuration from the endpoint parameter.
 - Adding an MC-EP under the related endpoint configuration does not affect in any way the above behavior.

Prior to Release 7.0, the **block-on-mesh-failure** command could not be enabled under **config>service>vpls>endpoint** context. In order for a spoke SDP to be added to an (single-chassis) endpoint, its **block-on-mesh-failure** had to be disabled (**config>service>vpls>spoke-sdp>no block-on-mesh-failure**). Then, the configuration of **block-on-mesh-failure** under a spoke SDP is blocked.

- If **block-on-mesh-failure** is enabled on PE1 and PE2, these PEs will signal pseudowire standby status toward the MC-EP PE pair. PE3 and PE3 should consider the pseudowire status signaling from remote PE1 and PE2 when making the selection of the active pseudowire.

Support for Force Spoke SDP in MC-EP

In a regular (single chassis) endpoint scenario, the following command can be used to force a specific SDP binding (pseudowire) to become active:

```
tools perform service id service-id endpoint endpoint-name force
```

In the MC-EP case, this command has a similar effect when there is a single forced SDP binding in an MC-EP. The forced SDP binding (pseudowire) will be elected as active.

However, when the command is run at the same time as both MC-EP PEs, when the endpoints belong to the same mc-endpoint, the regular MC-EP selection algorithm (for example, the operational status -> precedence value) will be applied to determine the winner.

Revertive Behavior for Primary Pseudowire(s) in a MC-EP

For a single-chassis endpoint a revert-time command is provided under the VPLS endpoint. Refer to the [VPLS Services Command Reference on page 591](#) for syntax and command useage information.

In a regular endpoint the revert-time setting affects just the pseudowire defined as primary (precedence 0). For a failure of the primary pseudowire followed by restoration the revert-timer is started. After it expires the primary pseudowire takes the active role in the endpoint. This behavior does not apply for the case when both pseudowires are defined as secondary; i.e. if the active secondary pseudowire fails and is restored it will stay in standby until a configuration change or a force command occurs.

In the MC-EP case the revertive behavior is supported for pseudowire defined as primary (precedence 0). The following rules apply:

- The revert-time setting under each individual endpoint control the behavior of the local primary pseudowire if one is configured under the local endpoint.
 - The secondary pseudowires behave as in the regular endpoint case
-

Using B-VPLS for Increased Scalability and Reduced Convergence Times

The PBB-VPLS solution can be used to improve scalability of the solution and to reduce convergence time. If PBB-VPLS is deployed starting at the edge PEs, the gateway PEs will contain only BVPLS instances. The MC-EP procedures described for regular VPLS apply.

PBB-VPLS can be also enabled just on the gateway MC-EP PEs as depicted in [Figure 69](#) below.

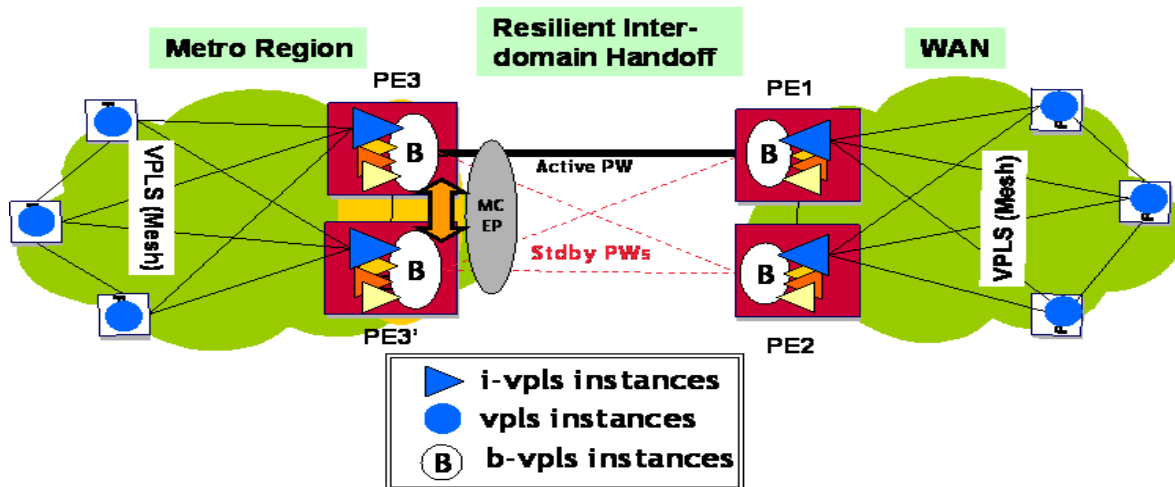


Figure 69: MC-EP with B-VPLS

Multiple I-VPLS instances may be used to represent in the gateway PEs the customer VPLS instances using PBB-VPLS M:1 model described in the PBB section. A backbone VPLS (B-VPLS) is used in this example to administer the resiliency for all customer VPLS instances at the domain borders. Just one MC-EP is required to be configured in the B-VPLS to address 100s or even 1000s of customers VPLS instances. If load balancing is required, multiple B-VPLS instances may be used to ensure even distribution of the customers across all the pseudowires interconnecting the two domains. In this example, four B-VPLS will be able to loadshare the customers across all four possible pseudowire paths.

The use of MC-EP with B-VPLS is strictly limited to cases where VPLS mesh exists on both sides of a B-VPLS. For example, active/standby pseudowires resiliency in the I-VPLS context where PE3, PE3' are PEs cannot be used because there is no way to synchronize the active/standby selection between the two domains.

For a similar reason, MC-LAG resiliency in the I-VPLS context on the gateway PEs participating in the MC-EP (PE3, PE3') should not be used.

Note that for the PBB topology described in [Figure 69](#), block-on-mesh-failure in the I-VPLS domain will not have any effect on the B-VPLS MC-EP side. That is because mesh failure in one I-VPLS should not affect other I-VPLS sharing the same B-VPLS.

MAC Flush Additions for PBB VPLS

The scenario depicted in [Figure 70](#) is used to define the blackholing problem in PBB-VPLS using MC-EP.

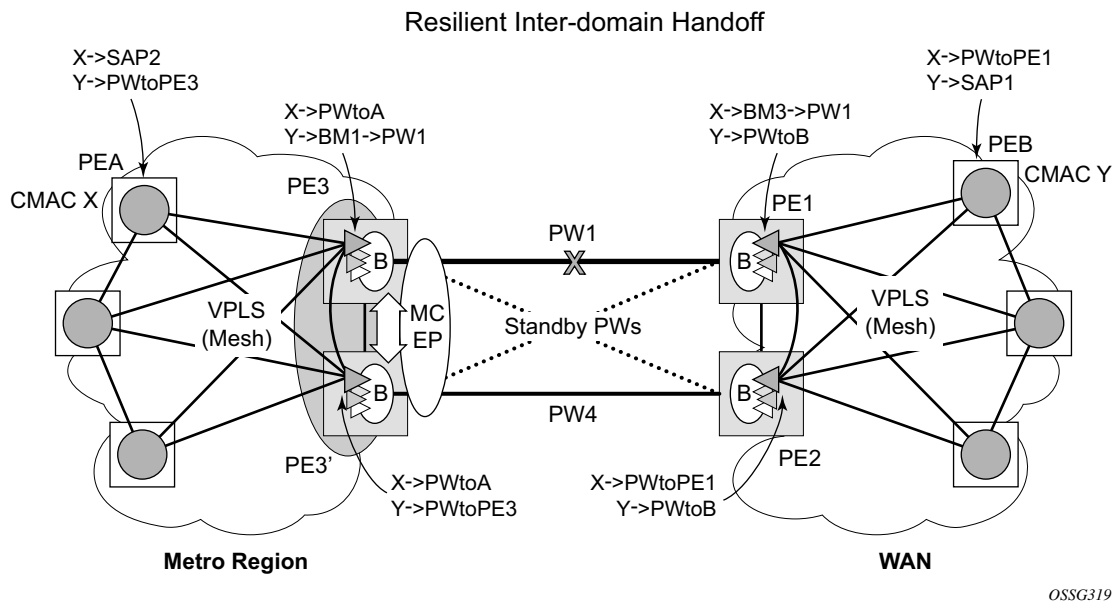


Figure 70: MC-EP with B-VPLS Failure Scenario

In topology displayed in [Figure 70](#), PE A and PE B are regular VPLS PEs participating in the blue VPLS mesh deployed in the metro and respectively WAN region. As the traffic flows between CEs with CMAC X and CMAC Y, the FIB entries in blue are installed. A failure of the active PW1 will result in the activation of PW4 between PE3 and PE2 in this example. An LDP flush-all-but-mine will be sent from PE3 to PE2 to clear the BVPLS FIBs. The traffic between CMAC X and CMAC Y will be blackholed as long as the entries in red from the VPLS and I-VPLS FIBs along the path are not removed. This may take as long as 300 seconds, the usual aging timer used for MAC entries in a VPLS FIB.

A MAC flush is required in the I-VPLS space from PBB PEs to PEA and PEB to avoid blackholing in the regular VPLS space.

In the case of a regular VPLS the following procedure is used:

- PE3 sends a flush-all-from-me towards its local blue IVPLS mesh to PE3 and PEA when its MC-Endpoint becomes disabled
- PE3 sends a flush-all-but-mine on the active PW4 to PE2 which is then propagated by PE2 (propagate-mac-flush must be on) to PEB in the WAN IVPLS mesh.

For consistency, a similar procedure is used for the BVPLS case as depicted in [Figure 71](#).

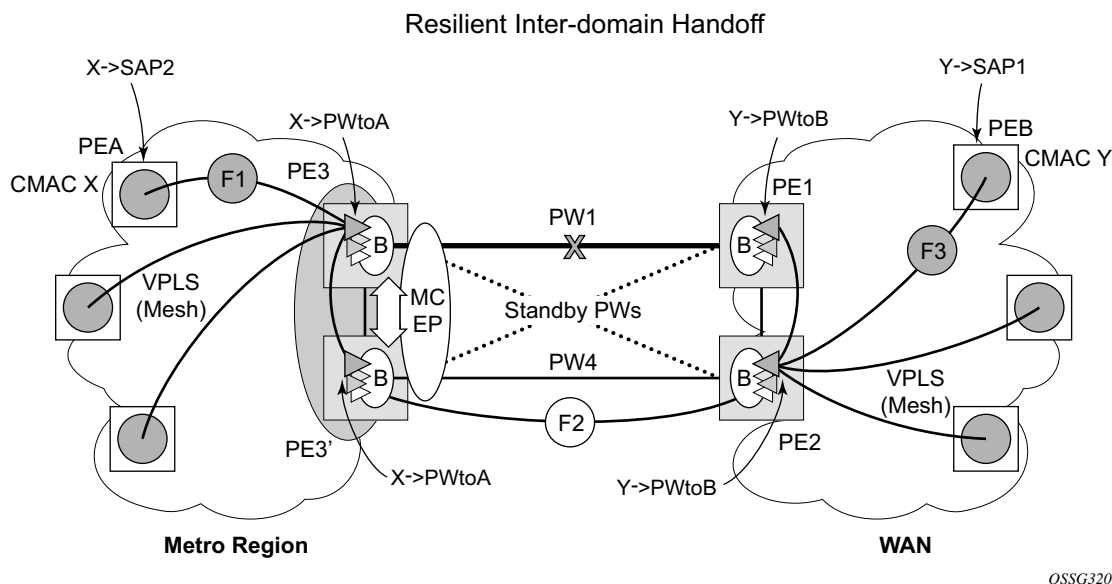


Figure 71: MC-EP with B-VPLS Mac Flush Solution

In this example, the MC-EP activates B-VPLS PW4 because of either a link/node failure or because of an MC-EP selection re-run that affected the previously active PW1. As a result, the endpoint on PE3 containing PW1 goes down.

The following steps apply:

- PE3 sends in the local I-VPLS context a LDP flush-all-from-me (marked with F1) to PE A and to the other regular VPLS PEs, including PE3'. The following command enables this behavior on a per I-VPLS basis: **configure>service>vpls ivpls>send-flush-on-bvpls-failure** .
 - Result: PEA, PE3 and the other local VPLS PEs in the metro clear the VPLS FIB entries associated to PW to PE3.
- PE3 clears the entries associated to PW1 and sends in the B-VPLS context an LDP flush-all-but-mine (marked with F2) towards PE2 on the active PW4.
 - Result: PE2 clears the BVPLS FIB entries not associated with PW4.
- PE2 propagates the MAC flush-all-but-mine (marked with F3) from B-VPLS in the related I-VPLS context(s) towards all participating VPLS PEs – for example, in the blue IVPLS to PE B, PE1. It also clears all the CMAC entries associated with IVPLS pseudowires.

The following command enables this behavior on a per I-VPLS basis:

configure>service>vpls ivpls>propagate-mac-flush-from-bvpls

→ Result: PE B, PE1 and the other local VPLS PEs in the WAN clear the VPLS FIB entries associated to PW to PE2.

→ This command does not control though the propagation in the related IVPLS of the BVPLS LDP MAC flush containing a PBB TLV (BMAC and ISID –list).

- Similar to regular VPLS, LDP signaling of the MAC flush will follow the active topology: for example, no MAC flush will be generated on standby PWs.

Other failure scenarios are addressed using the same or a subset of the above steps:

- If the pseudowire (PW2) in the same endpoint with PW1 becomes active instead of PW4, there will be no MAC flush of F1 type.
- If the pseudowire (PW3) in the same endpoint becomes active instead of PW4, the same procedure applies.

Note that for an SC/MC endpoint configured in a BVPLS, failure/de-activation of the active pseudowire member always generates a local MAC flush of all the BMAC associated with the pseudowire. It never generates a MAC move to the newly active pseudowire even if the endpoint stays up. That is because in SC-EP/MC-EP topology, the remote PE might be the terminating PBB PE and may not be able to reach the BMAC of the other remote PE. In other words, connectivity between them exists only over the regular VPLS Mesh.

For the same reasons, it is recommended that static BMAC not be used on SC/MC endpoints.

VPLS Access Redundancy

A second application of hierarchical VPLS is using MTUs that are not MPLS-enabled which must have Ethernet links to the closest PE node. To protect against failure of the PE node, an MTU can be dual-homed and have two SAPs on two PE nodes.

There are several mechanisms that can be used to resolve a loop in an access circuit, however from operation perspective they can be subdivided into two groups:

- STP-based access, with or without mVPLS.
- Non-STP-based access using mechanisms such as MC_LAG, MC-APS, MC-RING.

STP-Based Redundant Access to VPLS

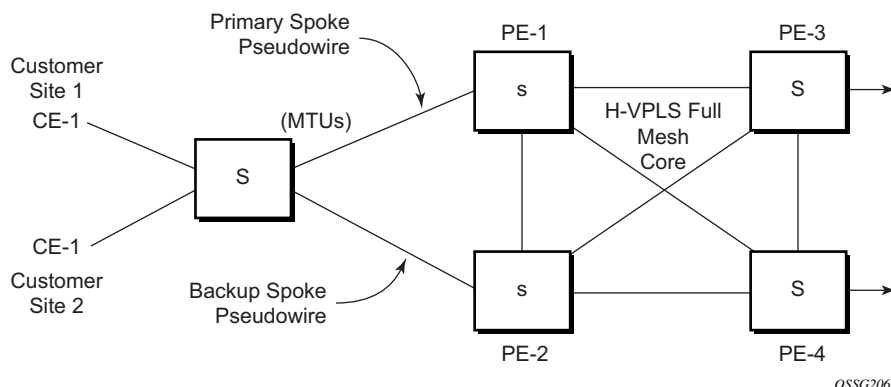


Figure 72: Dual Homed MTU-s in Two-Tier Hierarchy H-VPLS

In configuration shown in [Figure 72](#), STP is activated on the MTU and two PEs in order to resolve a potential loop. Note that STP only needs to run in a single VPLS instance, and the results of the STP calculations are applied to all VPLSes on the link.

In this configuration the scope of STP domain is limited to MTU and PEs, while any topology change needs to be propagated in the whole VPLS domain including mesh SDPs. This is done by using so called “MAC-flush” messages defined by RFC 4762. In case of STP as a loop resolution mechanism, every TCN (Topology Change Notification) received in a context of STP instance is translated into LDP- MAC address withdrawal message (also referred to as MAC-flush message) requesting to clear all FDB entries, but the ones learned from originating PE. Such messages are sent to all PE peers connected through SDPs (mesh and spoke) in the context of VPLS service(s) which are managed by the given STP instance.

Redundant Access to VPLS Without STP

The Alcatel-Lucent implementation also alternative methods for providing a redundant access to LAYER 2 services, such as MC-LAG, MC-APS or MC-RING. Also in this case, the topology change event needs to be propagated into VPLS topology in order to provide fast convergence.

Figure 64 illustrates a dual-homed connection to VPLS service (PE-A, PE-B, PE-C, PE-D) and operation in case of link failure (between PE-C and L2-B). Upon detection of a link failure PE-C will send MAC-Address-Withdraw messages, which will indicate to all LDP peers that they should flush all MAC addresses learned from PE-C. This will lead that to a broadcasting of packets addressing affected hosts and re-learning process in case an alternative route exists.

Note that the message described here is different than the message described in previous section and in RFC 4762, *Virtual Private LAN Services Using LDP Signaling*. The difference is in the interpretation and action performed in the receiving PE. According to the standard definition, upon receipt of a MAC withdraw message, all MAC addresses, except the ones learned from the source PE, are flushed,

This section specifies that all MAC addresses learned from the source are flushed. This message has been implemented as an LDP address message with vendor-specific type, length, value (TLV), and is called the flush-mine message.

The advantage of this approach (as compared to RSTP based methods) is that only MAC-affected addresses are flushed and not the full forwarding database. While this method does not provide a mechanism to secure alternative loop-free topology, the convergence time is dependent on the speed of the given CE device will open alternative link (L2-B switch in Figure 57) as well as on the speed PE routers will flush their FDB.

In addition, this mechanism is effective only if PE and CE are directly connected (no hub or bridge) as it reacts to physical failure of the link.

MAC Flush Message Processing

The previous sections described operation principle of several redundancy mechanisms available in context of VPLS service. All of them rely on MAC flush message as a tool to propagate topology change in a context of the given VPLS. This section aims to summarize basic rules for generation and processing of these messages.

As described on respective sections, the 7750 SR supports two types of MAC flush message, flush-all-but-mine and flush-mine. The main difference between these messages is the type of action they signal. Flush-all-but-mine requests clearing of all FDB entries which were learned from all other LDP peers except the originating PE. This type is also defined by RFC 4762 as an LDP MAC address withdrawal with an empty MAC address list.

Flush-all-mine message requests clearing all FDB entries learned from originating PE. This means that this message has exactly other effect than flush-all-but-mine message. This type is not included in RFC 4762 definition and it is implemented using vendor specific TLV.

The advantages and disadvantages of the individual types should be apparent from examples in the previous section. The description here focuses on summarizing actions taken on reception and conditions individual messages are generated.

Upon reception of MAC flush messages (regardless the type) SR-Series PE will take following actions:

- Clears FDB entries of all indicated VPLS services conforming the definition.
- Propagates the message (preserving the type) to all LDP peers, if “propagate-mac-flush” flag is enabled at corresponding VPLS level.

The flush-all-but-mine message is generated under following conditions:

- The flush-all-but-mine message is received from LDP peer and propagate-mac-flush flag is enabled. The message is sent to all LDP peers in the context of VPLS service it was received in.
- TCN message in a context of STP instance is received. The flush-all-but-mine message is sent to all LDP-peers connected with spoke and mesh SDPs in a context of VPLS service controlled by the given STP instance (based on mVPLS definition). The message is sent only to LDP peers which are not part of STP domain, which means corresponding spoke and mesh SDPs are not part of mVPLS.
- Flush-all-but-mine message is generated when switch over between spoke SDPs of the same endpoint occurs. The message is sent to LDP peer connected through newly active spoke SDP.

The flush-mine message is generated under following conditions:

- The flush-mine message is received from LDP peer and “propagate-mac-flush” flag is enabled. The message is sent to all LDP peers in the context of VPLS service it was received.
- The flush-mine message is generated when on a SAP or SDP transition from operationally up to an operationally down state and send-flush-on-failure flag is enabled in the context of the given VPLS service. The message is sent to all LDP peers connected in the context of the given VPLS service. Note, that enabling “send-flush-on-failure” the flag is blocked in VPLS service managed by mVPLS. This is to prevent that both messages are sent at the same time.
- The flush-mine message is generated when on a MC-LAG SAP or MC-APS SAP transition from an operationally up state to an operationally down state. The message is sent to all LDP peers connected in the context of the given VPLS service.
- The flush-mine message is generated when on a MC-RING SAP transition from operationally up to an operationally down state or when MC-RING SAP transitions to slave state. The message is sent to all LDP peers connected in the context of the given VPLS service.

Dual Homing to a VPLS Service

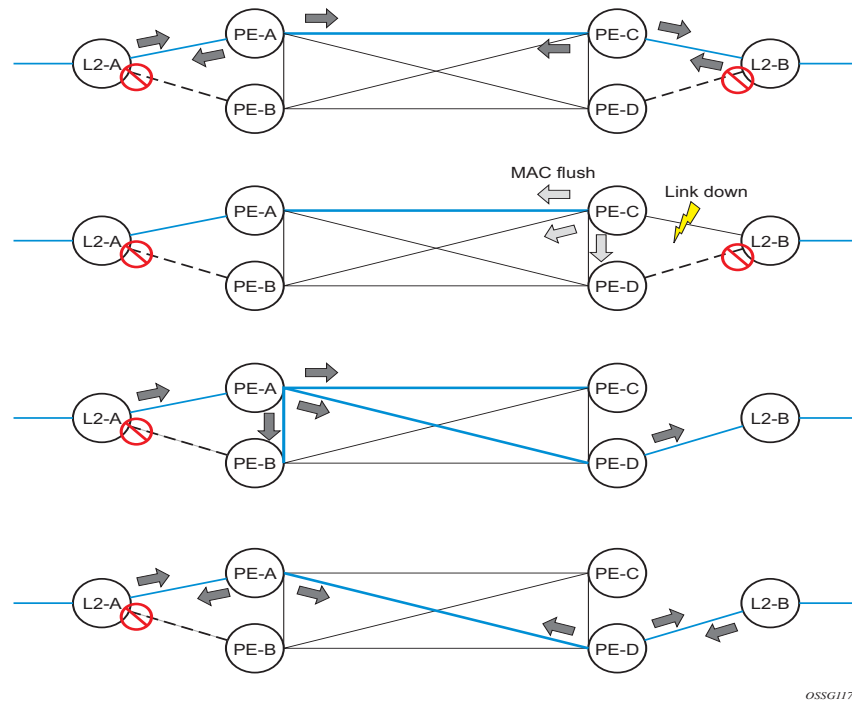


Figure 73: Dual Homed CE Connection to VPLS

Figure 73 illustrates a dual-homed connection to VPLS service (PE-A, PE-B, PE-C, PE-D) and operation in case of link failure (between PE-C and L2-B). Upon detection of a link failure PE-C will send MAC-Address-Withdraw messages, which will indicate to all LDP peers that they should flush all MAC addresses learned from PE-C. This will lead that to a broadcasting of packets addressing affected hosts and re-learning process in case an alternative route exists.

Note that the message described here is different than the message described in draft-ietf-l2vpn-vpls-ldp-xx.txt, *Virtual Private LAN Services over MPLS*. The difference is in the interpretation and action performed in the receiving PE. According the draft definition, upon receipt of a MAC-withdraw message, all MAC addresses, except the ones learned from the source PE, are flushed. This section specifies that all MAC addresses learned from the source are flushed. This message has been implemented as an LDP address message with vendor-specific type, length, value (TLV), and is called the flush-all-from-ME message.

The draft definition message is currently used in management VPLS which is using RSTP for recovering from failures in Layer 2 topologies. The mechanism described in this document represent an alternative solution.

The advantage of this approach (as compared to RSTP based methods) is that only MAC-affected addresses are flushed and not the full forwarding database. While this method does not provide a mechanism to secure alternative loop-free topology, the convergence time is dependent on the speed of the given CE device will open alternative link (L2-B switch in [Figure 73](#)) as well as on the speed PE routers will flush their FDB.

In addition, this mechanism is effective only if PE and CE are directly connected (no hub or bridge) as it reacts to physical failure of the link.

MC-Ring and VPLS

The use of multi-chassis ring control in a combination with the plain VPLS SAP is supported FDB in individual ring nodes in case of the link (or ring node) failure cannot be cleared.

This combination is not easily blocked in the CLI. If configured, the combination may be functional but the switchover times will be proportional to MAC aging in individual ring nodes and/or to relearning rate due to downstream traffic.

Redundant plain VPLS access in ring configurations, therefore, exclude corresponding SAPs from the multi-chassis ring operation. Configurations such as mVPLS can be applied.

ACL Next-Hop for VPLS

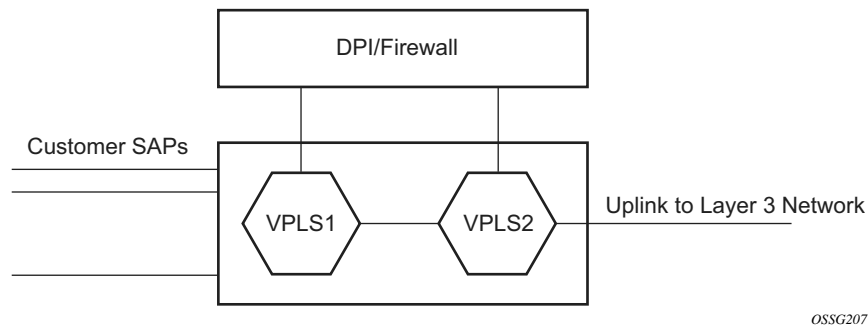


Figure 74: Application 1 Diagram

The ACL next-hop for VPLS feature enables an ACL that has a forward next-hop SAP or SDP action specified to be used in a VPLS service to direct traffic with specific match criteria to a SAP or SDP. This allows traffic destined to the same gateway to be split and forwarded differently based on the ACL.

Policy routing is a popular tool used to direct traffic in Layer 3 networks. As Layer 2 VPNs become more popular, especially in network aggregation, policy forwarding is required. Many providers are using methods such as DPI servers, transparent firewalls or Intrusion Detection/Prevention Systems (IDS/IPS). Since these devices are bandwidth limited providers want to limit traffic forwarded through them. A mechanism is required to direct some traffic coming from a SAP to the DPI without learning and other traffic coming from the same SAP directly to the gateway uplink based learning. This feature will allow the provider to create a filter that will forward packets to a specific SAP or SDP. The packets are then forwarded to the destination SAP regardless of learned destination or lack thereof. The SAP can either terminate a Layer 2 firewall, deep packet inspection (DPI) directly or may be configured to be part of a cross connect bridge into another service. This will be useful when running the DPI remotely using VLLs. If an SDP is used the provider can terminate it in a remote VPLS or VLL service where the firewall is connected. The filter can be configured under a SAP or SDP in a VPLS service. All packets (unicast, multicast, broadcast and unknown) can be delivered to the destination SAP/SDP.

The filter may be associated SAPs/SDPs belonging to a VPLS service only if all actions in the ACL forward to SAPs/SDPs that are within the context of that VPLS. Other services do not support this feature. An ACL that contains this feature is allowed but the system will drop any packet that matches an entry with this action.

SDP Statistics for VPLS and VLL Services

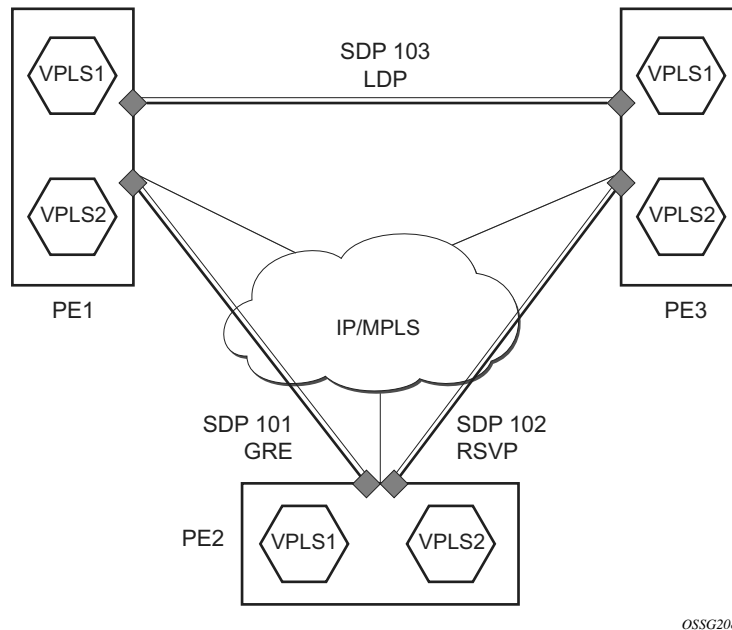


Figure 75: SDP Statistics for VPLS and VLL Services

The simple three-node network described in [Figure 75](#) shows two MPLS SDPs and one GRE SDP defined between the nodes. These SDPs connect VPLS1 and VPLS2 instances that are defined in the three nodes. With this feature the operator will have local CLI based as well as SNMP based statistics collection for each VC used in the SDPs. This will allow for traffic management of tunnel usage by the different services and with aggregation the total tunnel usage.

SDP statistics allow providers to bill customers on a per-SDP per-byte basis. This destination-based billing model is can be used by providers with a variety of circuit types and have different costs associated with the circuits. An accounting file allows the collection of statistics in a bulk manner.

Auto SDPs and Auto SDP Bindings

When a VPLS service is created and the **radius-discovery** command is enabled, manual configuration of SDPs is not required. The far-end SDP is discovered by RADIUS and an auto-SDP will be created for each far-end PE. An auto-SDP binding will be created for the service (the SDP binding is on a per service basis). The auto-SDP can be used for other VPLS service instances between the pair of PEs. If a manual SDP binding is created for the service, it will be preferred to the auto-SDP binding to allow override.

An auto-SDP is created by a PE router automatically with information provided by RADIUS discovery. The binding, auto-SDP binding is created automatically for an auto-SDP. An auto-SDP can be GRE based or LDP based. The default is GRE.

An SNMP trap is generated to inform the NMS about the creation of an auto-SDP or auto-SDP binding. Auto-SDPs and auto-SDP bindings are not saved in the router configuration file. Auto-SDPs cannot be manually configured nor modified.

Manual SDPs and Manual SDP Bindings

“Manual” SDPs can be used with RADIUS discovery. Manual SDPs take precedence over auto SDPs.

If a manual SDP is available, it should be used to create the auto SDP binding; otherwise, the PE router creates auto SDPs and auto SDP bindings. If there are multiple SDPs available for a remote PE router, the SDP with the highest SDP ID should be used.

If a manual SDP was provisioned after the RADIUS discovery process, the **admin>radius-discovery>force-discover** command should be executed in order to use the new manual SDPs.

Users cannot remove a manual SDP if there is an auto SDP binding associated with the manual SDP. However, manual SDP bindings and RADIUS discovery are mutually exclusive. If a manual SDP binding was already provisioned for a service, RADIUS discovery cannot be enabled for the service. If RADIUS discovery was already enabled for a service, manual SDP bindings cannot be provisioned for the service.

Discovery Procedures

A PE router issues an access-request to the RADIUS server using the configured VPN as the user-name and configured password. The service type of the access request is L2VPN.

The RADIUS server authenticates the PE router. If authentication is successful, it responds with an access-accept which includes a list of IP addresses of the PE routers. Optional information such as vc-type and SDP could be included. If authentication fails, an access-reject message is returned. The access-accept response has a session-timeout attribute in which a PE router needs to issue a new access-request before the access-accept times out.

Auto SDPs and SDP-Bindings Creation

After the discovery of all other PE routers, the PE router checks if it has valid auto SDP bindings for remote PE routers. Manual SDPs always take precedence over auto SDPs. If there was a manual SDP available, it is used to create the auto SDP binding; otherwise, the PE router creates auto SDPs and auto SDP bindings. If there were multiple SDPs available for a PE router, the SDP with the smallest SDP ID is used.

What auto-SDP to create, LDP or GRE, depends on the RADIUS configuration, default is GRE.

When an auto SDP is created for a remote PE router and there is no targeted LDP session to the PE router, a targeted LDP session is automatically created.

Pseudo-Wire Setup

The PE routers use “AII” as the VC-ID (pseudowire ID) to signal pseudowires to each other by targeted LDP.

RADIUS Server Polling

A PE router should periodically query the RADIUS server to make sure its L2VPN membership information is up-to-date. The polling interval is configurable by CLI.

Any change to the VPN membership (such as adding or removing a PE) takes effect at the next polling.

Removing RADIUS Discovery

The VPLS service must be shut down in order to disable or remove RADIUS discovery from a VPLS service.

When RADIUS discovery is disabled for a VPLS service, auto SDPs and auto SDP-bindings for that VPLS are removed.

Remove a PE from VPLS

When a PE is removed from a VPLS service, the RADIUS server must be updated manually to remove the PE from the membership database.

BGP Auto-Discovery for LDP VPLS

BGP Auto Discovery (BGP AD) for LDP VPLS is a framework for automatically discovering the endpoints of a Layer 2 VPN offering an operational model similar to that of an IP VPN. This allows carriers to leverage existing network elements and functions, including but not limited to, route reflectors and BGP policies to control the VPLS topology.

BGP AD is an excellent complement to an already established and well deployed Layer 2 VPN signaling mechanism target LDP providing one touch provisioning for LDP VPLS where all the related PEs are discovered automatically. The service provider may make use of existing BGP policies to regulate the exchanges between PEs in the same, or in different, autonomous system (AS) domains. The addition of BGP AD procedures does not require carriers to uproot their existing VPLS deployments and to change the signaling protocol.

BGP AD Overview

The BGP protocol establishes neighbor relationships between configured peers. An open message is sent after the completion of the three-way TCP handshake. This open message contains information about the BGP peer sending the message. This message contains Autonomous System Number (ASN), BGP version, timer information and operational parameters, including capabilities. The capabilities of a peer are exchanged using two numerical values: the Address Family Identifier (AFI) and Subsequent Address Family Identifier (SAFI). These numbers are allocated by the Internet Assigned Numbers Authority (IANA). BGP AD uses AFI 65 (L2VPN) and SAFI 25 (BGP VPLS). The complete list of allocations may be found at: <http://www.iana.org/assignments/address-family-numbers> and SAFI <http://www.iana.org/assignments/safi-namespace>.

Information Model

Following the establishment of the peer relationship, the discovery process begins as soon as a new VPLS service instance is provisioned on the PE.

Two VPLS identifiers are used to indicate the VPLS membership and the individual VPLS instance:

- VPLS-ID — Membership information, unique network wide identifier; same value assigned for all VPLS switch instances (VSIs) belonging to the same VPLS; encodable and carried as a BGP extended community in one of the following formats:
 - A two-octet AS specific extended community
 - An IPv4 address specific extended community

- **VSI-ID**— The unique identifier for each individual VSI, built by concatenating a route distinguisher (RD) with a 4 bytes identifier (usually the system IP of the VPLS PE); encoded and carried in the corresponding BGP NLRI.

In order to advertise this information, BGP AD employs a simplified version of the BGP VPLS NLRI where just the RD and the next 4 bytes are used to identify the VPLS instance. There is no need for Label Block and Label Size fields as T-LDP will take care of signaling the service labels later on.

The format of the BGP AD NLRI is very similar with the one used for IP VPN as depicted in [Figure 76](#). The system IP may be used for the last 4 bytes of the VSI ID further simplifying the addressing and the provisioning process.

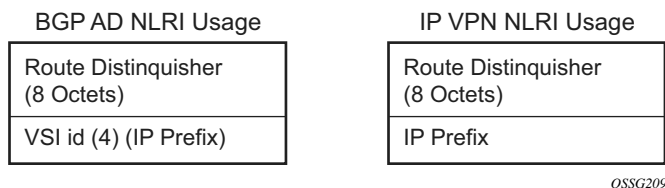


Figure 76: BGP AD NLRI versus IP VPN NLRI

Network Layer Reachability Information (NLRI) is exchanged between BGP peers indicating how to reach prefixes. The NLRI is used in the Layer 2 VPN case to tell PE peers how to reach the VSI rather than specific prefixes. The advertisement includes the BGP next hop and a route target (RT). The BGP next hop indicates the VSI location and is used in the next step to determine which signaling session is used for pseudowire signaling. The RT, also coded as an extended community, can be used to build a VPLS full mesh or a HVPLS hierarchy through the use of BGP import/export policies.

BGP is only used to discover VPN endpoints and the corresponding far end PEs. It is not used to signal the pseudowire labels. This task remains the responsibility of targeted-LDP (T-LDP).

FEC Element for T-LDP Signaling

Two LDP FEC elements are defined in RFC 4447, *PW Setup & Maintenance Using LDP*. The original pseudowire-ID FEC element 128 (0x80) employs a 32-bit field to identify the virtual circuit ID and it was used extensively in the initial VPWS and VPLS deployments. The simple format is easy to understand but it does not provide the required information model for BGP auto-discovery function. In order to support BGP AD and other new applications a new Layer 2 FEC element, the generalized FEC (0x81) is required.

The generalized pseudowire-ID FEC element has been designed for auto discovery applications. It provides a field, the address group identifier (AGI), that is used to signal the membership information from the VPLS-ID. Separate address fields are provided for the source and target address associated with the VPLS endpoints called the Source Attachment Individual Identifier (SAII) and respectively, Target Attachment Individual Identifier (TAII). These fields carry the VSI ID values for the two instances that are to be connected through the signaled pseudowire.

The detailed format for FEC 129 is depicted in [Figure 77](#).

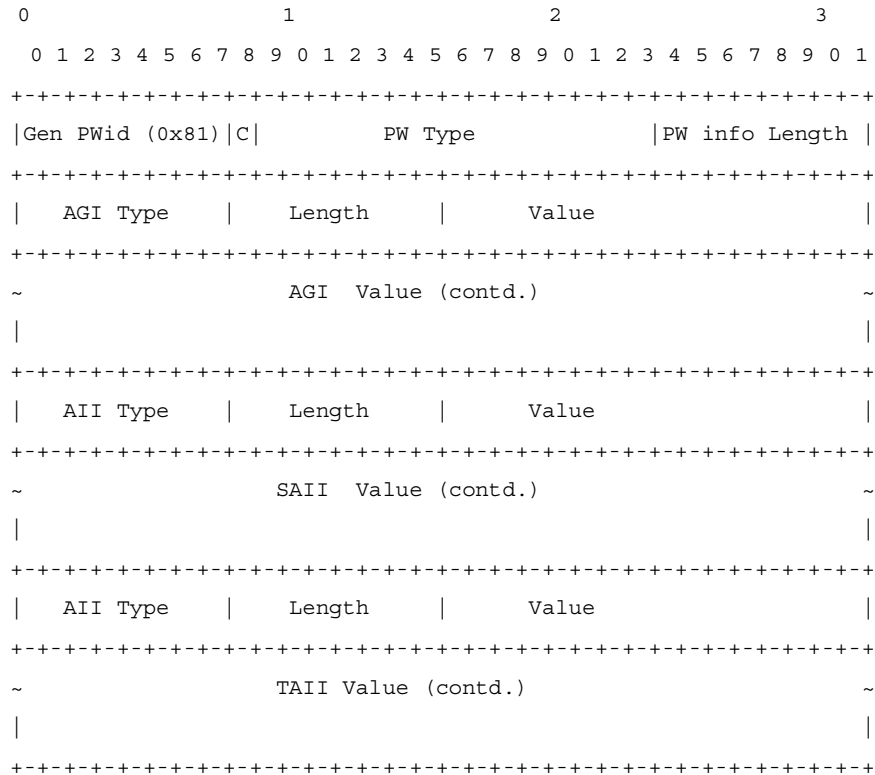


Figure 77: Generalized Pseudowire-ID FEC Element

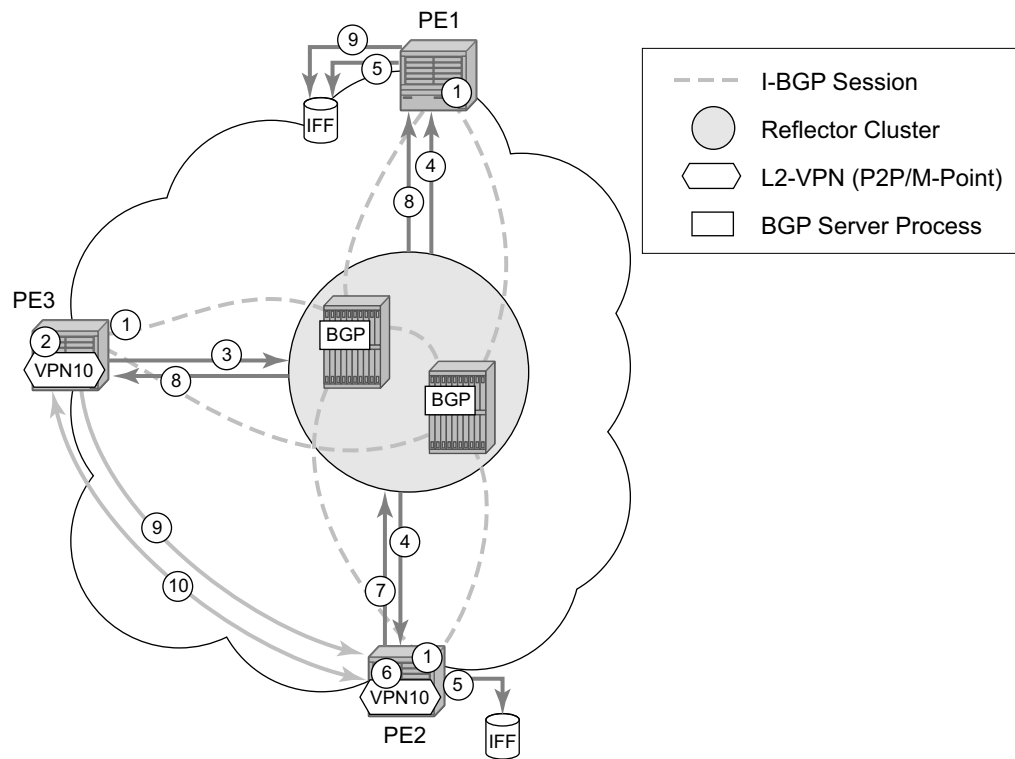
Each of the FEC fields are designed as a sub-TLV equipped with its own type and length providing support for new applications. To accommodate the BGP AD information model the following FEC formats are used:

- AGI (type 1) is identical in format and content with the BGP extended community attribute used to carry the VPLS-ID value.
- Source AII (type 1) is a 4 bytes value destined to carry the local VSI-id (outgoing NLRI minus the RD).
- Target AII (type 1) is a 4 bytes value destined to carry the remote VSI-ID (incoming NLRI minus the RD).

BGP-AD and Target LDP (T-LDP) Interaction

BGP is responsible for discovering the location of VSIs that share the same VPLS membership. LDP protocol is responsible for setting up the pseudowire infrastructure between the related VSIs by exchanging service specific labels between them.

Once the local VPLS information is provisioned in the local PE, the related PEs participating in the same VPLS are identified through BGP AD exchanges. A list of far end PEs is generated and will trigger the creation, if required, of the necessary T-LDP sessions to these PEs and the exchange of the service specific VPN labels. The steps for the BGP AD discovery process and LDP session establishment and label exchange are shown in [Figure 78](#) below.



OSSG210

Figure 78: BGP-AD and T-LDP Interaction

SDP Usage

Service Access Points (SAP) are linked to transport tunnels using Service Distribution Points (SDP). The service architecture of the 77507450 platform allows services to be abstracted from the transport network.

MPLS transport tunnels are signaled using the Resource Reservation Protocol (RSVP-TE) or by the Label Distribution Protocol (LDP). The capability to automatically create an SDP only exists for LDP based transport tunnels. Using a manually provisioned SDP is available for both RSVP-TE and LDP transport tunnels. Refer to the appropriate OS MPLS Guide for more information about MPLS, LDP, and RSVP.

Automatic Creation of SDPs

When BGP AD is used for LDP VPLS and LDP is used as the transport tunnel there is no requirement to manually create an SDP. The LDP SDP can be automatically instantiated using the information advertised by BGP AD. This simplifies the configuration on the service node.

Enabling LDP on the IP interfaces connecting all nodes between the ingress and the egress builds transport tunnels based on the best IGP path. LDP bindings are automatically built and stored in the hardware. These entries contain an MPLS label pointing to the best next hop along the best path toward the destination.

When two endpoints need to connect and no SDP exists, a new SDP will automatically be constructed. New services added between two endpoints that already have an automatically created SDP will be immediately used. No new SDP will be constructed. The far-end information is gleaned from the BGP next hop information in the NLRI. When services are withdrawn with a BGP_Unreach_NLRI, the automatically established SDP will remain up as long as at least one service is connected between those endpoints. An automatically created SDP will be removed and the resources released when the only or last service is removed.

Manually Provisioned SDP

The carrier is required to manually provision the SDP if they create transport tunnels using RSVP-TE. Operators have the option to choose a manually configured SDP if they use LDP as the tunnel signaling protocol. The functionality is the same regardless of the signaling protocol.

Creating a BGP AD enabled VPLS service on an ingress node with the manually provisioned SDP option causes the Tunnel Manager to search for an existing SDP that connects to the far-end PE. The far-end IP information is gleaned from the BGP next hop information in the NLRI. If a single SDP exists to that PE, it is used. If no SDP is established between the two endpoints, the service will remain down until a manually configured SDP becomes active.

When multiple SDPs exist between two endpoints, the tunnel manager will select the appropriate SDP. The algorithm will prefer SDPs with the best (lower) metric. Should there be multiple SDPs with equal metrics, the operational state of the SDPs with the best metric will be considered. If the operational state is the same, the SDP with the higher sdp-id will be used. If an SDP with a preferred metric is found with an operational state that is not active, the tunnel manager will flag it as ineligible and restart the algorithm.

Automatic Instantiation of Pseudowires (SDP Bindings)

The choice of manual or auto provisioned SDPs has limited impact on the amount of required provisioning. Most of the savings are achieved through the automatic instantiation of the pseudowire infrastructure (SDP bindings). This is achieved for every auto-discovered VSIs through the use of the pseudowire template concept. Each VPLS service that uses BGP AD contains the “pw-template-bind” option defining specific layer 2 VPN parameters. This command references a “pw-template” which defines the pseudowire parameters. The same “pw-template” may be referenced by multiple VPLS services. As a result, changes to these pseudowire templates have to be treated with great care as they may impact many customers at once.

The Alcatel-Lucent implementation provides for safe handling of pseudowire templates. Changes to the pseudowire templates are not automatically propagated. Tools are provided to evaluate and distribute the changes. The following command is used to distribute changes to a “pw-template” at the service level to one or all services that use that template.

PERs-4# tools perform service id 300 eval-pw-template 1 allow-service-impact

If the service ID is omitted, then all services will be updated. The type of change made to the “pw-template” will influence how the service is impacted.

1. Adding or removing a split-horizon-group will cause the router to destroy the original object and recreate using the new value.
2. Changing parameters in the **vc-type {ether | vlan}** command requires LDP to re-signal the labels.

Both of these changes are service affecting. Other changes will not be service affecting.

Mixing Statically Configured and Auto-Discovered Pseudowires in a VPLS

The services implementation allows for manually provisioned and auto-discovered pseudowire (SDP bindings) to coexist in the same VPLS instance (for example, both FEC128 and FEC 129 are supported). This allows for gradual introduction of auto discovery into an existing VPLS deployment.

As FEC 128 and 129 represent different addressing schemes, it is important to make sure that only one is used at any point in time between the same two VPLS instances. Otherwise, both pseudowires may become active causing a loop that might adversely impact the correct functioning of the service. It is recommended that FEC128 pseudowire be disabled as soon as the FEC129 addressing scheme is introduced in a portion of the network. Alternatively, RSTP may be used during the migration as a safety mechanism to provide additional protection against operational errors.

Resiliency Schemes

The use of BGP AD on the network side, or in the backbone, does not affect the different resiliency schemes Alcatel-Lucent has developed in the access network. This means that both Multi-Chassis Link Aggregation (MC-LAG) and Management-VPLS (M-VPLS) can still be used.

BGP AD may coexist with Hierarchical-VPLS (H-VPLS) resiliency schemes (for example, dual homed MTU-s devices to different PE-rs nodes) using existing methods (M-VPLS and statically configured Active/Standby pseudowire endpoint).

If provisioned SDPs are used by BGP AD, M-VPLS may be employed to provide loop avoidance. However, it is currently not possible to auto-discover active/standby pseudowires and to instantiate the related endpoint.

BGP VPLS

The Alcatel-Lucent BGP VPLS solution, compliant with RFC 4761, is described in this section.

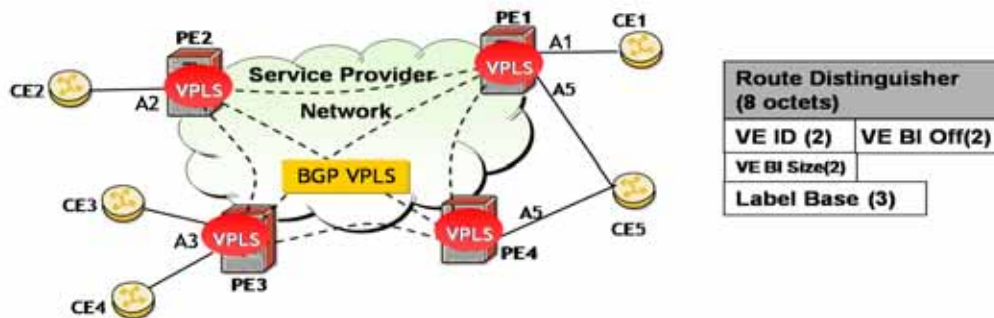


Figure 79: BGP VPLS Solution

Figure 79 depicts the service representation for BGP VPLS mesh. The major BGP VPLS components and the deltas from LDP VPLS with BGP AD are explained below:

- Data plane is identical with the LDP VPLS solution: for example, VPLS instances interconnected via pseudowire mesh. Split horizon groups may be used for loop avoidance between pseudowires.
- Addressing is based on two (2) bytes VE ID assigned to the VPLS instance.
 - BGP-AD for LDP VPLS: 4 bytes VSI-ID (system IP) identifies the VPLS instance.
- The target VPLS instance is identified by the Route Target (RT) contained in the MP-BGP advertisement (extended community attribute).
 - BGP-AD: a new MP-BGP extended community is used to identify the VPLS. RT is used for topology control.
- Auto-discovery is MP-BGP based. Same AFI, SAFI used as for LDP VPLS BGP-AD.
 - The BGP VPLS updates are distinguished from the BGP-AD ones based on the value of the NLRI prefix length: 17 bytes for BGP VPLS, 12 bytes for BGP-AD
 - BGP-AD NLRI is shorter since there is no need to carry pseudowire label information as T-LDP does the pseudowire signaling for LDP VPLS
- Pseudowire label signaling is MP-BGP based. As a result the BGP NLRI content includes also label related information – for example, block offset, block size and label base.
 - LDP VPLS: target LDP (T-LDP) is used for signaling the pseudowire service label.
 - The L2 extended community proposed in RFC 4761 is used to signal pseudowire characteristics – for example, VPLS status, control word, sequencing

Pseudowire Signaling Details

The pseudowire is setup using the following NLRI fields:

- VE Block offset (VBO): used to define for each VE-ID set the NLRI is targeted:
 - $VBO = n * VBS + 1$; for $VBS=8$ this results in 1, 9, 17, 25, ...
 - Targeted Remote VE-IDs are from VBO to $(VBO + VBS - 1)$
- VE Block size (VBS): defines how many contiguous pseudowire labels are reserved starting with the Label Base
 - Alcatel-Lucent implementation uses always a value of eight (8).
- Label Base (LB): local allocated label base
 - The next eight (8) labels allocated for remote PEs

This BGP update is telling the other PE(s) that accept the RT: “in order to reach me (VE-ID = x) use a pseudowire label of $LB + VE-ID - VBO$ using the BGP NLRI for which $VBO \leq \text{local VE-ID} < VBO + VBS$.”

Here is an example of how this algorithm works assuming PE1 has VE-ID 7 configured:

- PE1 finds a Label Block of eight (8) consecutive labels available, starting with LB = 1000
- PE1 then starts sending BGP Update with pseudowire information of ($VBO = 1$, $VBS=8$, $LB=1000$) in the NLRI.
- This pseudowire information will be accepted by all participating PEs with VE-IDs from one (1) to eight (8).
- Each of the receiving PEs will use the pseudowire label = $LB + VE-ID - VBO$ to send traffic back to the originator PE. For example VE-ID 2 will use pseudowire label 1001.

Assuming that VE-ID = 10 is configured in another PE4 the following procedure applies:

- PE4 sends BGP Update with the new VE-ID in the network that will be received by all the other participating PEs, including PE1
- PE1 upon reception will generate another label block of 8 labels for the $VBO = 9$. For example the initial PE will create now new pseudowire signaling information of ($VBO = 9$, $VBS = 8$, $LB = 3000$) and insert it in a new NLRI and BGP Update that is sent in the network.
- This new NLRI will be used by the VE-ID from 9 to 16 to establish pseudowires back to the originator PE1. For example PE4 with VE-ID 10 will use pseudowire label 3001 to send VPLS traffic back to PE1
- The PEs owning the set of VE-IDs from 1 to 8 will ignore this NLRI.

In addition to the pseudowire label information, the "Layer2 Info Extended Community" attribute must be included in the BGP Update for BGP VPLS to signal the attributes of all the pseudowires that converge towards the originator VPLS PE.

The format is described below:

```
+-----+
| Extended community type (2 octets) |
+-----+
| Encaps Type (1 octet)              |
+-----+
| Control Flags (1 octet)            |
+-----+
| Layer-2 MTU (2 octet)              |
+-----+
| Reserved (2 octets)                |
+-----+
```

The meaning of the fields:

- Extended community type – the value allocated by IANA for this attribute is 0x800A
- Encaps Type - Encapsulation Type, identifies the type of pseudowire encapsulation. The only value used by BGP VPLS is 19 (13 in HEX). This value identifies the encapsulation to be used for pseudowire instantiated through BGP Signaling which is the same as the one used for Ethernet pseudowire type in regular VPLS. There is no support for an equivalent Ethernet VLAN pseudowire in BGP VPLS in BGP Signaling. Still it is desirable to check the pseudowire-template vc-type to identify what kind of pseudowire is really to be used. While vc-type ether should be the default for interoperability with JNPR, it is desired to still have the vc-type vlan option to allow for the QoS transparency features.
- Control Flags - control information regarding the pseudowires, see below for details
- Layer-2 MTU is the Maximum Transmission Unit to be used on the pseudowires.
- Reserved – this field is reserved and must be set to zero and ignored on reception except for the solution described in [BGP-Mhoming] PRD where it is used for VPLS Preference.

The detailed format for the Control Flags bit vector is described below:

```
0 1 2 3 4 5 6 7
+-----+
|D| MBZ      |C|S| (MBZ = MUST Be Zero)
+-----+
```

The following bits in the Control Flags are defined:

- S, sequenced delivery of frames MUST or MUST NOT be used when sending VPLS packets to this PE, depending on whether S is 1 or 0, respectively

- C, a Control word MUST or MUST NOT be present when sending VPLS packets to this PE, depending on whether C is 1 or 0, respectively. By default, Alcatel-Lucent implementation uses value 0.
- MBZ, Must Be Zero bits, set to zero when sending and ignored when receiving.
- D indicates the status of the whole VPLS instance (VSI); D=0 if Admin & Operational status are up, D=1 otherwise.

Here are the events that set the D-bit to 1 to indicate VSI down status in BGP update message sent out from a PE:

- local VSI is shutdown administratively using the “config service vpls shutdown”
- all the related endpoints (SAPs or LDP pseudowires) are down
- There are no related endpoints (SAPs or LDP pseudowires) configured yet in the VSI
→ The idea is to save the core bandwidth by not establishing the BGP pseudowires to an empty VSI
- Upon reception of a BGP Update message with D-bit set to 1 all the receiving VPLS PEs must mark related pseudowires as down.

The following events do not set the D-bit to 1

- local VSI is deleted - a BGP Update with unreachable-NLRI is sent out. Upon reception all remote VPLS PEs must remove the related pseudowires and BGP routes.
- if the local SDP goes down, only the BGP pseudowire(s) mapped to that SDP goes down. There is no BGP-update sent.

Supported VPLS Features

BGP VPLS just added support for a new type of pseudowire signaling based on MP-BGP. It is based on the existing VPLS instance hence it inherited all the existing Ethernet switching functions. Here are some of the most important existing VPLS features ported also to BGP VPLS:

- VPLS data plane features: for example FIB management, SAPs, LAG access, BUM rate limiting.
- MPLS tunneling: LDP, LDP over RSVP-TE, RSVP-TE, MP-BGP based on RFC3107 (Option C solution)
- HVPLS topologies, Hub and Spoke traffic distribution
- Coexists with LDP VPLS (with or without BGP-AD) in the same VPLS instance.
→ LDP, BGP-signaling should operate in disjoint domains to simplify loop avoidance
- Coexist with BGP-based multi-homing.
- BGP VPLS is supported as the control plane for BVPLS.

- Supports IGMP/PIM snooping
 - Support for High Availability is provided
 - Ethernet Service OAM toolset is supported: IEEE 802.1ag, Y.1731.
→ Not supported OAM features: CPE Ping, MAC trace/ping/populate/purge.
-

BGP VPLS Configuration Procedure

BGP VPLS configuration requires the setup of the MPLS infrastructure and VPLS instance:

- Create LSPs
- Create SDPs if manually provisioned ones are required
- Create customer accounts
- Create template QoS, filter, scheduler, and accounting policies
- Create a VPLS service
- Configure interfaces and SAPs
- Create exclusive QoS and filter policies

The provisioning of the BGP VPLS information is similar with the BGP AD for LDP VPLS procedure:

- Configure Route Distinguisher, Route Target
- Configure pseudowire template to be used, eventually multiple mappings between import RT and pseudowire template
- The above information is re-used also by BGP-AD
- Configure the local VE-ID

The BGP VPLS parameters are provisioned at VPLS instance level, once for all SDPs, automatically generating the SDP associations using a procedure similar with the auto-binding in BGP-VPNs/BGP-AD: i.e.

- The MP-BGP Next Hop value is used to determine the Far End (FE) information
- The FE value is used to see if any SDP already exist to the remote PE
- If none exist, the equivalent SDP must be instantiated:
 - FE value is used to find any existing LSP to remote PE
 - SDP and pseudowire parameters from the related pseudowire template are used

Use of Pseudowire Template for BGP VPLS

The pseudowire template concept used for BGP AD is re-used also for BGP VPLS to dynamically instantiate pseudowire (SDP-bindings) and the related SDP (provisioned or automatically instantiated).

On transmission the settings for the L2-Info extended community in the BGP Update are derived from the pseudowire-template attributes. The following rules apply:

- If multiple pseudowire-templates (with or without import-rt) are specified for the same VPLS instance the first pseudowire-template entry will be used.
- Encaps Type is always 19 (13 in hex)
 - BGP VPLS supports only the Ethernet pseudowire type so the setting of vc-type parameter in pseudowire-template is ignored and ether value is always used.
- Layer 2 MTU – derived from service vpls service-mtu parameter
 - same value must be used in all related BGP VPLS instances in the Remote PEs to ensure the related pseudowires will come up
 - in order to interoperate with existing implementations if the received MTU value = 0, then MTU negotiation does not take place; the related pseudowire is setup ignoring the MTU.
- Control Flag C – depending on the control-word setting in pseudowire-template
- Control Flag S – always 0

On reception the values of the parameters in the L2-Info extended community of the BGP Update are compared with the settings from the corresponding pseudowire-template. The following steps are used to determine the local pseudowire-template:

- The RT values are matched to determine the pseudowire-template.
- If multiple pseudowire-templates matches are found from the previous steps, the first configured pseudowire-template entry will be considered.
- Note that it is expected that for most of the BGP VPLS use cases there will be no cases where multiple RTs will be matched at the receiving end.
- If the values used for Layer 2 MTU or C Flag do not match the pseudowire setup fails.

The tools perform commands can be used similarly as for BGP-AD to force the application of changes in pseudowire-template using the format described below:

tools perform service [*id service-id*] **eval-pw-template** *policy-id* [**allow-service-impact**]

This command is as follows:

- In earlier releases, in BGP-AD when the import RT policy changes a VPLS shutdown followed by a no shutdown was required for the next pw-template-bin match to be considered.
- Now the above command can be used also to apply the changes to the mapping between pw-template-bind and import-rt. When used the command checks if all the bindings using this pseudowire template in the command context (service id, if used) are still meant to use this policy. If the mapping has changed and allow-service-impact is TRUE, then the old binding is removed and then re-added with the new template.

Usage example: assuming the service vpls 100 bgp pw-template-bind 1 import-rt 100:50 was removed, the following command can be used to remove the old pseudowire-bindings:

tools perform service id 100 eval-pw-template 1 allow-service-impact

Including the service id is not mandatory but it is recommended as it will reduce the scope of the command to only the affected service id.

BGP Multi-Homing for VPLS

This section describes BGP based procedures for electing a designated forwarder among the set of PEs that are multi-homed to a customer site. Only the local PEs are actively participating in the selection algorithm. The PE(s) remote from the dual homed CE are not required to participate in the designated forwarding election for a remote dual-homed CE.

The main components of the BGP based multi-homing solution for VPLS are:

- Provisioning model
- MP-BGP procedures
- Designated Forwarder Election
- Blackhole avoidance – indicating the designated forwarder change towards the core PEs and access PEs or CEs
- The interaction with pseudowire signaling (BGP/LDP)

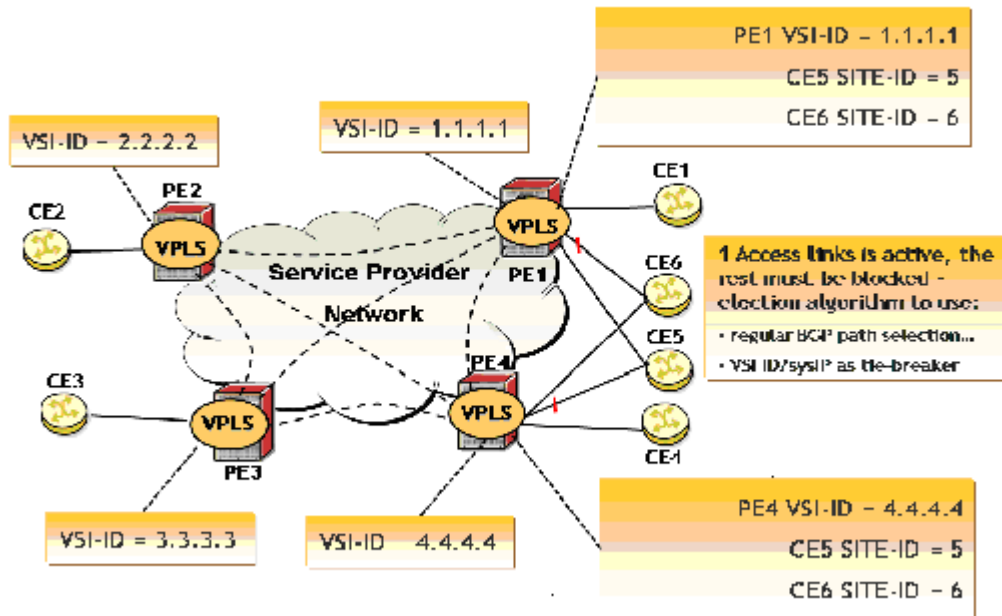


Figure 80: BGP Multi-Homing for VPLS

Figure 80 depicts the VPLS using BGP Multi-homing for the case of multi-homed CEs. Although the picture depicts the case of a pseudowire infrastructure signaled with LDP for a LDP VPLS using BGP-AD for discovery, the procedures are identical for BGP VPLS or for a mix of BGP and LDP signaled pseudowires.

Information Model and Required Extensions to L2VPN NLRI

VPLS Multi-homing using BGP-MP expands on the BGP AD and BGP VPLS provisioning model. The addressing for the Multi-homed site is still independent from the addressing for the base VSI (VSI-ID or respectively VE-ID). Every multi-homed CE is represented in the VPLS context through a site-id, which is the same on the local PEs. The site-id is unique within the scope of a VPLS. It serves to differentiate between the multi-homed CEs connected to the same VPLS Instance (VSI). For example, in Figure 81, CE5 will be assigned the same site-id on both PE1 and PE4. For the same VPLS instance though, different SITE-IDs are assigned for multi-homed CE5 and CE6: for example, site id 5 is assigned for CE5 and site id 6 is assigned for CE6. The single-homed CEs (CE1, 2, 3 and 4) do not require allocation of a multi-homed site-id. They are associated with the addressing for the base VSI, either VSI-ID or VE-ID.

The new information model required changes to the BGP usage of the NLRI for VPLS. The extended MH NLRI for Multi-Homed VPLS is compared with the BGP AD and BGP VPLS NLRI in [Figure 81](#).

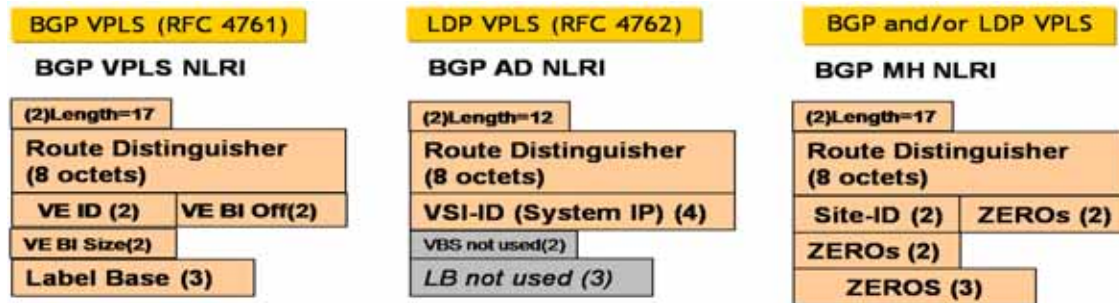


Figure 81: BGP MH-NLRI for VPLS Multi-Homing

The BGP VPLS NLRI described in RFC 4761 is used to carry a two (2) byte site-ID that identifies the MH Site. The last seven (7) bytes of the BGP VPLS NLRI used to instantiate the pseudowire are not used for BGP-MH and are ZEROed out. This NLRI format translates into the following processing path in the receiving VPLS PE:

- BGP VPLS PE: no Label information means there is no need to setup up a BGP pseudowire
- BGP AD for LDP VPLS: length =17 indicates a BGP VPLS NLRI that does not require any pseudowire LDP Signaling.

The processing procedures described in this section start from the above identification of the BGP Update as not destined for pseudowire signaling.

The RD ensures the NLRIs associated with a certain site-id on different PEs are seen as different by any of the intermediate BGP nodes (RRs) on the path between the multi-homed PEs. In other words, different RDs must be used on the MH PEs every time an RR or an ASBR is involved to guarantee the MH NLRIs reach the PEs involved in VPLS MH.

The L2-Info extended community from RFC 4761 is used in the BGP update for MH NLRI to initiate a MAC flush for blackhole avoidance to indicate the operational and admin status for the MH Site or the DF election status.

After the pseudowire infrastructure between VSIs is built using either RFC 4762 (LDP VPLS) or RFC 4761 (BGP VPLS) procedures or a mix of pseudowire Signaling procedure, on activation of a multi- homed site, an election algorithm must be run on the local and remote PEs to determine which site will be the designated forwarder (DF). The end result is that all the related MH sites in a VPLS will be placed in standby except for the site selected as DF. Alcatel-Lucent BGP-based multi-homing solution uses the DF election procedure described in the IETF working group

document *draft-ietf-l2vpn-vpls-multihoming*. The initial implementation allows the use of BGP Local Preference but does not support VPLS preference.

Supported Services and Multi-Homing Objects

This feature is supported for the following services:

- LDP VPLS with or without BGP-AD
- BGP VPLS
- mix of the above
- PBB BVPLS on BCB (no IVPLS/Epipe children)

The following access objects can be associated with MH SITE:

- SAPs
 - SDP bindings (pseudowire object), both mesh-sdp and spoke-sdp
 - Split Horizon Group
 - Under the SHG we can associate either one or multiple of the following objects: SAP(s), pseudowires (BGP VPLS, BGP-AD, provisioned and LDP signaled spoke-sdp and mesh-sdp)
-

Blackhole Avoidance

Blackholing refers to the forwarding of frames to a PE that is no longer carrying the designated forwarder. This could happen for traffic from:

- Core PE participating in the main VPLS
- Customer Edge devices (CEs)
- Access PEs - pseudowires between them and the MH PEs are associated with MH Sites

Changes in DF election results or MH site status must be detected by all of the above network elements to provide for Blackhole Avoidance.

MAC Flush to the Core PEs

Assuming there is a transition of the existing DF to non-DF status. The PE that owns the MH site experiencing this transition will generate a MAC flush-all-from-me (negative MAC flush) towards the related core PEs. Upon reception, the remote PEs will flush all the MACs learned from the MH PE.

MAC flush-all-from-me indication is sent using the following core mechanisms:

- For LDP VPLS running between core PEs, existing LDP MAC flush will be used.
- For pseudowire signaled with BGP VPLS, MAC flush will be provided implicitly using the L2-Info Extended community to indicate a transition of the active MH-site: for example the attached object(s) going down or more generically, the entire site going from Designated Forwarder (DF) to non-DF.
- Note that double flushing will not happen as it is expected that between any pair of PEs it will exist only one type of pseudowires – either BGP or LDP pseudowire but not both.

Indicating non-DF status towards the access PE or CE

For the CEs or access PEs support is provided for indicating the blocking of the MH site using the following procedures:

- For MH Access PE running LDP pseudowires the LDP standby-status is sent to all LDP pseudowires.
- For MH CEs site de-activation is linked to a CCM failure on a SAP that has a down MEP configured.

BGP Multi-Homing for VPLS Inter-Domain Resiliency

BGP MH for VPLS can be used to provide resiliency between different VPLS domains. An example of a Multi-Homing topology is depicted in [Figure 82](#).

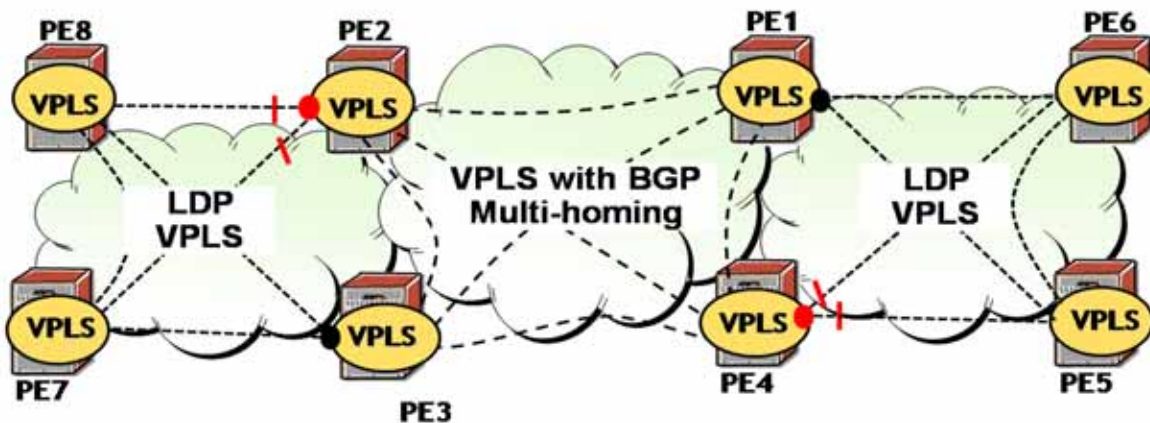


Figure 82: BGP MH used in a HVPLS topology

LDP VPLS domains are interconnected using a core VPLS domain either BGP VPLS or LDP VPLS. The gateway PEs for example PE2 and PE3 are running BGP Multi-Homing where one MH site is assigned to each of the pseudowires connecting the access PE, PE7 and PE8 in this example.

Alternatively, one may choose to associate the MH site to multiple access pseudowires using an access SHG. The command **config>service>vpls>site> failed-threshold** can be used to indicate how many pseudowire failures are required for the MH site to be declared down.

Multicast-Aware VPLS

VPLS is a Layer 2 service, hence, multicast and broadcast frames are normally flooded in a VPLS. Broadcast frames are targeted to all receivers. However, for IP multicast, normally for a multicast group, only some receivers in the VPLS are interested. Flooding to all sites can cause wasted network bandwidth and unnecessary replication on the ingress PE router.

In order to improve this condition, VPLS is IP multicast aware so it forwards IP multicast traffic based on multicast states.

PIM Snooping for VPLS

PIM snooping for VPLS allows a VPLS PE router to build multicast states by snooping PIM protocol packets that are sent over the VPLS. The VPLS PE then forwards multicast traffic based on the multicast states. When all receivers in a VPLS are IP multicast routers running PIM, multicast forwarding in the VPLS is efficient when PIM snooping for VPLS is enabled.

Because of PIM join/prune suppression, in order to make PIM snooping operate over VPLS pseudowires, two options are available, plain PIM snooping and PIM proxy. PIM proxy is the default behavior when PIM snooping is enabled for a VPLS.

Plain PIM Snooping

In plain PIM snooping configuration, VPLS PE routers only snoop, PIM messages generated on their own. Join/prune suppression must be disabled on CE routers.

When plain PIM snooping is configured, a VPLS PE router detects a condition where join/prune suppression is not disabled on one or multiple CE routers, the PE router should put PIM snooping into PIM proxy state. A trap is generated which reports the condition to the operator and is logged to syslog. If the condition changes, for example, join/prune suppression was disabled on CE routers, the PE reverts to plain PIM snooping state. A trap is generated and is logged to syslog.

PIM Proxy

For PIM proxy configurations, VPLS PE routers perform the following:

- Snoop hellos and flood hellos in fast data path.
- Consume join/prune messages from CE routers.
- Generate join/prune messages upstream using the IP address of one of the downstream CE routers.
- Run an upstream PIM state machine to determine whether a join/prune message should be sent upstream.
- When LDP multicast state distribution is enabled, generate PIM messages for LDP.

Join/prune suppression is not required to be disabled on CE routers, but it requires all PEs in the VPLS to have PIM proxy enabled. Otherwise, CEs behind the PE(s) that do not have PIM proxy enabled may not be able to get multicast traffic that they are interested in if they have join/prune suppression enabled.

When PIM proxy is enabled, but a VPLS PE router detects a condition where join/prune suppression is disabled on all CE routers, the PE router put PIM proxy into a plain PIM snooping state to improve efficiency. A trap is generated to report the scenario to the operator and is logged to syslog. If the condition changes, for example, join/prune suppression enabled on a CE router, PIM proxy is placed back into operational state. Again, a trap is generated to report the condition to the operator and is logged to syslog.

Multicast Listener Discovery (MLD) Snooping and MAC-Based Multicast Forwarding

VPLS-based transport is a popular architecture as it better handles IPv6 multicast on the transport configurations for those backbones who use IPv6 instead of IPv4.

The VPLS based transport architecture combines MLD snooping and MAC based multicast forwarding.

MLD Snooping

MLD snooping is basically a IPv6 version of IGMP snooping. The guidelines and procedures are similar to IGMP snooping as well.

MAC-Based IPv6 Multicast Forwarding

IPv6 multicast address to MAC address mapping — Ethernet MAC addresses in the range of 33-33-00-00-00-00 to 33-33-FF-FF-FF-FF are reserved for IPv6 multicast. To map an IPv6 multicast address to a MAC-layer multicast address, the low order 32 bits of the IPv6 multicast address are mapped directly to the low order 32 bits in the MAC-layer multicast address.

IPv6 multicast forwarding entries — IPv6 multicast snooping forwarding entries are based on MAC addresses, while native IPv6 multicast forwarding entries are based on IPv6 addresses (supported on 7750 SR with IOM2). Thus, when both MLD snooping and native IPv6 multicast are enabled on the same device, both formats are supported on the same IOM2, although they are used for different services.

PIM and IGMP Snooping Interaction

This section describes how to handle the scenario where IGMP snooping and PIM snooping are both enabled for the same VPLS.

When both PIM snooping and IGMP snooping are enabled for a VPLS, multicast traffic is forwarded based on the combined multicast forwarding table.

VPLS Multicast-Aware High Availability Features

The following features are HA capable:

- Configuration redundancy — All the VPLS multicast-aware configurations can be synchronized to the standby CPM.
- Local snooping states as well as states distributed by LDP can be synchronized to the standby CPM.
- Operational states can also be synchronized, for example, the operational state of PIM proxy.

VPLS Service Considerations

This section describes various 7750 SR service features and any special capabilities or considerations as they relate to VPLS services.

SAP Encapsulations

VPLS services are designed to carry Ethernet frame payloads, so it can provide connectivity between any SAPs and SDPs that pass Ethernet frames. The following SAP encapsulations are supported on the 7750 SR VPLS service:

- Ethernet null
 - Ethernet Dot1q
 - Ethernet QinQ
 - SONET/SDH BCP-null
 - SONET/SDH BCP-dot1q
 - ATM VC with RFC 2684 Ethernet bridged encapsulation (See [ATM/Frame Relay PVC Access and Termination on a VPLS Service on page 569.](#))
 - FR VC with RFC 2427 Ethernet bridged encapsulation (See [ATM/Frame Relay PVC Access and Termination on a VPLS Service on page 569.](#))
-

VLAN Processing

The SAP encapsulation definition on Ethernet ingress ports defines which VLAN tags are used to determine the service that the packet belongs to:

1. Null encapsulation defined on ingress — Any VLAN tags are ignored and the packet goes to a default service for the SAP.
2. Dot1q encapsulation defined on ingress — Only first label is considered.
3. QinQ encapsulation defined on ingress— Both labels are considered.
Note that the SAP can be defined with a wildcard for the inner label (for example, “100:*”). In this situation all packets with an outer label of 100 will be treated as belonging to the SAP. If, on the same physical link, there is also a SAP defined with a QinQ encapsulation of 100:1, then traffic with 100:1 will go to that SAP and all other traffic with 100 as the first label will go to the SAP with the 100:* definition.

In situations 2 and 3 above, traffic encapsulated with tags for which there is no definition are discarded.

Ingress VLAN Swapping

This feature is supported on VPLS and VLL service where the end to end solution is built using two node solutions (requiring SDP connections between the nodes).

In VLAN swapping, only the VLAN-id value will be copied to the inner VLAN position. Ethertype of the inner tag will be preserved and all consecutive nodes will work with that value. Similarly, the dot1p bits value of outer-tag will not be preserved.

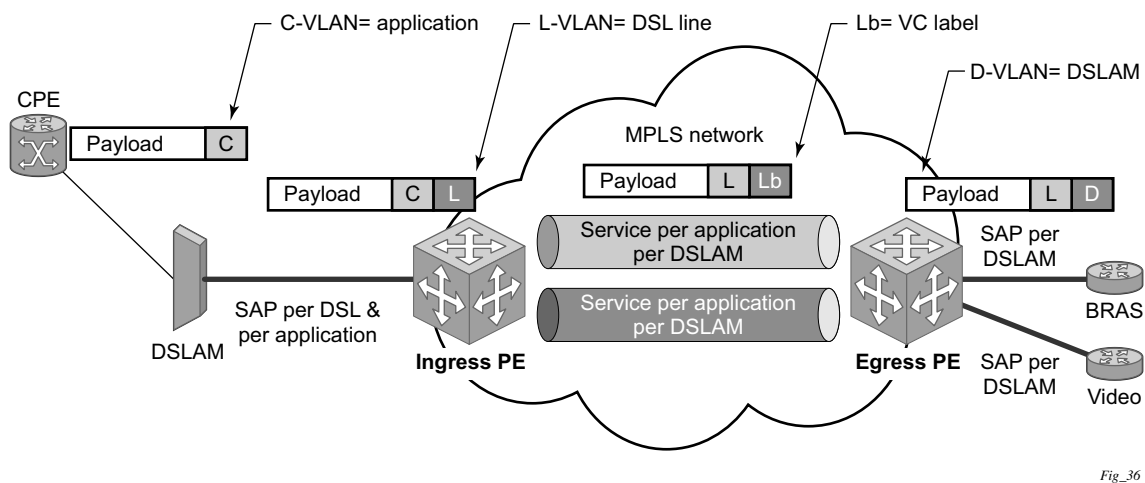


Fig_36

Figure 83: Ingress VLAN Swapping

The network diagram describes the network where at user access side (DSLAM facing SAPs) every subscriber is represented by several QinQ SAPs with inner-tag encoding service and outer-tag encoding subscriber (DSL line). The aggregation side (BRAS or PE facing SAPs) the is represented by DSL line number (inner VLAN tag) and DSLAM (outer VLAN tag). The effective operation on VLAN tag is to drop inner tag at access side and push another tag at the aggregation side.

Ingress VLAN Translation

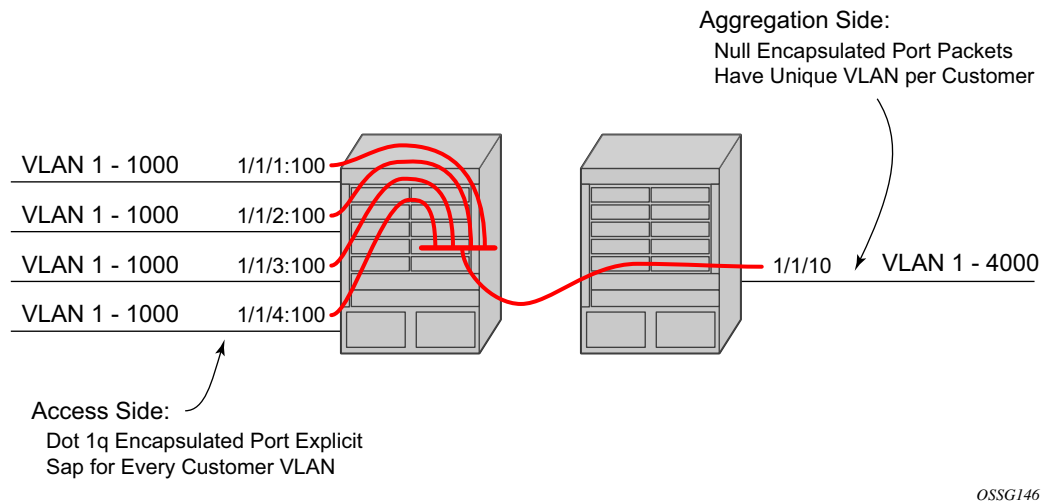


Figure 84: Ingress VLAN Translation

Configuring a VPLS Service with CLI

This section provides information to configure VPLS services using the command line interface.

Topics in this section include:

- [Basic Configuration on page 510](#)
- [Common Configuration Tasks on page 512](#)
 - [Configuring VPLS Components on page 513](#)
 - [Creating a VPLS Service on page 515](#)
 - [Configuring a VPLS SAP on page 525](#)
 - [Local VPLS SAPs on page 525](#)
 - [Distributed VPLS SAPs on page 526](#)
 - [Configuring SAP Subscriber Management Parameters on page 538](#)
 - [MSTP Control over Ethernet Tunnels on page 539](#)
 - [Configuring SDP Bindings on page 540](#)
- [Configuring VPLS Redundancy on page 553](#)
 - [Creating a Management VPLS for SAP Protection on page 553](#)
 - [Creating a Management VPLS for Spoke SDP Protection on page 556](#)
 - [BGP VPLS Configuration Example on page 574](#)
 - [Configuring Multi-Chassis Endpoints on page 565](#)
- [ATM/Frame Relay PVC Access and Termination on a VPLS Service on page 569](#)
- [Configuring Provider Edge Discovery Policies on page 580](#)
 - [Applying a PE Discovery Policy to a VPLS Service on page 582](#)
- [Configuring Policy-Based Forwarding for Deep Packet Inspection \(DPI\) in VPLS on page 583](#)
- [Service Management Tasks on page 586](#)
 - [Modifying VPLS Service Parameters on page 586](#)
 - [Modifying Management VPLS Parameters on page 587](#)
 - [Deleting a VPLS Service on page 589](#)
 - [Disabling a VPLS Service on page 589](#)
 - [Re-Enabling a VPLS Service on page 590](#)

Basic Configuration

The following fields require specific input (there are no defaults) to configure a basic VPLS service:

- Customer ID (refer to [Configuring Customers on page 91](#))
- For a local service, configure two SAPs, specifying local access ports and encapsulation values.
- For a distributed service, configure a SAP and an SDP for each far-end node.

The following example displays a sample configuration of a local VPLS service on ALA-1.

```
*A:ALA-1>config>service>vpls# info
-----
...
    vpls 9001 customer 6 create
        description "Local VPLS"
        stp
            shutdown
        exit
        sap 1/2/2:0 create
            description "SAP for local service"
        exit
        sap 1/1/5:0 create
            description "SAP for local service"
        exit
        no shutdown
-----
*A:ALA-1>config>service>vpls#
```

The following example displays a sample configuration of a distributed VPLS service between ALA-1, ALA-2, and ALA-3.

```
*A:ALA-1>config>service# info
-----
...
    vpls 9000 customer 6 create
        shutdown
        description "This is a distributed VPLS."
        def-mesh-vc-id 750
        stp
            shutdown
        exit
        sap 1/1/5:16 create
            description "VPLS SAP"
        exit
        spoke-sdp 2:22 create
        exit
        mesh-sdp 7:750 create
        exit
    exit
-----
```

```

*A:ALA-1>config>service#

*A:ALA-2>config>service# info
-----
...
    vpls 9000 customer 6 create
        description "This is a distributed VPLS."
        def-mesh-vc-id 750
        stp
            shutdown
        exit
        sap 1/1/5:16 create
            description "VPLS SAP"
        exit
        spoke-sdp 2:22 create
        exit
        mesh-sdp 8:750 create
        exit
        no shutdown
    exit
...
-----
*A:ALA-2>config>service#

*A:ALA-3>config>service# info
-----
...
    vpls 9000 customer 6 create
        description "This is a distributed VPLS."
        def-mesh-vc-id 750
        stp
            shutdown
        exit
        sap 1/1/3:33 create
            description "VPLS SAP"
        exit
        spoke-sdp 2:22 create
        exit
        mesh-sdp 8:750 create
        exit
        no shutdown
    exit
...
-----
*A:ALA-3>config>service#

```

Common Configuration Tasks

This section provides a brief overview of the tasks that must be performed to configure both local and distributed VPLS services and provides the CLI commands.

For egress multicast groups (optional):

1. Define egress multicast group name(s)
2. Specify the destinations per pass
3. Define SAP common requirements

For VPLS services:

1. Associate VPLS service with a customer ID
2. Define SAPs:
 - Select node(s) and port(s)
 - Optional — Select QoS policies other than the default (configured in `config>qos` context)
 - Optional — Select filter policies (configured in `config>filter` context)
 - Optional — Select accounting policy (configured in `config>log` context)
 - Optional — Specify SAP egress multicast-group name
3. Associate SDPs for (distributed services)
4. Modify STP default parameters (optional) (see [VPLS and Spanning Tree Protocol on page 435](#))
5. Enable service

Configuring VPLS Components

Use the CLI syntax displayed below to configure the following entities:

- [Configuring Egress Multicast Groups on page 514](#)
- [Creating a VPLS Service on page 515](#)
 - [Enabling MAC Move on page 517](#)
- [Configuring a VPLS SAP on page 525](#)
 - [Local VPLS SAPs on page 525](#)
 - [Distributed VPLS SAPs on page 526](#)
 - [Configuring SAP-Specific STP Parameters on page 528](#)
 - [STP SAP Operational States on page 532](#)
 - [Configuring VPLS SAPs with Split Horizon on page 535](#)
 - [Configuring SAP Subscriber Management Parameters on page 538](#)
 - [Configuring Overrides on Service SAPs on page 541](#)
- [Configuring SDP Bindings on page 540](#)
 - [Mesh SDP on page 542](#)
 - [Spoke SDP on page 543](#)
- [Configuring VPLS Redundancy on page 553](#)
- [Configuring Provider Edge Discovery Policies on page 580](#)

Configuring Egress Multicast Groups

Use the following CLI syntax to configure egress multicast groups:

CLI Syntax: `config>service# egress-multicast-group group-name`
 `description description-string`
 `dest-chain-limit [destinations per pass]`
 `sap-common-requirements`
 `dot1q-etype 0x0600..0xffff`
 `egress-filter [ip ip-filter-id]`
 `egress-filter [ipv6 ipv6-filter-id]`
 `egress-filter [mac mac-filter-id]`
 `qinq-etype [0x0600..0xffff]`
 `qinq-fixed-tag-value tag-value`

The following example displays an egress multicast group configuration:

```
A:ALA-48>config>service>egress-multicast-group# info
-----
      dest-chain-limit 10
      sap-common-requirements
      dot1q-etype 0x060e
      egress-filter ip 10
      exit
-----
A:ALA-48>config>service>egress-multicast-group#
```

Creating a VPLS Service

Use the following CLI syntax to create a VPLS service:

CLI Syntax: `config>service# vpls service-id [customer customer-id] [vpn
vpn-id] [m-vpls]
description description-string
no shutdown`

The following example displays a VPLS configuration:

```
*A:ALA-1>config>service>vpls# info
-----
...
    vpls 9000 customer 6 create
        description "This is a distributed VPLS."
        def-mesh-vc-id 750
        stp
            shutdown
        exit
    exit
...
-----
*A:ALA-1>config>service>vpls#
```

Enabling Multiple MAC Registration Protocol (MMRP)

Once MMRP is enabled in the B-VPLS, it advertises the presence of the I-VPLS instances associated with this B-VPLS.

The following example displays a configuration with MMRP enabled.

```
*A:PE-B>config>service# info
-----
      vpls 11 customer 1 vpn 11 i-vpls create
      backbone-vpls 100:11
      exit
      stp
      shutdown
      exit
      sap 1/5/1:11 create
      exit
      sap 1/5/1:12 create
      exit
      no shutdown
    exit
  vpls 100 customer 1 vpn 100 b-vpls create
  service-mtu 2000
  stp
  shutdown
  exit
  mrp
  flood-time 10
  no shutdown
  exit
  sap 1/5/1:100 create
  exit
  spoke-sdp 3101:100 create
  exit
  spoke-sdp 3201:100 create
  exit
  no shutdown
    exit
  -----
*A:PE-B>config>service#
```

Since I-VPLS 11 is associated with B-VPLS 100, MMRP advertises the group B-MAC 01:1e:83:00:00:0b) associated with I-VPLS 11 through a declaration on all the B-SAPs and B-SDPs. If the remote node also declares an I-VPLS 11 associated to its B-VPLS 10, then this results in a registration for the group B-MAC. This also creates the MMRP multicast tree (MFIB entries). In this case, sdp 3201:100 is connected to a remote node that declares the group B-MAC.

The following show commands display the current MMRP information for this scenario:

```
*A:PE-C# show service id 100 mrp
-----
MRP Information
-----
Admin State      : Up                      Failed Register Cnt: 0
Max Attributes   : 1023                   Attribute Count    : 1
```



```

Attr High Watermark: 95%                               Attr Low Watermark : 90%
Flood Time          : 10
-----
*A:PE-C# show service id 100 mmp mac
-----
SAP/SDP                                MAC Address      Registered  Declared
-----
sap:1/5/1:100                          01:1e:83:00:00:0b No           Yes
sdp:3101:100                           01:1e:83:00:00:0b No           Yes
sdp:3201:100                           01:1e:83:00:00:0b Yes          Yes
-----

*A:PE-C# show service id 100 sdp 3201:100 mmp
-----
Sdp Id 3201:100 MRP Information
-----
Join Time           : 0.2 secs                Leave Time          : 3.0 secs
Leave All Time       : 10.0 secs               Periodic Time       : 1.0 secs
Periodic Enabled    : false
Rx Pdus             : 7                      Tx Pdus            : 23
Dropped Pdus        : 0
Rx New Event        : 0                      Rx Join-In Event   : 6
Rx In Event         : 0                      Rx Join Empty Evt  : 1
Rx Empty Event      : 0                      Rx Leave Event     : 0
Tx New Event        : 0                      Tx Join-In Event   : 4
Tx In Event         : 0                      Tx Join Empty Evt  : 19
Tx Empty Event      : 0                      Tx Leave Event     : 0
-----
SDP MMRP Information
-----
MAC Address      Registered      Declared
-----
01:1e:83:00:00:0b Yes          Yes
-----
Number of MACs=1 Registered=1 Declared=1
-----
*A:PE-C#

*A:PE-C# show service id 100 mfib
=====
Multicast FIB, Service 100
=====
Source Address  Group Address      Sap/Sdp Id          Svc Id  Fwd/Blk
-----
*              01:1E:83:00:00:0B  sdp:3201:100      Local   Fwd
-----
Number of entries: 1
=====
*A:PE-C#

```

Enabling MAC Move

The **mac-move** feature is useful to protect against undetected loops in your VPLS topology as well as the presence of duplicate MACs in a VPLS service. For example, if two clients in the VPLS have the same MAC address, the VPLS will experience a high re-learn rate for the MAC and will shut down the SAP or spoke SDP when the threshold is exceeded.

Use the following CLI syntax to configure **mac-move** parameters.

```
CLI Syntax: config>service# vpls service-id [customer customer-id] [vpn
               vpn-id] [m-vpls]
               mac-move
                 primary-ports
                   spoke-sdp
                   cumulative-factor
                 exit
                 secondary-ports
                   spoke-sdp
                 sap
                 exit
                 move-frequency frequency
                 retry-timeout timeout
                 no shutdown
```

The following example displays a **mac-move** configuration:

```
*A:ALA-2009>config>service>vpls>mac-move# show service id 500 mac-move
=====
Service Mac Move Information
=====
Service Id      : 500                      Mac Move       : Enabled
Primary Factor  : 4                        Secondary Factor : 2
Mac Move Rate   : 2                        Mac Move Timeout : 10
Mac Move Retries : 3
-----
SAP Mac Move Information: 2/1/3:501
-----
Admin State      : Up                      Oper State      : Down
Flags            : RelearnLimitExceeded
Time to come up  : 1 seconds                Retries Left    : 1
Mac Move         : Blockable                Blockable Level : Tertiary
-----
SAP Mac Move Information: 2/1/3:502
-----
Admin State      : Up                      Oper State      : Up
Flags            : None
Time to RetryReset: 267 seconds              Retries Left    : none
Mac Move         : Blockable                Blockable Level : Tertiary
-----
SDP Mac Move Information: 21:501
-----
Admin State      : Up                      Oper State      : Up
Flags            : None
Time to RetryReset: never                   Retries Left    : 3
Mac Move         : Blockable                Blockable Level : Secondary
-----
SDP Mac Move Information: 21:502
-----
Admin State      : Up                      Oper State      : Down
Flags            : RelearnLimitExceeded
Time to come up  : never                   Retries Left    : none
Mac Move         : Blockable                Blockable Level : Tertiary
=====
*A:*A:ALA-2009>config>service>vpls>mac-move#
```

Configuring STP Bridge Parameters in a VPLS

Modifying some of the Spanning Tree Protocol parameters allows the operator to balance STP between resiliency and speed of convergence extremes. Modifying particular parameters, mentioned below, must be done in the constraints of the following two formulae:

$$2 \times (\text{Bridge\_Forward\_Delay} - 1.0 \text{ seconds}) \geq \text{Bridge\_Max\_Age}$$

$$\text{Bridge\_Max\_Age} \geq 2 \times (\text{Bridge\_Hello0\_Time} + 1.0 \text{ seconds})$$

The following STP parameters can be modified at VPLS level:

- [Bridge STP Admin State on page 519](#)
- [Mode on page 520](#)
- [Bridge Priority on page 520](#)
- [Max Age on page 521](#)
- [Forward Delay on page 521](#)
- [Hello Time on page 522](#)
- [MST Instances on page 523](#)
- [MST Max Hops on page 523](#)
- [MST Name on page 523](#)
- [MST Revision on page 523](#)

STP always uses the locally configured values for the first three parameters (Admin State, Mode and Priority).

For the parameters Max Age, Forward Delay, Hello Time and Hold Count, the locally configured values are only used when this bridge has been elected root bridge in the STP domain, otherwise the values received from the root bridge are used. The exception to this rule is: when STP is running in RSTP mode, the Hello Time is always taken from the locally configured parameter. The other parameters are only used when running mode MSTP.

Bridge STP Admin State

The administrative state of STP at the VPLS level is controlled by the shutdown command.

When STP on the VPLS is administratively disabled, any BPDUs are forwarded transparently through the 7750 SR. When STP on the VPLS is administratively enabled, but the administrative state of a SAP or spoke SDP is down, BPDUs received on such a SAP or spoke SDP are discarded.

CLI Syntax: `config>service>vpls service-id# stp`
`no shutdown`

Mode

To be compatible with the different iterations of the IEEE 802.1D standard, the 7750 SR supports several variants of the Spanning Tree protocol:

- **rstp** — Rapid Spanning Tree Protocol (RSTP) compliant with IEEE 802.1D-2004 - default mode.
- **dot1w** — Compliant with IEEE 802.1w.
- **comp-dot1w** — Operation as in RSTP but backwards compatible with IEEE 802.1w (this mode was introduced for interoperability with some MTU types).
- **mstp** — Compliant with the Multiple Spanning Tree Protocol specified in IEEE 802.1Q REV/D5.0-09/2005. This mode of operation is only supported in an mVPLS.
- **pmstp** — Compliant with the Multiple Spanning Tree Protocol specified in IEEE 802.1Q REV/D3.0-04/2005 but with some changes to make it backwards compatible to 802.1Q 2003 edition and IEEE 802.1w.

See section [Spanning Tree Operating Modes on page 435](#) for details on these modes.

CLI Syntax: `config>service>vpls service-id# stp
mode {rstp | comp-dot1w | dot1w | mstp}
Default: rstp`

Bridge Priority

The **bridge-priority** command is used to populate the priority portion of the bridge ID field within outbound BPDUs (the most significant 4 bits of the bridge ID). It is also used as part of the decision process when determining the best BPDU between messages received and sent. When running MSTP, this is the bridge priority used for the CIST.

All values will be truncated to multiples of 4096, conforming with IEEE 802.1t and 802.1D-2004.

CLI Syntax: `config>service>vpls service-id# stp
priority bridge-priority
Range: 1 to 65535
Default: 32768
Restore Default: no priority`

Max Age

The **max-age** command indicates how many hops a BPDU can traverse the network starting from the root bridge. The message age field in a BPDU transmitted by the root bridge is initialized to 0. Each other bridge will take the message_age value from BPDUs received on their root port and increment this value by 1. The message_age thus reflects the distance from the root bridge. BPDUs with a message age exceeding max-age are ignored.

STP uses the max-age value configured in the root bridge. This value is propagated to the other bridges via the BPDUs.

The default value of **max-age** is 20. This parameter can be modified within a range of 6 to 40, limited by the standard STP parameter interaction formulae.

CLI Syntax: `config>service>vpls service-id# stp
max-age max-info-age`

Range: 6 to 40 seconds

Default: 20 seconds

Restore Default: no max-age

Forward Delay

RSTP, as defined in the IEEE 802.1D-2004 standards, will normally transition to the forwarding state via a handshaking mechanism (rapid transition), without any waiting times. If handshaking fails (e.g. on shared links, see below), the system falls back to the timer-based mechanism defined in the original STP (802.1D-1998) standard.

A shared link is a link with more than two Ethernet bridges (for example, a shared 10/100BaseT segment). The `port-type` command is used to configure a link as point-to-point or shared (see section [SAP Link Type on page 531](#)).

For timer-based transitions, the 802.1D-2004 standard defines an internal variable forward-delay, which is used in calculating the default number of seconds that a SAP or spoke SDP spends in the discarding and learning states when transitioning to the forwarding state. The value of the forward-delay variable depends on the STP operating mode of the VPLS instance:

- in **rstp** mode, but only when the SAP or spoke SDP has not fallen back to legacy STP operation, the value configured by the **hello-time** command is used;
- in all other situations, the value configured by the **forward-delay** command is used.

CLI Syntax: `config>service>vpls service-id# stp
forward-delay seconds`

Range: 4 to 30 seconds

Default: 15 seconds

Restore Default: no forward-delay

Hello Time

The **hello-time** command configures the Spanning Tree Protocol (STP) hello time for the Virtual Private LAN Service (VPLS) STP instance.

The *seconds* parameter defines the default timer value that controls the sending interval between BPDU configuration messages by this bridge, on ports where this bridge assumes the designated role.

The active hello time for the spanning tree is determined by the root bridge (except when the STP is running in RSTP mode, then the hello time is always taken from the locally configured parameter).

The configured hello-time value can also be used to calculate the bridge forward delay, see [Forward Delay on page 521](#).

CLI Syntax: `config>service>vpls service-id# stp
hello-time hello-time`
Range: 1 to 10 seconds
Default: 2 seconds
Restore Default: `no hello-time`

Hold Count

The **hold-count** command configures the peak number of BPDUs that can be transmitted in a period of one second.

CLI Syntax: `config>service>vpls service-id# stp
hold-count count-value`
Range: 1 to 10
Default: 6
Restore Default: `no hold-count`

MST Instances

You can create up to 15 MST-instances. They can range from 1 to 4094. By changing path-cost and priorities, you can make sure that each instance will form its own tree within the region, thus making sure different VLANs follow different paths.

You can assign non overlapping VLAN ranges to each instance. VLANs that are not assigned to an instance are implicitly assumed to be in instance 0, which is also called the CIST. This CIST cannot be deleted or created.

The parameter that can be defined per instance are mst-priority and vlan-range.

- mst-priority — The bridge-priority for this specific mst-instance. It follows the same rules as bridge-priority. For the CIST, the bridge-priority is used.
 - vlan-range — The VLANs are mapped to this specific mst-instance. If no VLAN-ranges are defined in any mst-instances, then all VLANs are mapped to the CIST.
-

MST Max Hops

The mst-max-hops command defines the maximum number of hops the BPDU can traverse inside the region. Outside the region max-age is used.

MST Name

The MST name defines the name that the operator gives to a region. Together with MST revision and the VLAN to MST-instance mapping, it forms the MST configuration identifier. Two bridges that have the same MST configuration identifier form a region if they exchange BPDUs.

MST Revision

The MST revision together with MST-name and VLAN to MST-instance mapping define the MST configuration identifier. Two bridges that have the same MST configuration identifier form a region if they exchange BPDUs.

Configuring GSMP Parameters

The following parameters must be configured in order for GSMP to function:

- One or more GSMP sessions
- One or more ANCP policies
- For basic subscriber management only, ANCP static maps
- For enhanced subscriber management only, associate subscriber profiles with ANCP policies.

Use the following CLI syntax to configure GSMP parameters.

CLI Syntax: `config>service>vpls# gsmp`
`group name [create]`
`ancp`
`dynamic-topology-discover`
`oam`
`description description-string`
`hold-multiplier multiplier`
`keepalive seconds`
`neighbor ip-address [create]`
`description v`
`local-address ip-address`
`priority-marking dscp dscp-name`
`priority-marking prec ip-prec-value`
`[no] shutdown`
`[no] shutdown`
`[no] shutdown`

This example displays a GSMP group configuration.

```
A:ALA-48>config>service>vpls>gsmp# info
-----
group "group1" create
description "test group config"
neighbor 10.10.10.104 create
description "neighbor1 config"
local-address 10.10.10.103
no shutdown
exit
no shutdown
exit
no shutdown
-----
A:ALA-48>config>service>vpls>gsmp#
```


Configuring a VPLS SAP

A default QoS policy is applied to each ingress and egress SAP. Additional QoS policies can be configured in the **config>qos** context. There are no default filter policies. Filter policies are configured in the **config>filter** context and must be explicitly applied to a SAP.

Use the following CLI syntax to create:

- [Local VPLS SAPs on page 525](#)
- [Distributed VPLS SAPs on page 526](#)

Local VPLS SAPs

To configure a local VPLS service, enter the **sap sap-id** command twice with different port IDs in the same service configuration.

The following example displays a local VPLS configuration:

```
*A:ALA-1>config>service# info
-----
...
    vpls 90001 customer 6 create
        description "Local VPLS"
        stp
            shutdown
        exit
        sap 1/2/2:0 create
            description "SAP for local service"
        exit
        sap 1/1/5:0 create
            description "SAP for local service"
        exit
        no shutdown
    exit
-----
*A:ALA-1>config>service#
```

Distributed VPLS SAPs

To configure a distributed VPLS service, you must configure service entities on originating and far-end nodes. You must use the same service ID on all ends (for example, create a VPLS service ID 9000 on ALA-1, ALA-2, and ALA-3). A distributed VPLS consists of a SAP on each participating node and an SDP bound to each participating node.

For SDP configuration information, see [Configuring an SDP on page 94](#). For SDP binding information, see [Configuring SDP Bindings on page 540](#).

The following example displays a configuration of VPLS SAPs configured for ALA-1, ALA-2, and ALA-3.

```
*A:ALA-1>config>service# info
-----
...
    vpls 9000 customer 6 vpn 750 create
        description "Distributed VPLS services."
        def-mesh-vc-id 750
        stp
            shutdown
        exit
        sap 1/2/5:0 create
            description "VPLS SAP"
            multi-service-site "West"
        exit
    exit
...
-----
*A:ALA-1>config>service#

*A:ALA-2>config>service# info
-----
...
    vpls 9000 customer 6 vpn 750 create
        description "Distributed VPLS services."
        def-mesh-vc-id 750
        stp
            shutdown
        exit
        sap 1/1/2:22 create
            description "VPLS SAP"
            multi-service-site "West"
        exit
    exit
...
-----
*A:ALA-2>config>service#

*A:ALA-3>config>service# info
-----
...
    vpls 9000 customer 6 vpn 750 create
        description "Distributed VPLS services."
        def-mesh-vc-id 750
```

```
        stp
            shutdown
        exit
    sap 1/1/3:33 create
        description "VPLS SAP"
        multi-service-site "West"
    exit
exit
...
-----
*A:ALA-3>config>service#
```

Configuring SAP-Specific STP Parameters

When a VPLS has STP enabled, each SAP within the VPLS has STP enabled by default. The operation of STP on each SAP is governed by:

- [SAP STP Administrative State on page 528](#)
 - [SAP Virtual Port Number on page 529](#)
 - [SAP Priority on page 529](#)
 - [SAP Path Cost on page 530](#)
 - [SAP Edge Port on page 530](#)
 - [SAP Auto Edge on page 531](#)
 - [SAP Link Type on page 531](#)
-

SAP STP Administrative State

The administrative state of STP within a SAP controls how BPDUs are transmitted and handled when received. The allowable states are:

- SAP Admin Up

The default administrative state is *up* for STP on a SAP. BPDUs are handled in the normal STP manner on a SAP that is administratively up.

- SAP Admin Down

An administratively down state allows a service provider to prevent a SAP from becoming operationally blocked. BPDUs will not originate out the SAP towards the customer.

If STP is enabled on VPLS level, but disabled on the SAP, received BPDUs are discarded. Discarding the incoming BPDUs allows STP to continue to operate normally within the VPLS service while ignoring the down SAP. The specified SAP will always be in an operationally forwarding state.

NOTE: The administratively down state allows a loop to form within the VPLS.

CLI Syntax: `config>service>vpls>sap>stp#`
`[no] shutdown`

Range: shutdown or no shutdown

Default: no shutdown (SAP admin up)

SAP Virtual Port Number

The virtual port number uniquely identifies a SAP within configuration BPDUs. The internal representation of a SAP is unique to a system and has a reference space much bigger than the 12 bits definable in a configuration BPDU. STP takes the internal representation value of a SAP and identifies it with its own virtual port number that is unique to every other SAP defined on the VPLS. The virtual port number is assigned at the time that the SAP is added to the VPLS.

Since the order in which SAPs are added to the VPLS is not preserved between reboots of the system, the virtual port number may change between restarts of the STP instance. To achieve consistency after a reboot, the virtual port number can be specified explicitly.

CLI Syntax: `config>service>vpls>sap# stp
port-num number`
Range: 1 — 2047
Default: (automatically generated)
Restore Default: no port-num

SAP Priority

SAP priority allows a configurable “tie breaking” parameter to be associated with a SAP. When configuration BPDUs are being received, the configured SAP priority will be used in some circumstances to determine whether a SAP will be designated or blocked. These are the values used for CIST when running MSTP.

In traditional STP implementations (802.1D-1998), this field is called the port priority and has a value of 0 to 255. This field is coupled with the port number (0 to 255 also) to create a 16 bit value. In the latest STP standard (802.1D-2004) only the upper 4 bits of the port priority field are used to encode the SAP priority. The remaining 4 bits are used to extend the port ID field into a 12 bit virtual port number field. The virtual port number uniquely references a SAP within the STP instance. See [SAP Virtual Port Number on page 529](#) for details on the virtual port number.

STP computes the actual SAP priority by taking the configured priority value and masking out the lower four bits. The result is the value that is stored in the SAP priority parameter. For example, if a value of 0 was entered, masking out the lower 4 bits would result in a parameter value of 0. If a value of 255 was entered, the result would be 240.

The default value for SAP priority is 128. This parameter can be modified within a range of 0 to 255, 0 being the highest priority. Masking causes the values actually stored and displayed to be 0 to 240, in increments of 16.

CLI Syntax: `config>service>vpls>sap>stp#
priority stp-priority`
Range: 0 to 255 (240 largest value, in increments of 16)
Default: 128
Restore Default: no priority

SAP Path Cost

The SAP path cost is used by STP to calculate the path cost to the root bridge. The path cost in BPDUs received on the root port is incremented with the configured path cost for that SAP. When BPDUs are sent out other egress SAPs, the newly calculated root path cost is used. These are the values used for CIST when running MSTP.

STP suggests that the path cost is defined as a function of the link bandwidth. Since SAPs are controlled by complex queuing dynamics, in the 7750 SR the STP path cost is a purely static configuration.

The default value for SAP path cost is 10. This parameter can be modified within a range of 1 to 65535, 1 being the lowest cost.

CLI Syntax: `config>service>vpls>sap>stp#
path-cost sap-path-cost
Range: 1 to 200000000
Default: 10
Restore Default: no path-cost`

SAP Edge Port

The SAP `edge-port` command is used to reduce the time it takes a SAP to reach the forwarding state when the SAP is on the edge of the network, and thus has no further STP bridge to handshake with.

The `edge-port` command is used to initialize the internal `OPER_EDGE` variable. At any time, when `OPER_EDGE` is false on a SAP, the normal mechanisms are used to transition to the forwarding state (see [Forward Delay on page 521](#)). When `OPER_EDGE` is true, STP assumes that the remote end agrees to transition to the forwarding state without actually receiving a BPDU with an agreement flag set.

The `OPER_EDGE` variable will dynamically be set to false if the SAP receives BPDUs (the configured `edge-port` value does not change). The `OPER_EDGE` variable will dynamically be set to true if `auto-edge` is enabled and STP concludes there is no bridge behind the SAP.

When STP on the SAP is administratively disabled and re-enabled, the `OPER_EDGE` is re-initialized to the value configured for `edge-port`.

Valid values for SAP `edge-port` are `enabled` and `disabled` with `disabled` being the default.

CLI Syntax: `config>service>vpls>sap>stp#
[no] edge-port
Default: no edge-port`

SAP Auto Edge

The SAP **edge-port** command is used to instruct STP to dynamically decide whether the SAP is connected to another bridge.

If auto-edge is enabled, and STP concludes there is no bridge behind the SAP, the OPER_EDGE variable will dynamically be set to true. If auto-edge is enabled, and a BPDU is received, the OPER_EDGE variable will dynamically be set to true (see [SAP Edge Port on page 530](#)).

Valid values for SAP auto-edge are enabled and disabled with enabled being the default.

CLI Syntax: config>service>vpls>sap>stp#
[no] auto-edge
Default: auto-edge

SAP Link Type

The SAP **link-type** parameter instructs STP on the maximum number of bridges behind this SAP. If there is only a single bridge, transitioning to forwarding state will be based on handshaking (fast transitions). If more than two bridges are connected via a shared media, their SAPs should all be configured as shared, and timer-based transitions are used.

Valid values for SAP link-type are shared and pt-pt with pt-pt being the default.

CLI Syntax: config>service>vpls>sap>stp#
link-type {pt-pt|shared}
Default: link-type pt-pt
Restore Default: no link-type

STP SAP Operational States

The operational state of STP within a SAP controls how BPDUs are transmitted and handled when received. Defined states are:

- [Operationally Disabled on page 532](#)
 - [Operationally Discarding on page 532](#)
 - [Operationally Learning on page 532](#)
 - [Operationally Forwarding on page 533](#)
-

Operationally Disabled

Operationally disabled is the normal operational state for STP on a SAP in a VPLS that has any of the following conditions:

- VPLS state administratively down
- SAP state administratively down
- SAP state operationally down

If the SAP enters the operationally up state with the STP administratively up and the SAP STP state is up, the SAP will transition to the STP SAP discarding state.

When, during normal operation, the router detects a downstream loop behind a SAP or spoke SDP, BPDUs can be received at a very high rate. To recover from this situation, STP will transition the SAP to disabled state for the configured forward-delay duration.

Operationally Discarding

A SAP in the discarding state only receives and sends BPDUs, building the local proper STP state for each SAP while not forwarding actual user traffic. The duration of the discarding state is explained in section [Forward Delay on page 521](#).

Note: in previous versions of the STP standard, the discarding state was called a blocked state.

Operationally Learning

The learning state allows population of the MAC forwarding table before entering the forwarding state. In this state, no user traffic is forwarded.

Operationally Forwarding

Configuration BPDUs are sent out a SAP in the forwarding state. Layer 2 frames received on the SAP are source learned and destination forwarded according to the FIB. Layer 2 frames received on other forwarding interfaces and destined for the SAP are also forwarded.

SAP BPDUs Encapsulation State

IEEE 802.1d (referred as Dot1d) and Cisco's per VLAN Spanning Tree (PVST) BPDUs encapsulations are supported on a per SAP basis. STP is associated with a VPLS service like PVST is associated per VLAN. The main difference resides in the Ethernet and LLC framing and a type-length-value (TLV) field trailing the BPDU.

The following table shows differences between Dot1d and PVST Ethernet BPDUs encapsulations based on the interface encap-type field:

Table 13: SAP BPDUs Encapsulation States

Field	dot1d encap-type null	dot1d encap-type dot1q	PVST encap-type null	PVST encap-type dot1q
Destination MAC	01:80:c2:00:00:00	01:80:c2:00:00:00	N/A	01:00:0c:cc:cc:cd
Source MAC	Sending Port MAC	Sending Port MAC	N/A	Sending Port MAC
EtherType	N/A	0x81 00	N/A	0x81 00
Dot1p and CFI	N/A	0xe	N/A	0xe
Dot1q	N/A	VPLS SAP ID	N/A	VPLS SAP encap value
Length	LLC Length	LLC Length	N/A	LLC Length
LLC DSAP SSAP	0x4242	0x4242	N/A	0xaaaa (SNAP)
LLC CNTL	0x03	0x03	N/A	0x03
SNAP OUI	N/A	N/A	N/A	00 00 0c (Cisco OUI)
SNAP PID	N/A	N/A	N/A	01 0b
CONFIG	Standard 802.1d	Standard 802.1d	N/A	Standard 802.1d
TLV: Type & Len	N/A	N/A	N/A	58 00 00 00 02
TLV: VLAN	N/A	N/A	N/A	VPLS SAP encap value
Padding	As Required	As Required	N/A	As Required

Each SAP has a Read Only operational state that shows which BPDUs are currently active on the SAP. The following states apply:

- Dot1d specifies that the switch is currently sending IEEE 802.1d standard BPDUs. The BPDUs will be tagged or non-tagged based on the encapsulation type of the egress interface and the encapsulation value defined in the SAP. A SAP defined on an interface with encapsulation type Dot1q will continue in the dot1d BPDUs encapsulation state until a PVST encapsulated BPDUs is received, in which case the SAP will convert to the PVST encapsulation state. Each received BPDUs must be properly IEEE 802.1q tagged if the interface encapsulation type is defined as Dot1q. PVST BPDUs will be silently discarded if received when the SAP is on an interface defined with encapsulation type null.
- PVST specifies that the switch is currently sending proprietary encapsulated BPDUs. PVST BPDUs are only supported on Ethernet interfaces with the encapsulation type set to dot1q. The SAP continues in the PVST BPDUs encapsulation state until a dot1d encapsulated BPDUs is received, in which case the SAP reverts to the dot1d encapsulation state. Each received BPDUs must be properly IEEE 802.1q tagged with the encapsulation value defined for the SAP. PVST BPDUs are silently discarded if received when the SAP is on an interface defined with a null encapsulation type.

Dot1d is the initial and only SAP BPDUs encapsulation state for SAPs defined on Ethernet interface with encapsulation type set to null.

Each transition between encapsulation types optionally generates an alarm that can be logged and optionally transmitted as an SNMP trap.

Configuring VPLS SAPs with Split Horizon

To configure a VPLS service with a split horizon group, add the **split-horizon-group** parameter when creating the SAP. Traffic arriving on a SAP within a split horizon group will not be copied to other SAPs in the same split horizon group.

The following example displays a VPLS configuration with split horizon enabled:

```
*A:ALA-1>config>service# info
-----
...
    vpls 800 customer 6001 vpn 700 create
        description "VPLS with split horizon for DSL"
        stp
            shutdown
        exit
        sap 1/1/3:100 split-horizon-group DSL-group1 create
            description "SAP for residential bridging"
        exit
        sap 1/1/3:200 split-horizon-group DSL-group1 create
            description "SAP for residential bridging"
        exit
        split-horizon-group DSL-group1
            description "Split horizon group for DSL"
        exit
        no shutdown
    exit
...
-----
*A:ALA-1>config>service#
```

Configuring MAC Learning Protection

To configure MAC learning protection, configure split horizon, MAC protection, and SAP parameters.

The following example displays a VPLS configuration with split horizon enabled:

```
A:ALA-48>config>service>vpls# info
-----
description "IMA VPLS"
split-horizon-group "DSL-group1" create
    restrict-protected-src
    restrict-unprotected-dst
exit
mac-protect
    mac ff:ff:ff:ff:ff:ff
exit
sap 1/1/9:0 create
    ingress
        scheduler-policy "SLA1"
        qos 100 shared-queuing
    exit
    egress
        scheduler-policy "SLA1"
        filter ip 10
    exit
    restrict-protected-src
    arp-reply-agent
    host-connectivity-verify source-ip 143.144.145.1
exit
...
-----
A:ALA-48>config>service>vpls#
```

Applying an Egress Multicast Group to a VPLS Service SAP

Use the following CLI syntax to apply an egress multicast group to a VPLS service SAP:

CLI Syntax: `config>service>vpls service-id [customer customer-id] [vpn vpn-id] [mvpls]
 sap sap-id [split-horizon-group group-name]
 egress
 multicast-group group-name`

The following example displays a VPLS configuration with egress multicast group:

```
A:ALA-48>config>service>vpls# info
-----
description "VPLS with split horizon for DSL"
split-horizon-group "DSL-group1" create
    description "Split horizon group for DSL"
exit
stp
    shutdown
exit
sap 1/1/4:200 split-horizon-group "DSL-group1" create
    description "SAP for residential bridging"
exit
sap 1/1/3:100 split-horizon-group "DSL-group1" create
    description "SAP for residential bridging"
    egress
        multicast-group "vpls-emg-1"
exit
no shutdown
-----
A:ALA-48>config>service>vpls#
```

Configuring SAP Subscriber Management Parameters

Use the following CLI syntax to configure subscriber management parameters on a VPLS service SAP. The policies and profiles that are referenced in the **def-sla-profile**, **def-sub-profile**, **non-sub-traffic**, and **sub-ident-policy** commands must already be configured in the **config>subscriber** context.

CLI Syntax:

```
config>service>vpls service-id
  sap sap-id [split-horizon-group group-name]
  sub-sla-mgmt
    def-sla-profile default-sla-profile-name
    def-sub-profile default-subscriber-profile-name
    mac-da-hashing
    multi-sub-sap [number-of-sub]
    no shutdown
    single-sub-parameters
      non-sub-traffic sub-profile sub-profile-name sla-
        profile sla-profile-name [subscriber sub-ident-
          string]
      profiled-traffic-only
      sub-ident-policy sub-ident-policy-name
```

The following example displays a subscriber management configuration:

```
A:ALA-48>config>service>vpls#
-----
      description "Local VPLS"
      stp
        shutdown
      exit
      sap 1/2/2:0 create
        description "SAP for local service"
        sub-sla-mgmt
          def-sla-profile "sla-profile1"
          sub-ident-policy "SubIdent1"
        exit
      exit
      sap 1/1/5:0 create
        description "SAP for local service"
      exit
      no shutdown
-----
A:ALA-48>config>service>vpls#
```

MSTP Control over Ethernet Tunnels

When MSTP is used to control VLANs, a range of VLAN IDs is normally used to specify the VLANs to be controlled.

If an Ethernet tunnel SAP is to be controlled by MSTP, the Ethernet Tunnel SAP ID needs to be within the VLAN range specified under the mst-instance.

```

vpls 400 customer 1 m-vpls create
    stp
        mode mstp
        mst-instance 111 create
            vlan-range 1-100
        exit
        mst-name "abc"
        mst-revision 1
        no shutdown
    exit
    sap 1/1/1:0 create // untagged
    exit
    sap eth-tunnel-1 create
    exit
    no shutdown
exit
vpls 401 customer 1 create
    stp
        shutdown
    exit
    sap 1/1/1:12 create
    exit
    sap eth-tunnel-1:12 create
        // Ethernet tunnel SAP ID 12 falls within the VLAN
        // range for mst-instance 111
    eth-tunnel
        path 1 tag 1000
        path 8 tag 2000
    exit
    exit
    no shutdown
exit

```

Configuring SDP Bindings

VPLS provides scaling and operational advantages. A hierarchical configuration eliminates the need for a full mesh of VCs between participating devices. Hierarchy is achieved by enhancing the base VPLS core mesh of VCs with access VCs (spoke) to form two tiers. Spoke SDPs are generally created between Layer 2 switches and placed at the Multi-Tenant Unit (MTU). The PE routers are placed at the service provider's Point of Presence (POP). Signaling and replication overhead on all devices is considerably reduced.

A spoke SDP is treated like the equivalent of a traditional bridge port where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received (unless a split horizon group was defined on the spoke SDP, see section [Configuring VPLS Spoke SDPs with Split Horizon on page 552](#)).

A spoke SDP connects a VPLS service between two sites and, in its simplest form, could be a single tunnel LSP. A set of ingress and egress VC labels are exchanged for each VPLS service instance to be transported over this LSP. The PE routers at each end treat this as a virtual spoke connection for the VPLS service in the same way as the PE-MTU connections. This architecture minimizes the signaling overhead and avoids a full mesh of VCs and LSPs between the two metro networks.

A mesh SDP bound to a service is logically treated like a single bridge “port” for flooded traffic where flooded traffic received on any mesh SDP on the service is replicated to other “ports” (spoke SDPs and SAPs) and not transmitted on any mesh SDPs.

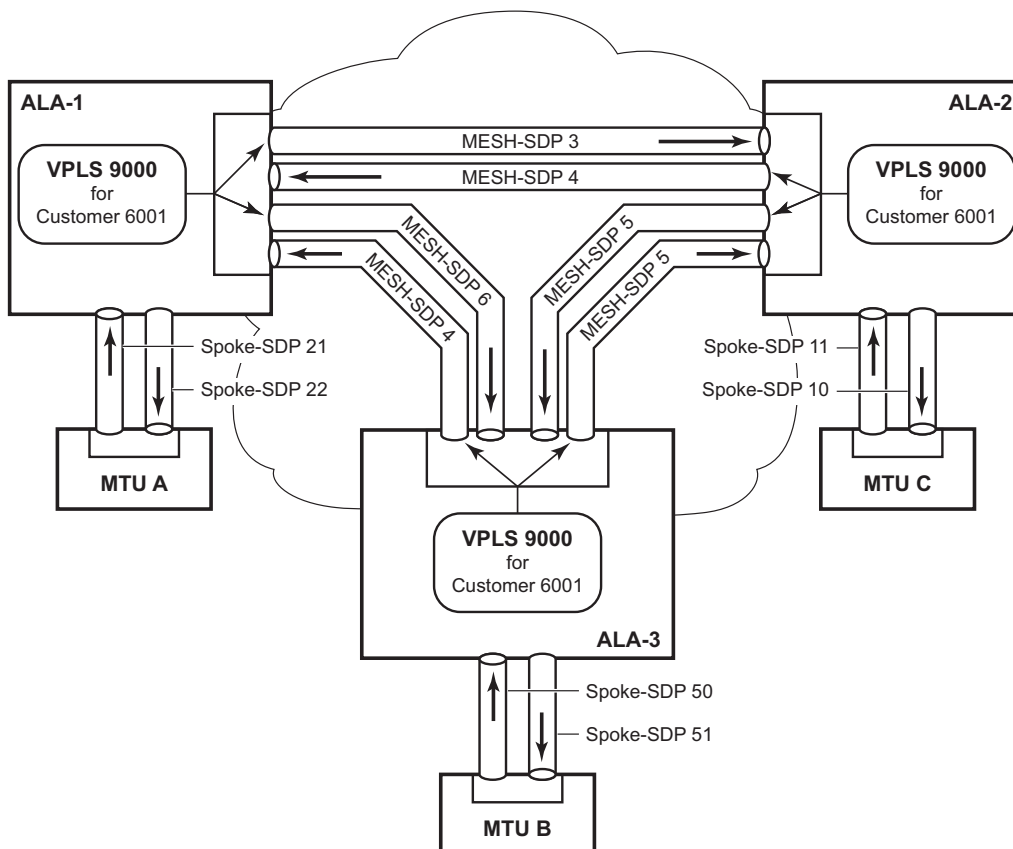
A VC-ID can be specified with the SDP-ID. The VC-ID is used instead of a label to identify a virtual circuit. The VC-ID is significant between peer SRs on the same hierarchical level. The value of a VC-ID is conceptually independent from the value of the label or any other datalink specific information of the VC.

[Figure 85](#) displays an example of a distributed VPLS service configuration of spoke and mesh SDPs (uni-directional tunnels) between 7750 SR routers and MTUs.

Configuring Overrides on Service SAPs

The following output displays a service SAP queue override configuration example.

```
*A:ALA-48>config>service>vpls>sap# info
-----
...
    exit
    ingress
        scheduler-policy "SLA1"
        qos 100 multipoint-shared
        queue-override
            queue 1 create
                rate 1500000 cir 2000
            exit
        exit
    exit
    egress
        scheduler-policy "SLA1"
        queue-override
            queue 1 create
                adaptation-rule pir max cir max
            exit
        exit
    filter ip 10
    exit
-----
*A:ALA-48>config>service>vpls>sap#
```



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Figure 85: SDPs — Uni-Directional Tunnels

Use the following CLI syntax to create a mesh or spoke SDP bindings with a distributed VPLS service. SDPs must be configured prior to binding. Refer to [Configuring an SDP on page 94](#) for information about creating SDPs.

Use the following CLI syntax to configure mesh SDP bindings:

CLI Syntax:

```
config>service# vpls service-id
  mesh-sdp sdp-id[:vc-id] [vc-type {ether | vlan}]
    egress
      filter {ip ip-filter-id|mac mac-filter-id}
      mfib-allowed-mda-destinations
        mda mda-id
      vc-label egress-vc-label
    ingress
      filter {ip ip-filter-id|mac mac-filter-id}
      vc-label ingress-vc-label
    no shutdown
    static-mac ieee-address
    vlan-vc-tag 0..4094
```

Use the following CLI syntax to configure spoke SDP bindings:

CLI Syntax: config>service# vpls *service-id*
 spoke-sdp *sdp-id:vc-id* [vc-type {ether | vlan}] [split-horizon-group *group-name*]
 egress
 filter {ip *ip-filter-id*|mac *mac-filter-id*}
 vc-label *egress-vc-label*
 ingress
 filter {ip *ip-filter-id*|mac *mac-filter-id*}
 vc-label *ingress-vc-label*
 limit-mac-move [non-blockable]
 vlan-vc-tag 0..4094
 no shutdown
 static-mac *ieee-address*
 stp
 path-cost *stp-path-cost*
 priority *stp-priority*
 no shutdown
 vlan-vc-tag [0..4094]

The following displays SDP binding configurations for ALA-1, ALA-2, and ALA-3 for VPLS service ID 9000 for customer 6:

```
*A:ALA-1>config>service# info
-----
...
    vpls 9000 customer 6 create
        description "This is a distributed VPLS."
        def-mesh-vc-id 750
        stp
            shutdown
        exit
        sap 1/2/5:0 create
        exit
        spoke-sdp 2:22 create
        exit
        mesh-sdp 5:750 create
        exit
        mesh-sdp 7:750 create
        exit
        no shutdown
    exit
-----
*A:ALA-1>config>service#

*A:ALA-2>config>service# info
-----
...
    vpls 9000 customer 6 create
        description "This is a distributed VPLS."
```

```

def-mesh-vc-id 750
stp
    shutdown
exit
sap 1/1/2:22 create
exit
spoke-sdp 2:22 create
exit
mesh-sdp 5:750 create
exit
mesh-sdp 7:750 create
exit
no shutdown
exit
-----

*A:ALA-3>config>service# info
-----
...
    vpls 9000 customer 6 create
        description "This is a distributed VPLS."
        def-mesh-vc-id 750
        stp
            shutdown
        exit
        sap 1/1/3:33 create
        exit
        spoke-sdp 2:22 create
        exit
        mesh-sdp 5:750 create
        exit
        mesh-sdp 7:750 create
        exit
        no shutdown
    exit
-----

*A:ALA-3>config>service#

```

Configuring Spoke SDP Specific STP Parameters

When a VPLS has STP enabled, each spoke SDP within the VPLS has STP enabled by default. The operation of STP on each spoke SDP is governed by:

- [Spoke SDP STP Administrative State on page 545](#)
 - [Spoke SDP Virtual Port Number on page 546](#)
 - [Spoke SDP Priority on page 546](#)
 - [Spoke SDP Path Cost on page 547](#)
 - [Spoke SDP Edge Port on page 547](#)
 - [Spoke SDP Auto Edge on page 548](#)
 - [Spoke SDP Link Type on page 548](#)
-

Spoke SDP STP Administrative State

The administrative state of STP within a spoke SDP controls how BPDUs are transmitted and handled when received. The allowable states are:

- Spoke SDP Admin Up

The default administrative state is *up* for STP on a spoke SDP. BPDUs are handled in the normal STP manner on a spoke SDP that is administratively up.

- Spoke SDP Admin Down

An administratively down state allows a service provider to prevent a spoke SDP from becoming operationally blocked. BPDUs will not originate out the spoke SDP towards the customer.

If STP is enabled on VPLS level, but disabled on the spoke SDP, received BPDUs are discarded. Discarding the incoming BPDUs allows STP to continue to operate normally within the VPLS service while ignoring the down spoke SDP. The specified spoke SDP will always be in an operationally forwarding state.

NOTE: The administratively down state allows a loop to form within the VPLS.

CLI Syntax: `config>service>vpls>spoke-sdp>stp#`
 `[no] shutdown`
 Range: shutdown or no shutdown
 Default: no shutdown (spoke SDP admin up)

Spoke SDP Virtual Port Number

The virtual port number uniquely identifies a spoke SDP within configuration BPDUs. The internal representation of a spoke SDP is unique to a system and has a reference space much bigger than the 12 bits definable in a configuration BPDU. STP takes the internal representation value of a spoke SDP and identifies it with its own virtual port number that is unique to every other spoke SDP defined on the VPLS. The virtual port number is assigned at the time that the spoke SDP is added to the VPLS.

Since the order in which spoke SDPs are added to the VPLS is not preserved between reboots of the system, the virtual port number may change between restarts of the STP instance. To achieve consistency after a reboot, the virtual port number can be specified explicitly.

CLI Syntax: `config>service>vpls>spoke-sdp# stp
port-num number`
Range: 1 — 2047
Default: (automatically generated)
Restore Default: `no port-num`

Spoke SDP Priority

Spoke SDP priority allows a configurable tie breaking parameter to be associated with a spoke SDP. When configuration BPDUs are being received, the configured spoke SDP priority will be used in some circumstances to determine whether a spoke SDP will be designated or blocked.

In traditional STP implementations (802.1D-1998), this field is called the port priority and has a value of 0 to 255. This field is coupled with the port number (0 to 255 also) to create a 16 bit value. In the latest STP standard (802.1D-2004) only the upper 4 bits of the port priority field are used to encode the spoke SDP priority. The remaining 4 bits are used to extend the port ID field into a 12 bit virtual port number field. The virtual port number uniquely references a spoke SDP within the STP instance. See [Spoke SDP Virtual Port Number on page 546](#) for details on the virtual port number.

STP computes the actual spoke SDP priority by taking the configured priority value and masking out the lower four bits. The result is the value that is stored in the spoke SDP priority parameter. For instance, if a value of 0 was entered, masking out the lower 4 bits would result in a parameter value of 0. If a value of 255 was entered, the result would be 240.

The default value for spoke SDP priority is 128. This parameter can be modified within a range of 0 to 255, 0 being the highest priority. Masking causes the values actually stored and displayed to be 0 to 240, in increments of 16.

CLI Syntax: `config>service>vpls>spoke-sdp>stp#
priority stp-priority`
Range: 0 to 255 (240 largest value, in increments of 16)
Default: 128
Restore Default: `no priority`

Spoke SDP Path Cost

The spoke SDP path cost is used by STP to calculate the path cost to the root bridge. The path cost in BPDUs received on the root port is incremented with the configured path cost for that spoke SDP. When BPDUs are sent out other egress spoke SDPs, the newly calculated root path cost is used.

STP suggests that the path cost is defined as a function of the link bandwidth. Since spoke SDPs are controlled by complex queuing dynamics, the STP path cost is a purely static configuration.

The default value for spoke SDP path cost is 10. This parameter can be modified within a range of 1 to 200000000 (1 is the lowest cost).

CLI Syntax: `config>service>vpls>spoke-sdp>stp#
path-cost stp-path-cost
Range: 1 to 200000000
Default: 10
Restore Default: no path-cost`

Spoke SDP Edge Port

The spoke SDP `edge-port` command is used to reduce the time it takes a spoke SDP to reach the forwarding state when the spoke SDP is on the edge of the network, and thus has no further STP bridge to handshake with.

The `edge-port` command is used to initialize the internal `OPER_EDGE` variable. At any time, when `OPER_EDGE` is false on a spoke SDP, the normal mechanisms are used to transition to the forwarding state (see [Forward Delay on page 521](#)). When `OPER_EDGE` is true, STP assumes that the remote end agrees to transition to the forwarding state without actually receiving a BPDU with an agreement flag set.

The `OPER_EDGE` variable will dynamically be set to false if the spoke SDP receives BPDUs (the configured `edge-port` value does not change). The `OPER_EDGE` variable will dynamically be set to true if `auto-edge` is enabled and STP concludes there is no bridge behind the spoke SDP.

When STP on the spoke SDP is administratively disabled and re-enabled, the `OPER_EDGE` is re-initialized to the spoke SDP configured for `edge-port`.

Valid values for spoke SDP `edge-port` are `enabled` and `disabled` with `disabled` being the default.

CLI Syntax: `config>service>vpls>spoke-sdp>stp#
[no] edge-port
Default: no edge-port`

Spoke SDP Auto Edge

The spoke SDP `edge-port` command is used to instruct STP to dynamically decide whether the spoke SDP is connected to another bridge.

If auto-edge is enabled, and STP concludes there is no bridge behind the spoke SDP, the `OPER_EDGE` variable will dynamically be set to true. If auto-edge is enabled, and a BPDU is received, the `OPER_EDGE` variable will dynamically be set to false (see [Spoke SDP Edge Port on page 547](#)).

Valid values for spoke SDP auto-edge are `enabled` and `disabled` with `enabled` being the default.

CLI Syntax: `config>service>vpls>spoke-sdp>stp#`
`[no] auto-edge`
Default: `auto-edge`

Spoke SDP Link Type

The spoke SDP `link-type` command instructs STP on the maximum number of bridges behind this spoke SDP. If there is only a single bridge, transitioning to forwarding state will be based on handshaking (fast transitions). If more than two bridges are connected via a shared media, their spoke SDPs should all be configured as `shared`, and timer-based transitions are used.

Valid values for spoke SDP link-type are `shared` and `pt-pt` with `pt-pt` being the default.

CLI Syntax: `config>service>vpls>spoke-sdp>stp#`
`link-type {pt-pt|shared}`
Default: `link-type pt-pt`
Restore Default: `no link-type`

Spoke SDP STP Operational States

The operational state of STP within a spoke SDP controls how BPDUs are transmitted and handled when received. Defined states are:

- [Operationally Disabled on page 549](#)
 - [Operationally Discarding on page 549](#)
 - [Operationally Learning on page 549](#)
 - [Operationally Forwarding on page 550](#)
-

Operationally Disabled

Operationally disabled is the normal operational state for STP on a spoke SDP in a VPLS that has any of the following conditions:

- VPLS state administratively down
- Spoke SDP state administratively down
- Spoke SDP state operationally down

If the spoke SDP enters the operationally up state with the STP administratively up and the spoke SDP STP state is up, the spoke SDP will transition to the STP spoke SDP discarding state.

When, during normal operation, the router detects a downstream loop behind a spoke SDP, BPDUs can be received at a very high rate. To recover from this situation, STP will transition the spoke SDP to a disabled state for the configured forward-delay duration.

Operationally Discarding

A spoke SDP in the discarding state only receives and sends BPDUs, building the local proper STP state for each spoke SDP while not forwarding actual user traffic. The duration of the discarding state is explained in section [Forward Delay on page 521](#).

Note: in previous versions of the STP standard, the discarding state was called a blocked state.

Operationally Learning

The learning state allows population of the MAC forwarding table before entering the forwarding state. In this state no user traffic is forwarded.

Operationally Forwarding

Configuration BPDUs are sent out a spoke SDP in the forwarding state. Layer 2 frames received on the spoke SDP are source learned and destination forwarded according to the FIB. Layer 2 frames received on other forwarding interfaces and destined for the spoke SDP are also forwarded.

Spoke SDP BPDUs Encapsulation States

IEEE 802.1D (referred as dot1d) and Cisco's per VLAN Spanning Tree (PVST) BPDUs encapsulations are supported on a per spoke SDP basis. STP is associated with a VPLS service like PVST is per VLAN. The main difference resides in the Ethernet and LLC framing and a type-length-value (TLV) field trailing the BPDUs.

[Table 14](#) shows differences between dot1D and PVST Ethernet BPDUs encapsulations based on the interface encap-type field:

Table 14: Spoke SDP BPDUs Encapsulation States

Field	dot1d encap-type null	dot1d encap-type dot1q	PVST encap-type null	PVST encap-type dot1q
Destination MAC	01:80:c2:00:00:00	01:80:c2:00:00:00	N/A	01:00:0c:cc:cc:cd
Source MAC	Sending Port MAC	Sending Port MAC	N/A	Sending Port MAC
EtherType	N/A	0x81 00	N/A	0x81 00
Dot1p and CFI	N/A	0xe	N/A	0xe
Dot1q	N/A	VPLS spoke SDP ID	N/A	VPLS spoke SDP encap value
Length	LLC Length	LLC Length	N/A	LLC Length
LLC DSAP SSAP	0x4242	0x4242	N/A	0xaaaa (SNAP)
LLC CNTL	0x03	0x03	N/A	0x03
SNAP OUI	N/A	N/A	N/A	00 00 0c (Cisco OUI)
SNAP PID	N/A	N/A	N/A	01 0b
CONFIG or TCN BPDU	Standard 802.1d	Standard 802.1d	N/A	Standard 802.1d
TLV: Type & Len	N/A	N/A	N/A	58 00 00 00 02
TLV: VLAN	N/A	N/A	N/A	VPLS spoke SDP encap value
Padding	As Required	As Required	N/A	As Required

Each spoke SDP has a Read Only operational state that shows which BPDU encapsulation is currently active on the spoke SDP. The following states apply:

- **Dot1d** specifies that the switch is currently sending IEEE 802.1D standard BPDUs. The BPDUs will be tagged or non-tagged based on the encapsulation type of the egress interface and the encapsulation value defined in the spoke SDP. A spoke SDP defined on an interface with encapsulation type dot1q will continue in the dot1d BPDU encapsulation state until a PVST encapsulated BPDU is received, after which the spoke SDP will convert to the PVST encapsulation state. Each received BPDU must be properly IEEE 802.1q tagged if the interface encapsulation type is defined to dot1q.
- **PVST** specifies that the switch is currently sending proprietary encapsulated BPDUs. PVST BPDUs are only supported on Ethernet interfaces with the encapsulation type set to dot1q. The spoke SDP continues in the PVST BPDU encapsulation state until a dot1d encapsulated BPDU is received, in which case the spoke SDP reverts to the dot1d encapsulation state. Each received BPDU must be properly IEEE 802.1q tagged with the encapsulation value defined for the spoke SDP.

Dot1d is the initial and only spoke SDP BPDU encapsulation state for spoke SDPs defined on Ethernet interface with encapsulation type set to null.

Each transition between encapsulation types optionally generates an alarm that can be logged and optionally transmitted as an SNMP trap.

Configuring VPLS Spoke SDPs with Split Horizon

To configure spoke SDPs with a split horizon group, add the `split-horizon-group` parameter when creating the spoke SDP. Traffic arriving on a SAP or spoke SDP within a split horizon group will not be copied to other SAPs or spoke SDPs in the same split horizon group.

The following example displays a VPLS configuration with split horizon enabled:

```
*A:ALA-1>config>service# info
-----
...
vpls 800 customer 6001 vpn 700 create
    description "VPLS with split horizon for DSL"
    stp
        shutdown
    exit
    spoke-sdp 51:15 split-horizon-group DSL-group1 create
    exit
    split-horizon-group DSL-group1
        description "Split horizon group for DSL"
    exit
    no shutdown
exit
...
-----
*A:ALA-1>config>service#
```

Configuring VPLS Redundancy

This section discusses the following service management tasks:

- [Creating a Management VPLS for SAP Protection on page 553](#)
 - [Creating a Management VPLS for Spoke SDP Protection on page 556](#)
-

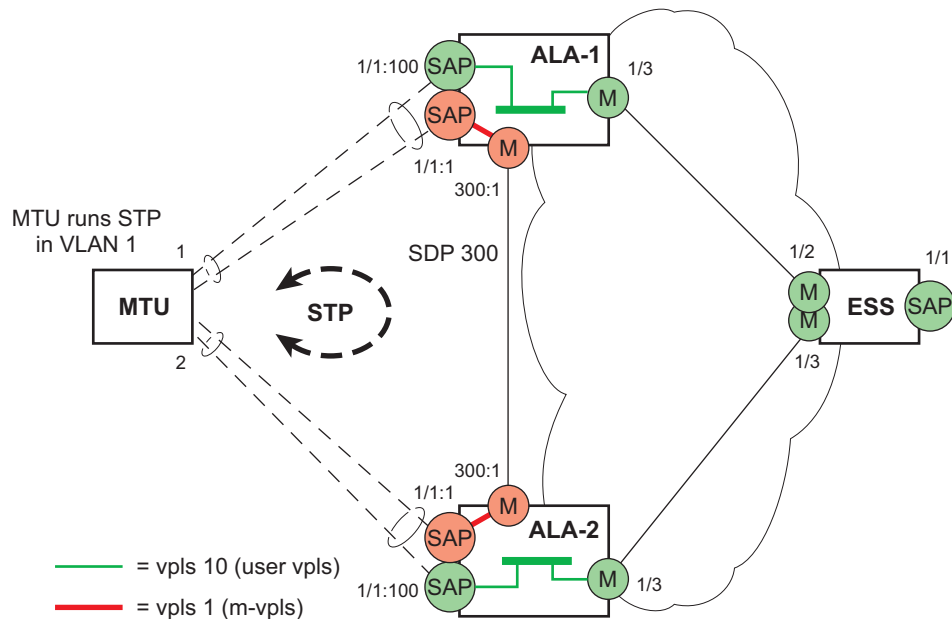
Creating a Management VPLS for SAP Protection

This section provides a brief overview of the tasks that must be performed to configure a management VPLS for SAP protection and provides the CLI commands, see [Figure 86](#). The tasks below should be performed on both nodes providing the protected VPLS service.

Before configuring a management VPLS, first read [VPLS Redundancy on page 455](#) for an introduction to the concept of management VPLS and SAP redundancy.

1. Create an SDP to the peer node.
2. Create a management VPLS.
3. Define a SAP in the m-vpls on the port towards the MTU. Note that the port must be dot1q or qinq tagged. The SAP corresponds to the (stacked) VLAN on the MTU in which STP is active.
4. Optionally modify STP parameters for load balancing.
5. Create a mesh SDP in the m-vpls using the SDP defined in Step 1. Ensure that this mesh SDP runs over a protected LSP (see note below).
6. Enable the management VPLS service and verify that it is operationally up.
7. Create a list of VLANs on the port that are to be managed by this management VPLS.
8. Create one or more user VPLS services with SAPs on VLANs in the range defined by Step 6.

Note: The mesh SDP should be protected by e.g., a backup LSP or Fast Reroute. If the mesh SDP were to go down, STP on both nodes would go to “forwarding” state and a loop would occur.



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Figure 86: Example Configuration for Protected VPLS SAP

Use the following CLI syntax to create a management VPLS:

CLI Syntax: `config>service# sdp sdp-id mpls create
far-end ip-address
lsp lsp-name
no shutdown`

CLI Syntax: `vpls service-id customer customer-id [m-vpls] create
description description-string
sap sap-id create
managed-vlan-list
range vlan-range
mesh-sdp sdp-id:vc-id create
stp
no shutdown`

The following example displays a VPLS configuration:

```
*A:ALA-1>config>service# info
-----
...
sdp 300 mpls create
  far-end 10.0.0.20
  lsp "toALA-A2"
  no shutdown
exit
vpls 1 customer 1 m-vpls create
  sap 1/1/1:1 create
```

```
        managed-vlan-list
        range 100-1000
    exit
exit
mesh-sdp 300:1 create
exit
stp
exit
no shutdown
exit
...
-----
*A:ALA-1>config>service#
```

Creating a Management VPLS for Spoke SDP Protection

This section provides a brief overview of the tasks that must be performed to configure a management VPLS for spoke SDP protection and provides the CLI commands, see [Figure 87](#). The tasks below should be performed on all four nodes providing the protected VPLS service.

Before configuring a management VPLS, please first read [Configuring a VPLS SAP on page 525](#) for an introduction to the concept of management VPLS and spoke SDP redundancy.

1. Create an SDP to the local peer node (node ALA-A2 in the example below).
2. Create an SDP to the remote peer node (node ALA-B1 in the example below).
3. Create a management VPLS.
4. Create a spoke SDP in the m-vpls using the SDP defined in Step 1. Ensure that this mesh SDP runs over a protected LSP (see note below).
5. Enable the management VPLS service and verify that it is operationally up.
6. Create a spoke SDP in the m-vpls using the SDP defined in Step 2.
Optionally, modify STP parameters for load balancing (see [Configuring Load Balancing with Management VPLS on page 559](#)).
7. Create one or more user VPLS services with spoke SDPs on the tunnel SDP defined by Step 2.

As long as the user spoke SDPs created in step 7 are in this same tunnel SDP with the management spoke SDP created in step 6, the management VPLS will protect them.

The SDP should be protected by, for example, a backup LSP or Fast Reroute. If the SDP were to go down, STP on both nodes would go to “forwarding” state and a loop would occur.

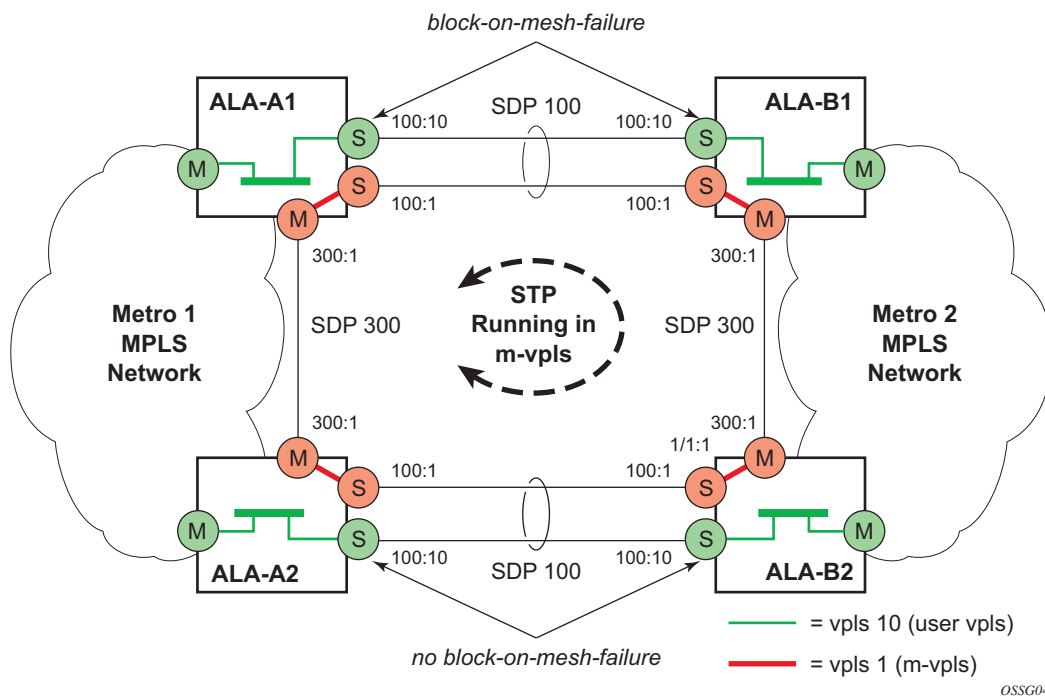


Figure 87: Example Configuration for Protected VPLS Spoke SDP

Use the following CLI syntax to create a management VPLS for spoke SDP protection:

CLI Syntax: `config>service# sdp sdp-id mpls create`
 `far-end ip-address`
 `lsp lsp-name`
 `no shutdown`

CLI Syntax: `vpls service-id customer customer-id [m-vpls] create`
 `description description-string`
 `mesh-sdp sdp-id:vc-id create`
 `spoke-sdp sdp-id:vc-id create`
 `stp`
 `no shutdown`

The following example displays a VPLS configuration:

```
*A:ALA-A1>config>service# info
-----
...
    sdp 100 mpls create
        far-end 10.0.0.30
        lsp "toALA-B1"
        no shutdown
    exit
    sdp 300 mpls create
        far-end 10.0.0.20
        lsp "toALA-A2"
        no shutdown
    exit
    vpls 101 customer 1 m-vpls create
        spoke-sdp 100:1 create
        exit
        mesh-sdp 300:1 create
        exit
        stp
        exit
        no shutdown
    exit
...
-----
*A:ALA-A1>config>service#
```

Configuring Load Balancing with Management VPLS

With the concept of management VPLS, it is possible to load balance the user VPLS services across the two protecting nodes. This is done by creating two management VPLS instances, where both instances have different active QinQ spokes (by changing the STP path-cost). When different user VPLS services are associated with either the two management VPLS services, the traffic will be split across the two QinQ spokes. Load balancing can be achieved in both the SAP protection and spoke SDP protection scenarios..

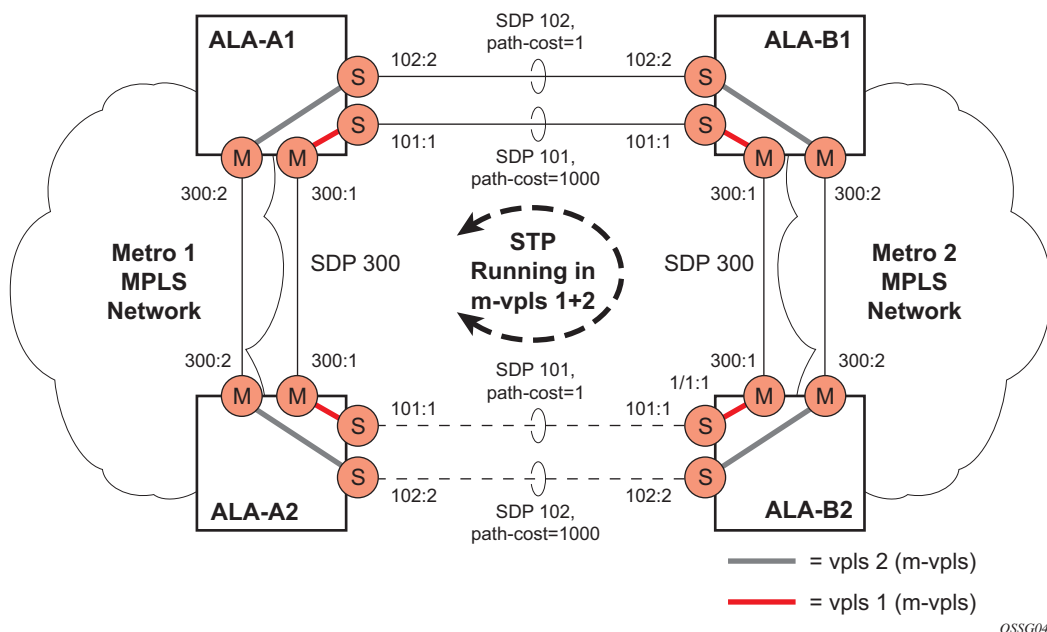


Figure 88: Example Configuration for Load Balancing Across Two Protected VPLS Spoke SDPs

Use the following CLI syntax to create a load balancing across two management VPLS instances:

CLI Syntax: `config>service# sdp sdp-id mpls create
far-end ip-address
lsp lsp-name
no shutdown`

CLI Syntax: `vpls service-id customer customer-id [m-vpls] create
description description-string
mesh-sdp sdp-id:vc-id create
spoke-sdp sdp-id:vc-id create
stp
path-cost
stp
no shutdown`

Note: the STP path costs in each peer node should be reversed.

The following example displays the VPLS configuration on ALA-A1 (top left, IP address 10.0.0.10):

```
*A:ALA-A1>config>service# info
-----
...
    sdp 101 mpls create
        far-end 10.0.0.30
        lsp "1toALA-B1"
        no shutdown
    exit
    sdp 102 mpls create
        far-end 10.0.0.30
        lsp "2toALA-B1"
        no shutdown
    exit
...
    vpls 101 customer 1 m-vpls create
        spoke-sdp 101:1 create
            stp
            path-cost 1
        exit
        exit
        mesh-sdp 300:1 create
        exit
        stp
        exit
        no shutdown
    exit
    vpls 102 customer 1 m-vpls create
        spoke-sdp 102:2 create
            stp
            path-cost 1000
        exit
        exit
        mesh-sdp 300:2 create
        exit
        stp
        exit
        no shutdown
    exit
...
-----
*A:ALA-A1>config>service#
```

The following example displays the VPLS configuration on ALA-A2 (bottom left, IP address 10.0.0.20):

```
*A:ALA-A2>config>service# info
-----
...
    sdp 101 mpls create
        far-end 10.0.0.40
        lsp "1toALA-B2"
        no shutdown
    exit
    sdp 102 mpls create
        far-end 10.0.0.40
        lsp "2toALA-B2"
        no shutdown
    exit
...
    vpls 101 customer 1 m-vpls create
        spoke-sdp 101:1 create
            stp
            path-cost 1000
        exit
        exit
        mesh-sdp 300:1 create
        exit
        stp
        exit
        no shutdown
    exit
    vpls 102 customer 1 m-vpls create
        spoke-sdp 102:2 create
            stp
            path-cost 1
        exit
        exit
        mesh-sdp 300:2 create
        exit
        stp
        exit
        no shutdown
    exit
...
-----
*A:ALA-A2>config>service#
```

The following example displays the VPLS configuration on ALA-A3 (top right, IP address 10.0.0.30):

```
*A:ALA-A1>config>service# info
-----
...
    sdp 101 mpls create
        far-end 10.0.0.10
        lsp "1toALA-A1"
        no shutdown
    exit
    sdp 102 mpls create
        far-end 10.0.0.10
        lsp "2toALA-A1"
        no shutdown
    exit
...
    vpls 101 customer 1 m-vpls create
        spoke-sdp 101:1 create
            stp
            path-cost 1
        exit
        exit
        mesh-sdp 300:1 create
        exit
        stp
        exit
        no shutdown
    exit
    vpls 102 customer 1 m-vpls create
        spoke-sdp 102:2 create
            stp
            path-cost 1000
        exit
        exit
        mesh-sdp 300:2 create
        exit
        stp
        exit
        no shutdown
    exit
...
-----
*A:ALA-A1>config>service#
```

The following example displays the VPLS configuration on ALA-A4 (bottom right, IP address 10.0.0.40):

```
*A:ALA-A2>config>service# info
-----
...
    sdp 101 mpls create
        far-end 10.0.0.20
        lsp "1toALA-B2"
        no shutdown
    exit
    sdp 102 mpls create
        far-end 10.0.0.20
        lsp "2toALA-B2"
        no shutdown
    exit
...
    vpls 101 customer 1 m-vpls create
        spoke-sdp 101:1 create
            stp
            path-cost 1000
        exit
        exit
        mesh-sdp 300:1 create
        exit
        stp
        exit
        no shutdown
    exit
    vpls 102 customer 1 m-vpls create
        spoke-sdp 102:2 create
            stp
            path-cost 1
        exit
        exit
        mesh-sdp 300:2 create
        exit
        stp
        exit
        no shutdown
    exit
...
-----
*A:ALA-A2>config>service#
```

Configuring Selective MAC Flush

Use the following CLI syntax to enable selective MAC Flush in a VPLS.

CLI Syntax: `config>service# vpls service-id
send-flush-on-failure`

Use the following CLI syntax to disable selective MAC Flush in a VPLS.

CLI Syntax: `config>service# vpls service-id
no send-flush-on-failure`

Configuring Multi-Chassis Endpoints

The following output displays configuration examples of multi-chassis redundancy and the VPLS configuration. The configurations in the graphics depicted in [Inter-Domain VPLS Resiliency Using Multi-Chassis Endpoints on page 458](#) are expressed in this output.

Node Mapping to figures the document:

- PE3 = Dut-B
- PE3' = Dut-C
- PE1 = Dut-D
- PE2 = Dut-E

PE3

```
*A:Dut-B>config>redundancy>multi-chassis# info
-----
      peer 3.1.1.3 create
        peer-name "Dut-C"
        description "mcep-basic-tests"
        source-address 2.1.1.2
        mc-endpoint
          no shutdown
          bfd-enable
          system-priority 50
        exit
      no shutdown
    exit
-----

*A:Dut-B>config>redundancy>multi-chassis#

*A:Dut-B>config>service>vpls# info
-----
      fdb-table-size 20000
      send-flush-on-failure
      stp
        shutdown
      exit
      endpoint "mcep-t1" create
        no suppress-standby-signaling
        block-on-mesh-failure
        mc-endpoint 1
        mc-ep-peer Dut-C
      exit
      exit
      mesh-sdp 201:1 vc-type vlan create
      exit
      mesh-sdp 211:1 vc-type vlan create
      exit
      spoke-sdp 221:1 vc-type vlan endpoint "mcep-t1" create
        stp
```

```

        shutdown
    exit
    block-on-mesh-failure
    precedence 1
exit
spoke-sdp 231:1 vc-type vlan endpoint "mcep-t1" create
    stp
        shutdown
    exit
    block-on-mesh-failure
    precedence 2
exit
no shutdown
-----
*A:Dut-B>config>service>vpls#

```

PE3' Dut-C

```

:Dut-C>config>redundancy>multi-chassis# info
-----
peer 2.1.1.2 create
    peer-name "Dut-B"
    description "mcep-basic-tests"
    source-address 3.1.1.3
    mc-endpoint
        no shutdown
        bfd-enable
        system-priority 21
    exit
    no shutdown
exit
-----
*A:Dut-C>config>redundancy>multi-chassis#

*A:Dut-C>config>service>vpls# info
-----
fdb-table-size 20000
send-flush-on-failure
stp
    shutdown
exit
endpoint "mcep-t1" create
    no suppress-standby-signaling
    block-on-mesh-failure
    mc-endpoint 1
        mc-ep-peer Dut-B
    exit
exit
mesh-sdp 301:1 vc-type vlan create
exit
mesh-sdp 311:1 vc-type vlan create
exit
spoke-sdp 321:1 vc-type vlan endpoint "mcep-t1" create
    stp
        shutdown
    exit
    block-on-mesh-failure
    precedence 3

```

```

exit
spoke-sdp 331:1 vc-type vlan endpoint "mcep-t1" create
    stp
        shutdown
    exit
    block-on-mesh-failure
exit
no shutdown
-----
*A:Dut-C>config>service>vpls#

```

PE1 Dut-D

```

*A:Dut-D>config>redundancy>multi-chassis# info
-----
peer 5.1.1.5 create
    peer-name "Dut-E"
    description "mcep-basic-tests"
    source-address 4.1.1.4
    mc-endpoint
        no shutdown
        bfd-enable
        system-priority 50
        passive-mode
    exit
    no shutdown
exit
-----
*A:Dut-D>config>redundancy>multi-chassis#

*A:Dut-D>config>service>vpls# info
-----
fdb-table-size 20000
propagate-mac-flush
stp
    shutdown
exit
endpoint "mcep-t1" create
    block-on-mesh-failure
    mc-endpoint 1
        mc-ep-peer Dut-E
    exit
exit
mesh-sdp 401:1 vc-type vlan create
exit
spoke-sdp 411:1 vc-type vlan endpoint "mcep-t1" create
    stp
        shutdown
    exit
    block-on-mesh-failure
    precedence 2
exit
spoke-sdp 421:1 vc-type vlan endpoint "mcep-t1" create
    stp
        shutdown
    exit
    block-on-mesh-failure
    precedence 1

```

```

        exit
        mesh-sdp 431:1 vc-type vlan create
        exit
        no shutdown
-----
*A:Dut-D>config>service>vpls#

```

PE2 Dut-E

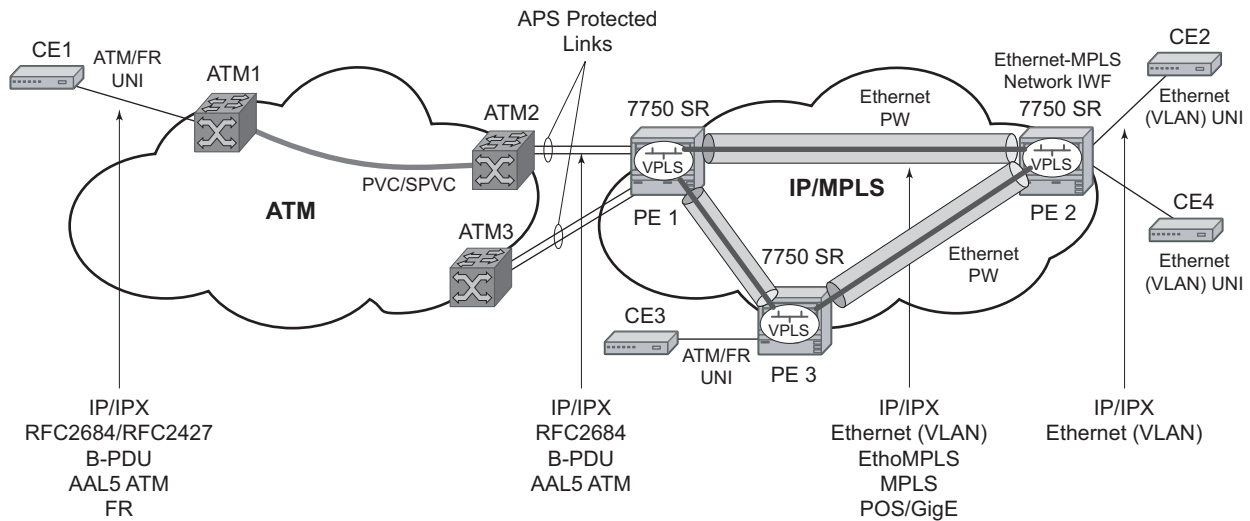
```

*A:Dut-E>config>redundancy>multi-chassis# info
-----
        peer 4.1.1.4 create
            peer-name "Dut-D"
            description "mcep-basic-tests"
            source-address 5.1.1.5
            mc-endpoint
                no shutdown
                bfd-enable
                system-priority 22
                passive-mode
            exit
            no shutdown
        exit
-----
*A:Dut-E>config>redundancy>multi-chassis#

*A:Dut-E>config>service>vpls# info
-----
        fdb-table-size 20000
        propagate-mac-flush
        stp
            shutdown
        exit
        endpoint "mcep-t1" create
            block-on-mesh-failure
            mc-endpoint 1
                mc-ep-peer Dut-D
            exit
        exit
        spoke-sdp 501:1 vc-type vlan endpoint "mcep-t1" create
            stp
                shutdown
            exit
            block-on-mesh-failure
            precedence 3
        exit
        spoke-sdp 511:1 vc-type vlan endpoint "mcep-t1" create
            stp
                shutdown
            exit
            block-on-mesh-failure
        exit
        mesh-sdp 521:1 vc-type vlan create
        exit
        mesh-sdp 531:1 vc-type vlan create
        exit
        no shutdown
-----
*A:Dut-E>config>service>vpls#

```

ATM/Frame Relay PVC Access and Termination on a VPLS Service



OSSG060

Figure 89: ATM/Frame Relay PVC Access and Termination on a VPLS Example

The application is depicted in above provides access to a VPLS service to Frame Relay and ATM users connected either directly or through an ATM access network to a 7750 PE node. The 7750 SR supports a Frame Relay or an ATM VC-delimited Service Access Point (SAP) terminating on a VPLS service.

RFC 2427-encapsulated or RFC 2684-encapsulated untagged Ethernet/802.3 frames (with or without Frame Check Sequence (FCS)) or BPDUs from a customer's bridge device are received on a given SAP over an ATM or Frame Relay interface on the 7750 SR. The Frame Relay or ATM-related encapsulation is stripped and the frames (without FCS) are forwarded towards destination SAPs either locally, or using SDPs associated with the VPLS service (as dictated by destination MAC address VPLS processing). In the egress direction, the received untagged frames are encapsulated into RFC 2427 or RFC 2684 (no Q-tags are added, no FCS in the forwarded frame) and sent over ATM or a FR VC towards the customer CPE.

When AAL5 RFC2427/2684 encapsulated tagged frames are received from the customer's bridge on an FR/ATM SAP, the tags are transparent and the frames are processed as described above with the exception that the frames forwarded towards the destination(s) will have the received tags preserved. Similarly in the egress direction, the received tagged Ethernet frames are encapsulated as is (i.e. Q-tags are again transparent and preserved) into RFC 2427/2684 and sent over the FR/ATM PVC towards the customer CPE. Note that since the tagging is transparent, the 7750 SR performs unqualified MAC learning (for example, MAC addresses are learned without reference to VLANs they are associated with). Because of that, MAC addresses used must be unique across all the VLANs used by the customer for a given VPLS service instance. If a customer wants a per-

VLAN separation, then the VLAN traffic that needs to be separated must come on different VCs (different SAPs) associated with different VPLS service instances.

All VPLS functionality available on the 7750 SR is applicable to FR and ATM-delimited VPLS SAPs. For example, bridged PDUs received over ATM SAP can be tunneled through or dropped; all Forwarding Information Base functionality applies; packet level QoS and MAC filtering applies; etc. Also, split horizon groups are applicable to ATM SAPs terminating on VPLS. In other words, frame forwarding between ATM SAPs, also referred to as VCI-to-VCI forwarding, within the same group is disabled.

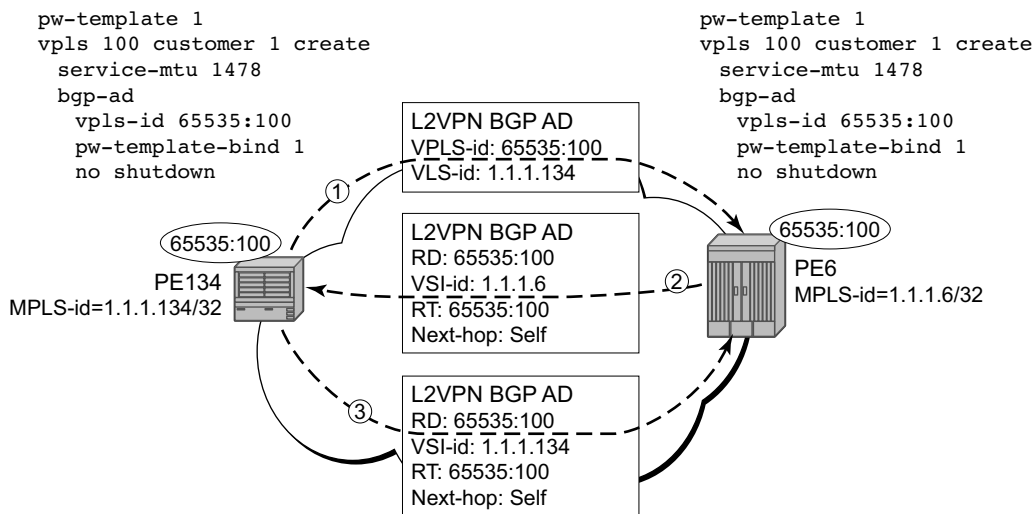
The Ethernet pseudowire is established using Targeted LDP (TLDP) signaling and uses the ether, vlan, or vpls VC type on the SDP. The SDP can be an MPLS or a GRE type.

Configuring BGP Auto-Discovery

This section provides important information to explain the different configuration options used to populate the required BGP AD and generate the LDP generalized pseudowire-ID FEC fields. There are a large number of configuration options that are available with this feature. Not all these configurations option are required to start using BGP AD. At the end of this section, it will be apparent that a very simple configuration will automatically generate the required values used by BGP and LDP. In most cases, deployments will provide full mesh connectivity between all nodes across a VPLS instance. However, capabilities are available to influence the topology and build hierarchies or hub and spoke models.

Configuration Steps

Using [Figure 90](#), assume PE6 was previously configured with VPLS 100 as indicated by the configurations lines in the upper right. The BGP AD process will commence after PE134 is configured with the VPLS 100 instance as shown in the upper left. This shows a very basic and simple BGP AD configuration. The minimum requirement for enabling BGP AD on a VPLS instance is configuring the VPLS-ID and point to a pseudowire template.



OSSG244

Figure 90: BGP AD Configuration Example

In many cases, VPLS connectivity is based on a pseudowire mesh. To reduce the configuration requirement, the BGP values can be automatically generated using the VPLS-ID and the MPLS router-ID. By default, the lower six bytes of the VPLS-ID are used to generate the RD and the RT

values. The VSI-ID value is generated from the MPLS router-ID. All of these parameters are configurable and can be coded to suit requirements and build different topologies.

```

PE134>config>service>vpls>bgp-ad#
[no] pw-template-bi* - Configure pw-template bind policy
[no] route-target      - Configure route target
[no] shutdown          - Administratively enable/disable BGP auto-discovery
    vpls-id            - Configure VPLS-ID
[no] vsi-export        - VSI export route policies
    vsi-id             + Configure VSI-id
[no] vsi-import        - VSI import route policies

```

Figure 91: BGP-AD CLI Command Tree

A helpful command displays the service information, the BGP parameters and the SDP bindings in use. When the discovery process is completed successfully each endpoint will have an entry for the service.

```

PE134># show service l2-route-table
=====
Services: L2 Route Information - Summary Service
=====
Svc Id      L2-Routes (RD-Prefix)          Next Hop      Origin
            Sdp Bind Id
-----
100          65535:100-1.1.1.6              1.1.1.6       BGP-L2
            17406:4294967295
-----
No. of L2 Route Entries: 1
=====
PERs6>#

```

```

PERs6># show service l2-route-table
=====
Services: L2 Route Information - Summary Service
=====
Svc Id      L2-Routes (RD-Prefix)          Next Hop      Origin
            Sdp Bind Id
-----
100          65535:100-1.1.1.134            1.1.1.134     BGP-L2
            17406:4294967295
-----
No. of L2 Route Entries: 1
=====
PERs6>#

```

When only one of the endpoints has an entry for the service in the l2-routing-table, it is most likely a problem with the RT values used for import and export. This would most likely happen when different import and export RT values are configured using a router policy or the route-target command.

Service specific commands continue to be available to display service specific information, including status.

```

PERs6# show service sdp-using
=====
SDP Using
=====
SvcId      SdpId      Type      Far End      Opr S* I.Label  E.Label
-----
100        17406:4294967295  BgpAd  1.1.1.134    Up      131063  131067
-----
Number of SDPs : 1
=====
* indicates that the corresponding row element may have been truncated.

```

BGP AD will advertise the VPLS-ID in the extended community attribute, VSI-ID in the NLRI and the local PE id in the BGP next hop. At the receiving PE, the VPLS-ID is compared against locally provisioned information to determine whether the two PEs share a common VPLS. If it is found that they do, the BGP information is used in the signaling phase (see [BGP VPLS Configuration Example on page 574](#)).

BGP VPLS Configuration Example

This section gives a configuration example required to bring up BGP VPLS in the VPLS PEs depicted in [Figure 92](#):

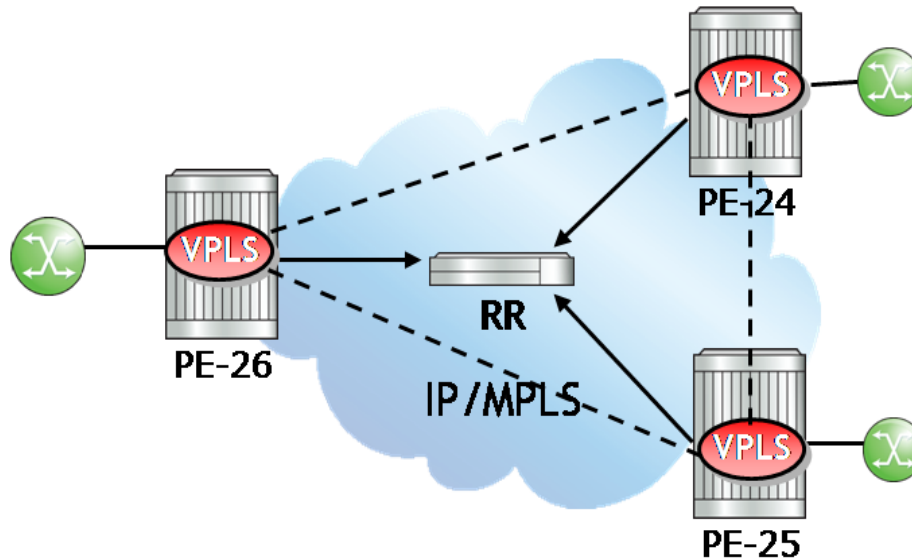


Figure 92: BGP VPLS Example

The red BGP VPLS is configured in the PE24, PE25 and PE26 using the commands shown in the following CLI examples.

```
*A:PE24>config>service>vpls# info
-----
      bgp
        route-distinguisher 65024:600
        route-target export target:65019:600 import target:65019:600
        pw-template-bind 1
      exit
      bgp-vpls
        max-ve-id 100
        ve-name 24
        ve-id 24
      exit
      no shutdown
    exit
    sap 1/1/20:600.* create
    exit
    no shutdown
  -----

*A:PE24>config>service>vpls#

*A:PE25>config>service>vpls# info
```

```

-----
      bgp
        route-distinguisher 65025:600
        route-target export target:65019:600 import target:65019:600
        pw-template-bind 1
      exit
    bgp-vpls
      max-ve-id 100
      ve-name 25
      ve-id 25
      exit
      no shutdown
    exit
    sap 1/1/19:600.* create
    exit
    no shutdown
-----

```

```

*A:PE25>config>service>vpls#

```

```

*A:PE26>config>service>vpls# info

```

```

-----
      bgp
        route-distinguisher 65026:600
        route-target export target:65019:600 import target:65019:600
        pw-template-bind 1
      exit
    bgp-vpls
      max-ve-id 100
      ve-name 26
      ve-id 26
      exit
      no shutdown
    exit
    sap 5/2/20:600.* create
    exit
    no shutdown
-----

```

```

*A:PE26>config>service>vpls#

```

LDP Signaling

T-LDP is triggered once the VPN endpoints have been discovered using BGP. The T-LDP session between the PEs is established when one does not exist. The far-end IP address required for the T-LDP identification is gleaned from the BGP AD next hop information. The pw-template and pw-template-bind configuration statements are used to establish the automatic SDP or to map to the appropriate SDP. The FEC129 content is built using the following values:

- AGI from the locally configured VPLS-ID.
- The SAI from the locally configured VSI-ID.
- The TAI from the VSI-ID contained in the last 4 bytes of the received BGP NLRI.

Figure 93 below shows the different detailed phases of the LDP signaling path, post BGP AD completion. It also indicates how some fields can be auto generated when they are not specified in the configuration.

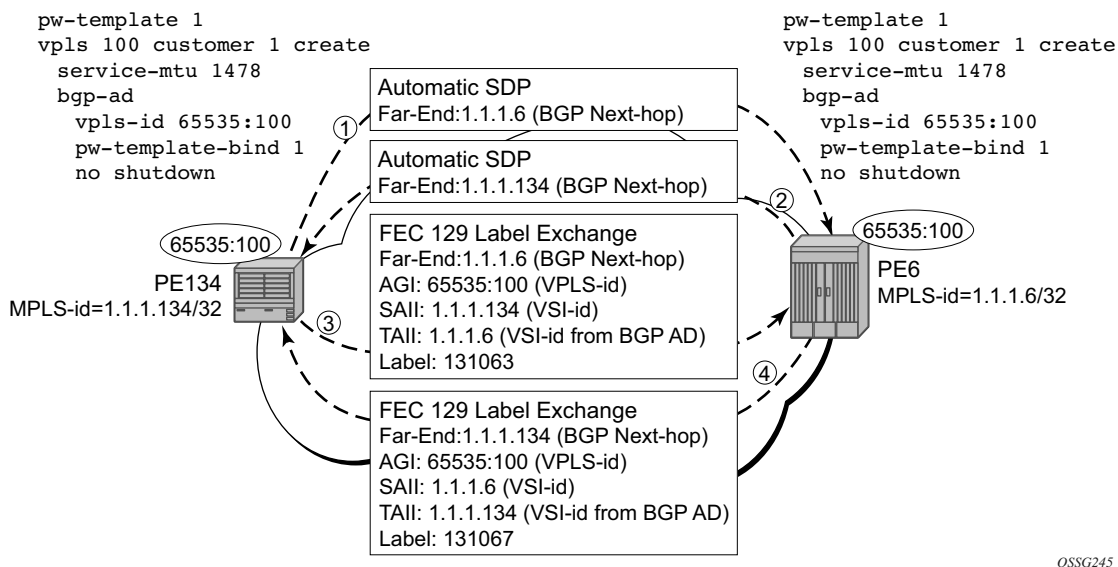


Figure 93: BGP AD Triggering LDP Functions

The first command will display the LDP peering relationships that have been established (Figure 94). The type of adjacency is displayed in the “Adj Type” column. In this case the type is “Both” meaning link and targeted sessions have been successfully established.

```
PERs6# show router ldp session
```

```
LDP Sessions
```

Peer LDP Id	Adj Type	State	Msg Sent	Msg Recv	Up Time
1.1.1.134:0	Both	Established	21482	21482	0d 15:38:44
No. of Sessions: 1					

Figure 94: Show Router LDP Session Output

The second command shows the specific LDP service label information broken up per FEC element type, 128 or 129, basis ([Figure 95](#)). The information for FEC element 129 includes the AGI, SAI, and the TAIL.

```
PERs6# show router ldp bindings fec-type services
```

```
LDP LSR ID: 1.1.1.6
```

```
Legend: U - Label In Use, N - Label Not In Use, W - Label Withdrawn
         S - Status Signaled Up, D - Status Signaled Down
         E - Epipe Service, V - VPLS Service, M - Mirror Service
         A - Apipe Service, F - Fpipe Service, I - IES Service, R - VPRN service
         P - Ipipe Service, C - Cpipe Service
         TLV - (Type, Length: Value)
```

```
LDP Service FEC 128 Bindings
```

Type	VCId	SvcId	SDPId	Peer	IngLbl	EgrLbl	MTU	RMTU
No Matching Entries Found								

```
LDP Service FEC 129 Bindings
```

AGI			SAI			TAIL		
Type	SvcId	SDPId	Peer	IngLbl	EgrLbl	MTU	RMTU	
65535:100			1.1.1.6		1.1.1.134			
V-Eth	100	17406	1.1.1.134	131063U	131067S	1464	1464	
No. of FEC 129s: 1								

Figure 95: Show Router LDP Bindings FEC-Type Services

Pseudowire Template

The pw-template is defined under the top level service command (**config>service# pw-template**) and specifies whether to use an automatically generated SDP or manually configured SDP. It also provides the set of parameters required for establishing the pseudowire (SDP binding) as displayed in [Figure 96](#).

```

PERs6>config>service# pw-template 1 create
- [no] pw-template <policy-id> [use-provisioned-sdp]

<policy-id>          : [1..2147483647]
<use-provisioned-s*> : keyword

[no] accounting-pol* - Configure accounting-policy to be used
[no] collect-stats   - Enable/disable statistics collection
[no] disable-aging   - Enable/disable aging of MAC addresses
[no] disable-learn*  - Enable/disable learning of new MAC addresses
[no] discard-unknow* - Enable/disable discarding of frames with unknown
                        source MAC address
      egress          + Spoke SDP binding egress configuration
      igmp-snooping   + Configure IGMP snooping parameters
      ingress         + Spoke SDP binding ingress configuration
[no] limit-mac-move   - Configure mac move
[no] mac-pinning      - Enable/disable MAC address pinning on this spoke SDP
[no] max-nbr-mac-ad* - Configure the maximum number of MAC entries in the FDB
                        from this SDP
[no] split-horizon-* + Configure a split horizon group
      vc-type         - Configure VC type
[no] vlan-vc-tag      - Configure VLAN VC tag

```

Figure 96: PW-Template CLI Tree

A **pw-template-bind** command configured within the VPLS service under the **bgp-ad** sub-command is a pointer to the pw-template that should be used. If a VPLS service does not specify an import-rt list, then that binding applies to all route targets accepted by that VPLS. The **pw-template-bind** command can select a different template on a per import-rt basis. It is also possible to specify specific pw-templates for some route targets with a VPLS service and use the single **pw-template-bind** command to address all unspecified but accepted imported targets.

```

PERs6>config>service>vpls>bgp-ad# pw-template-bind
- pw-template-bind <policy-id> [split-hozion-group <group-name>] [import-rt
  {ext-community, ... (upto 5 max)}]
- no pw-template-bind <policy-id>

<policy-id>          : [1..2147483647]
<group-name>         : [32 chars max]
<ext-community>      : target:{<ip-addr:comm-val>|<as-number:ext-comm-val>}
                        ip-addr      - a.b.c.d
                        comm-val     - [0..65535]
                        as-number    - [1..65535]
                        ext-comm-val - [0..4294967295]

```

Figure 97: PW-Template-Bind CLI Syntax

It is important understand the significance of the split-horizon-group used by the pw-template. Traditionally, when a VPLS instance was manually created using mesh-sdp bindings, these were automatically placed in a common split-horizon-group to prevent forwarding between the pseudowire in the VPLS instances. This prevents loops that would have otherwise occurred in the Layer 2 service. When automatically discovering VPLS service using BGP AD the service provider has the option of associating the auto-discovered pseudowire with a split-horizon group to control the forwarding between pseudowires.

Configuring Provider Edge Discovery Policies

Use the following CLI syntax to create PE discovery policy.

CLI Syntax: config>service# pe-discovery-policy *name*
password *password*
polling-interval *minutes*
server *server-index* address *ip-address* secret *key*
[*hash|hash2*] [*port port-num*]
timeout *seconds*

The following displays the PE discovery policy configuration.

```
A:ALA-48>config>service# info
-----
    pe-discovery-policy "RAD_Disc for Service 103"
        password "timetravpn"
        polling-interval 1
        timeout 10
        server 1 address 192.168.15.125 secret "LwyBQX4E2C/bXAGTtpNeYk" hash2 port 1812
        server 2 address 192.168.15.122 secret "cj0n8F.5UU15WBegZ.m6WmvwTYw6MZu0" hash2 port 1812
    exit
    customer 1 create
        description "Default customer"
    exit
...
-----
A:ALA-48
```


Configuring a VPLS Management Interface

Use the following CLI syntax to create a VPLS management interface.

CLI Syntax: `config>service>vpls# interface ip-int-name
address ip-address[/mask] [netmask]
arp-timeout seconds
description description-string
mac ieee-address
no shutdown
static-arp ip-address ieee-address`

The following displays the configuration.

```
A:ALA-49>config>service>vpls>interface# info detail
-----
no description
mac 14:31:ff:00:00:00
address 123.231.10.10/24
no arp-timeout
no shutdown
-----
A:ALA-49>config>service>vpls>interface#
```

Applying a PE Discovery Policy to a VPLS Service

Use the following CLI syntax to PE discovery parameters to a VPLS service.

CLI Syntax: config>service# vpls *service-id*
radius-discovery
pe-discovery-policy *name*
no shutdown
user-name-format {vpn-id *vpn-id* | router-distinguisher *rd*}
sap *sap-id* [split-horizon-group *group-name*]
description *description-string*
split-horizon-group *group-name*>[residential-group]
restrict-protected-src [alarm-only]

The following displays a VPLS PE discovery policy configuration.

```
*A:ALA-48>config>service>vpls# info
-----
description "Default sap description for service id 103"
split-horizon-group "SHG-RAD_Disc" create
    restrict-protected-src
exit
stp
    no shutdown
exit
radius-discovery
    pe-discovery-policy "RAD_Disc for Service 103"
    user-name-format vpn-id 901:103
    no shutdown
exit
sap 1/1/7:0 create
    description "Default sap description for service id 103"
    static-mac 12:34:56:78:90:0f create
exit
sap 1/1/11:0 split-horizon-group "SHG-RAD_Disc" create
    description "SHG for Radius Discovery"
exit
no shutdown
-----
*A:ALA-48>config>service>vpls#
```

Configuring Policy-Based Forwarding for Deep Packet Inspection (DPI) in VPLS

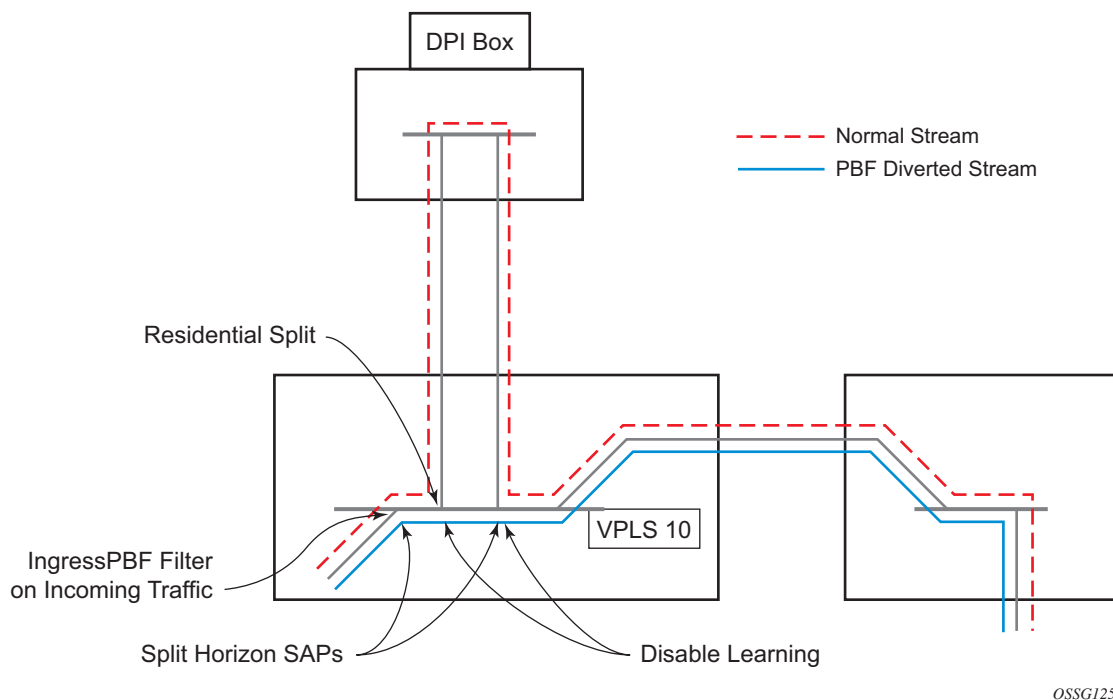
The purpose of policy-based forwarding is to capture traffic from a customer and perform a deep packet inspection (DPI) and forward traffic, if allowed, by the DPI.

In the following example, the split horizon groups are used to prevent flooding of traffic. Traffic from customers enter at SAP 1/1/5:5. Due to the mac-filter 100 that is applied on ingress, all traffic with dot1p 07 marking will be forwarded to SAP 1/1/22:1, which is the DPI.

DPI performs packet inspection/modification and either drops the traffic or forwards the traffic back into the box through SAP 1/1/21:1. Traffic will then be sent to spoke-sdp 3:5.

SAP 1/1/23:5 is configured to see if the VPLS service is flooding all the traffic. If flooding is performed by the router then traffic would also be sent to SAP 1/1/23:5 (which it should not).

Figure 98 shows an example to configure policy-based forwarding for deep packet inspection on a VPLS service. For information about configuring filter policies, refer to the 7750 SR OS Router Configuration Guide.



OSSG125

Figure 98: Policy-Based Forwarding For Deep Packet Inspection

The following example displays the service configuration:

```
*A:ALA-48>config>service# info
-----
...
    vpls 10 customer 1 create
        service-mtu 1400
        split-horizon-group "dpi" residential-group create
        exit
        split-horizon-group "split" create
        exit
        stp
            shutdown
        exit
        igmp-host-tracking
            expiry-time 65535
            no shutdown
        exit
        sap 1/1/21:1 split-horizon-group "split" create
            disable-learning
            static-mac 00:00:00:31:11:01 create
        exit
        sap 1/1/22:1 split-horizon-group "dpi" create
            disable-learning
            static-mac 00:00:00:31:12:01 create
        exit
        sap 1/1/23:5 create
            static-mac 00:00:00:31:13:05 create
        exit
        no shutdown
    exit
...
-----
*A:ALA-48>config>service#
```

The following example displays the MAC filter configuration:

```
*A:ALA-48>config>filter# info
-----
...
    mac-filter 100 create
        default-action forward
        entry 10 create
            match
                dot1p 7 7
            exit
            log 101
            action forward sap 1/1/22:1
        exit
    exit
...
-----
*A:ALA-48>config>filter#
```

The following example displays the service configuration with a MAC filter:

```
*A:ALA-48>config>service# info
-----
...
    vpls 10 customer 1 create
        service-mtu 1400
        split-horizon-group "dpi" residential-group create
        exit
        split-horizon-group "split" create
        exit
        stp
            shutdown
        exit
        igmp-host-tracking
            expiry-time 65535
            no shutdown
        exit
        sap 1/1/5:5 split-horizon-group "split" create
            ingress
                filter mac 100
            exit
            static-mac 00:00:00:31:15:05 create
        exit
        sap 1/1/21:1 split-horizon-group "split" create
            disable-learning
            static-mac 00:00:00:31:11:01 create
        exit
        sap 1/1/22:1 split-horizon-group "dpi" create
            disable-learning
            static-mac 00:00:00:31:12:01 create
        exit
        sap 1/1/23:5 create
            static-mac 00:00:00:31:13:05 create
        exit
        spoke-sdp 3:5 create
        exit
        no shutdown
    exit
....
-----
*A:ALA-48>config>service#
```

Service Management Tasks

This section discusses the following service management tasks:

- [Modifying VPLS Service Parameters on page 586](#)
 - [Modifying Management VPLS Parameters on page 587](#)
 - [Deleting a Management VPLS on page 587](#)
 - [Disabling a Management VPLS on page 588](#)
 - [Deleting a VPLS Service on page 589](#)
-

Modifying VPLS Service Parameters

You can change existing service parameters. The changes are applied immediately.

To display a list of services, use the **show service service-using vpls** command. Enter the parameter such as description, SAP, SDP, and/or service-MTU command syntax, and then enter the new information.

The following displays a modified VPLS configuration.

```
*A:ALA-1>config>service>vpls# info
-----
description "This is a different description."
disable-learning
disable-aging
discard-unknown
local-age 500
remote-age 1000
stp
    shutdown
exit
sap 1/1/5:22 create
    description "VPLS SAP"
exit
spoke-sdp 2:22 create
exit
no shutdown
-----
*A:ALA-1>config>service>vpls#
```

Modifying Management VPLS Parameters

To modify the range of VLANs on an access port that are to be managed by an existing management VPLS, first the new range should be entered and afterwards the old range removed. If the old range is removed before a new range is defined, all customer VPLS services in the old range will become unprotected and may be disabled.

CLI Syntax: `config>service# vpls service-id
 sap sap-id
 managed-vlan-list
 [no] range vlan-range`

Deleting a Management VPLS

As with normal VPLS service, a management VPLS cannot be deleted until SAPs and SDPs are unbound (deleted), interfaces are shutdown, and the service is shutdown on the service level.

Use the following CLI syntax to delete a management VPLS service:

CLI Syntax: `config>service
 [no] vpls service-id
 shutdown
 [no] mesh-sdp sdp-id
 shutdown
 [no] sap sap-id
 shutdown`

Disabling a Management VPLS

You can shut down a management VPLS without deleting the service parameters.

When a management VPLS is disabled, all associated user VPLS services are also disabled (to prevent loops). If this is not desired, first un-manage the user's VPLS service by removing them from the managed-vlan-list or moving the spoke SDPs on to another tunnel SDP.

CLI Syntax: config>service
 vpls service-id
 shutdown

Example: config>service# vpls 1
 config>service>vpls# shutdown
 config>service>vpls# exit

Deleting a VPLS Service

A VPLS service cannot be deleted until SAPs and SDPs are unbound (deleted), interfaces are shutdown, and the service is shutdown on the service level.

Use the following CLI syntax to delete a VPLS service:

CLI Syntax:

```
config>service
    [no] vpls service-id
        shutdown
    [no] mesh-sdp sdp-id
        shutdown
    sap sap-id [split-horizon-group group-name]
    no sap sap-id
        shutdown
```

Disabling a VPLS Service

You can shut down a VPLS service without deleting the service parameters.

CLI Syntax:

```
config>service> vpls service-id
    [no] shutdown
```

Example:

```
config>service# vpls 1
config>service>vpls# shutdown
config>service>vpls# exit
```

Re-Enabling a VPLS Service

To re-enable a VPLS service that was shut down.

CLI Syntax: `config>service> vpls service-id
[no] shutdown`

Example: `config>service# vpls 1
config>service>vpls# no shutdown
config>service>vpls# exit`

VPLS Services Command Reference

Command Hierarchies

- [Global Commands on page 591](#)
- [SAP Commands on page 597](#)
- [Mesh SDP Commands on page 605](#)
- [Spoke SDP Commands on page 608](#)
- [Egress Multicast Group Commands on page 611](#)
- [Provider Edge Discovery Policy Commands on page 612](#)
- [Show Commands on page 613](#)
- [Clear Commands on page 617](#)
- [Debug Commands on page 619](#)

VPLS Service Configuration Commands

Global Commands

```

config
  — service
    — vpls service-id [customer customer-id] [vpn vpn-id] [m-vpls] [b-vpls | i-vpls] [create]
    — no vpls service-id
      — backbone-smac ieee-address
      — no backbone-smac
      — backbone-vpls service-id[:isid]
      — no backbone-vpls
        — [no] stp
      — bgp
        — vsi-export policy-name [policy-name...(up to 5 max)]
        — no vsi-export
        — vsi-import policy-name [policy-name...(up to 5 max)]
        — no vsi-import
        — route-target {ext-community | {[export ext-community] [import ext-com-
          munity]}}
        — no route-target
        — pw-template-bind policy-id [split-horizon-group group-name] [import-
          rt {ext-community...(up to 5 max)}]
        — no pw-template-bind policy-id
        — route-distinguisher [ip-addr:comm-val | as-number:ext-comm-val]
        — no route-distinguisher
    — [no] bgp
      — pw-template-bind policy-id [split-horizon-group group-name] [import-
        rt {ext-community...(up to 5 max)}]

```

- **no pw-template-bind** *policy-id*
- **route-target** {*ext-community* | {[**export** *ext-community*] [**import** *ext-community*]}}
- **no route-target**
- [no] **shutdown**
- **vpls-id** *vpls-id*
- **vsi-export** *policy-name* [*policy-name...*(up to 5 max)]
- **no vsi-export**
- **vsi-id**
 - **prefix** *low-order-vsi-id*
 - **no prefix**
 - **route-distinguisher** [*ip-addr:comm-val* | *as-number:ext-comm-val*]
 - **no route-distinguisher**
- **vsi-import** *policy-name* [*policy-name...*(up to 5 max)]
- **no vsi-import**
- **bgp-vpls**
 - **max-ve-id** *value*
 - **no max-ve-id**
 - **ve-name** *name*
 - **no ve-name**
 - **ve-id** *ve-id-value*
 - **no ve-id**
 - [no] **shutdown**
- [no] **def-mesh-vc-id** *vc-id*
- **default-gtw**
 - **ip** *ip-address*
 - **no ip**
 - **mac** *ieee-address*
 - **no mac**
- **description** *description-string*
- **no description**
- [no] **disable-aging**
- [no] **disable-learning**
- [no] **discard-unknown**
- **endpoint** *endpoint-name* [**create**]
- **no endpoint**
 - [no] **block-on-mesh-failure**
 - **description** *description-string*
 - **no description**
 - [no] **ignore-standby-signaling**
 - [no] **mac-pinning**
 - **max-nbr-mac-addr** *table-size*
 - **no max-nbr-mac-addr**
 - [no] **mc-endpoint**
 - **mc-ep-peer** *name*
 - **mc-ep-peer** *ip-address*
 - **no mc-ep-peer**
 - **revert-time** *revert-time* | *infinite*
 - **no revert-time**
 - **static-mac** *ieee-address* [**create**]
 - **no static-mac**
 - [no] **suppress-standby-signaling**
- **eth-cfm**
 - [no] **mep** *mep-id* **domain** *md-index* **association** *ma-index*

```

— [no] ccm-enable
— ccm-ltm-priority priority
— no ccm-ltm-priority
— low-priority-defect {allDef | macRemErrXcon | remErrXcon
| errXcon | xcon | noXcon}
— mac-address mac-address
— no mac-address
— [no] shutdown
— [no] mip
— [no] fdb-table-high-wmark high-water-mark
— [no] fdb-table-low-wmark low-water-mark
— fdb-table-size table-size
— no fdb-table-size [table-size]
— gsmp
— [no] group name
— ancp
— [no] dynamic-topology-discover
— [no] line-configuration
— [no] oam
— description description-string
— no description
— hold-multiplier multiplier
— no hold-multiplier
— keepalive seconds
— no keepalive
— [no] neighbor ip-address
— description description-string
— no description
— local-address ip-address
— no local-address
— priority-marking dscp dscp-name
— priority-marking prec ip-prec-value
— no priority-marking
— [no] shutdown
— [no] shutdown
— [no] shutdown
— host-connectivity-verify source-ip ip-address [source-mac ieee-address] [interval
interval] [action {remove | alarm}]
— igmp-host-tracking
— expiry-time expiry-time
— no expiry-time
— [no] shutdown
— igmp-snooping
— mvr
— description description-string
— no description
— group-policy policy-name
— no group-policy
— [no] shutdown
— query-interval seconds
— no query-interval
— report-src-ip ip-address
— no report-src-ip
— robust-count robust-count

```

- **no robust-count**
- **[no] shutdown**
- **[no] interface** *ip-int-name*
 - **address** *ip-address[/mask]* [*netmask*]
 - **no address**
 - **arp-timeout** *seconds*
 - **no arp-timeout**
 - **description** *description-string*
 - **no description**
 - **mac** *ieee-address*
 - **no mac**
 - **[no] shutdown**
 - **static-arp** *ip-address ieee-address*
 - **no static-arp** *ip-address [ieee-address]*
- **local-age** *aging-timer*
- **no local-age**
- **[no] mac-move**
 - **move-frequency** *frequency*
 - **no move-frequency**
 - **number-retries** *number-retries*
 - **no number-retries**
 - **primary-ports**
 - **cumulative-factor** *cumulative-factor*
 - **no cumulative-factor**
 - **[no] sap** *sap-id*
 - **[no] spoke-sdp** *spoke-id*
 - **[no] cumulative-factor** *factor*
 - **retry-timeout** *timeout*
 - **no retry-timeout**
 - **secondary-ports**
 - **cumulative-factor** *cumulative-factor*
 - **no cumulative-factor**
 - **[no] sap** *sap-id*
 - **[no] spoke-sdp** *spoke-id*
 - **[no] cumulative-factor** *factor*
 - **[no] shutdown**
- **mac-protect**
 - **[no] mac** *ieee-address*
- **mac-subnet-length** *subnet-length*
- **no mac-subnet-length**
- **mfib-table-high-wmark** *high-water-mark*
- **no mfib-table-high-wmark**
- **mfib-table-low-wmark** *low-water-mark*
- **no mfib-table-low-wmark**
- **mfib-table-size** *table-size*
- **no mfib-table-size**
- **mld-snooping**
 - **mvr**
 - **description** *description-string*
 - **no description**
 - **group-policy** *policy-name*
 - **no group-policy**
 - **[no] shutdown**
 - **query-interval** *seconds*
 - **no query-interval**

```

— query-src-ip ipv6-address
— no query-src-ip
— report-src-ip ipv6-address
— no report-src-ip
— robust-count robust-count
— no robust-count
— [no] shutdown

— mrp
— [no] attribute-table-size
— [no] attribute-table-high-wmark
— [no] attribute-table-low-wmark
— flood-time flood-time
— no flood-time
— [no] shutdown

— multicast-info-policy policy-name
— no multicast-info-policy
— [no] per-service-hashing
— [no] pim-snooping
— group-policy grp-policy-name [.. grp-policy-name]
— no group-policy
— hold-time seconds
— no hold-time
— mode mode
— [no] shutdown

— [no] propagate-mac-flush
— [no] propagate-mac-flush-from-bvpls
— [no] radius-discovery
— pe-discovery-policy name
— no pe-discovery-policy
— [no] shutdown
— user-name-format {vpn-id vpn-id | router-distinguisher rd}
— no user-name-format

— remote-age aging-timer
— no remote-age
— send-bvpls-flush {[all-but-mine] [all-from-me]}
— no send-bvpls-flush
— [no] send-flush-on-bvpls-failure
— [no] send-flush-on-failure
— service-mtu octets
— no service-mtu
— service-name service-name
— no service-name
— [no] shutdown
— site name [create]
— no site name
— boot-timer seconds
— no boot-timer
— failed-threshold [1..1000]
— failed-threshold all
— [no] mesh-sdp-binding
— sap sap-id
— no sap
— [no] shutdown
— site-activation-timer seconds

```

- **no site-activation-timer**
- **site-id** *value*
- **no site-id**
- **split-horizon-group** *group-name*
- **no split-horizon-group**
- **spoke-sdp** *sdp-id:vc-id*
- **no spoke-sdp**
- **[no] split-horizon-group** *group-name* [*residential-group*]
 - **description** *description-string*
 - **no description**
 - **restrict-protected-src** *alarm-only*
 - **restrict-protected-src**
 - **restrict-unprotected-dst** *alarm-only*
 - **no restrict-unprotected-dst**
- **stp**
 - **forward-delay** *forward-delay*
 - **no forward-delay**
 - **hello-time** *hello-time*
 - **no hello-time**
 - **hold-count** *BDPU tx hold count*
 - **no hold-count**
 - **max-age** *max-info-age*
 - **no max-age**
 - **mode** {*rstp* | *comp-dot1w* | *dot1w* | *mstp* | *pmstp*}
 - **no mode**
 - **[no] mst-instance** *mst-inst-number*
 - **mst-port-priority** *bridge-priority*
 - **no mst-port-priority**
 - **[no] vlan-range** *vlan-range*
 - **mst-max-hops** *hops-count*
 - **no mst-max-hops**
 - **mst-name** *region-name*
 - **no mst-name**
 - **mst-revision** *revision-number*
 - **no mst-revision**
 - **priority** *bridge-priority*
 - **no priority**
 - **[no] shutdown**

SAP Commands

```

config
  — service
    — vpls service-id [customer customer-id] [vpn vpn-id] [m-vpls] [b-vpls | i-vpls] [create]
    — no vpls service-id
      — sap sap-id [split-horizon-group group-name] [create] [capture-sap]
      — [no] sap eth-tunnel-tunnel-id [:eth-tunnel-sap-id] [create]
      — no sap sap-id
        — accounting-policy acct-policy-id
        — no accounting-policy
        — anti-spoof {ip | mac | ip-mac}
        — no anti-spoof
        — app-profile app-profile-name
        — no app-profile
        — arp-host
          — host-limit max-num-hosts
          — no host-limit
          — min-auth-interval min-auth-interval
          — no min-auth-interval
          — [no] shutdown
        — arp-reply-agent [sub-ident]
        — no arp-reply-agent
        — atm
          — egress
            — traffic-desc traffic-desc-profile-id
            — no traffic-desc
          — encapsulation atm-encap-type
          — ingress
            — traffic-desc traffic-desc-profile-id
            — no traffic-desc
          — oam
            — [no] alarm-cells
        — authentication-policy name
        — no authentication-policy
        — bpdu-translation {auto | pvst | stp}
        — no bpdu-translation
        — calling-station-id {mac | remote-id | sap-id | sap-string}
        — no calling-station-id
        — [no] collect-stats
        — cpu-protection policy-id [mac-monitoring]
        — no cpu-protection
        — default-msap-policy policy-name
        — no default-msap-policy
        — description description-string
        — no description
        — dhcp
          — description description-string
          — no description
          — lease-populate [nbr-of-entries]
          — no lease-populate
          — [no] option
            — action [dhcp-action]

```

- **no action**
- **circuit-id** [ascii-tuple | vlan-ascii-tuple]
- [no] **remote-id** [mac | string *string*]
- [no] **vendor-specific-option**
 - [no] **client-mac-address**
 - [no] **sap-id**
 - [no] **service-id**
 - **string** *text*
 - **no string**
 - [no] **system-id**
- **proxy-server**
 - **emulated-server** *ip-address*
 - **no emulated-server**
 - **lease-time** [days *days*] [hrs *hours*] [min *minutes*] [sec *seconds*] [radius-override]
 - **no lease-time**
 - [no] **shutdown**
- [no] **shutdown**
- [no] **snoop**
- [no] **disable-aging**
- [no] **disable-learning**
- [no] **discard-unknown**
- **eth-cfm**
 - [no] **mep** *mep-id* **domain** *md-index* **association** *ma-index*
 - [no] **ais-enable**
 - **client-meg-level** [*level* [*level...*]]
 - **no client-meg-level**
 - **interval** {1|60}
 - **no interval**
 - **priority** *priority-value*
 - **no priority**
 - [no] **ccm-enable**
 - **ccm-ltm-priority** *priority*
 - **no ccm-ltm-priority**
 - [no] **eth-test-enable**
 - **fault-propagation-enable** {use-if-tlv | suspend-ccm}
 - **no fault-propagation-enable**
 - **low-priority-defect** {allDef | macRemErrXcon | remErrXcon | errXcon | xcon | noXcon}
 - **mac-address** *mac-address*
 - **no mac-address**
 - **one-way-delay-threshold** *seconds*
 - [no] **shutdown**
 - [no] **mip**
- **eth-tunnel**
 - **path** *path-index* **tag** *qtag* [*qtag*]
 - **no path** *path-index*
 - **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**direction** {up | down}]
 - **no mep** *mep-id* **domain** *md-index* **association** *ma-index*
 - [no] **ais-enable**
 - **client-meg-level** [[*level* [*level...*]]]
 - **no client-meg-level**
 - **interval** {1 | 60}

```

— no interval
— priority priority-value
— no priority
— [no] ccm-enable
— ccm-ltm-priority priority
— no ccm-ltm-priority
— [no] eth-test-enable
— test-pattern {all-zeros | all-ones} [crc-enable]
— no test-pattern
— fault-propagation-enable {use-if-tlv | suspend-ccm}
— no fault-propagation-enable
— low-priority-defect {allDef | macRemErrXcon |
  remErrXcon | errXcon | xcon | noXcon}
— mac-address mac-address
— no mac-address
— [no] shutdown
— [no] mip
— egress
— agg-rate-limit agg-rate [queue-frame-based-accounting]
— no agg-rate-limit
— filter ip ip-filter-id
— filter ipv6 ipv6-filter-id
— filter mac mac-filter-id
— no filter
— no filter [ip ip-filter-id] [mac mac-filter-id] [ipv6 ipv6-filter-id]
— [no] hsmda-queue-override
— packet-byte-offset {add add-bytes | subtract sub-
  bytes}
— no packet-byte-offset
— queue queue-id [create]
— no queue queue-id
— rate pir-rate [cir cir-rate]
— no rate
— slope-policy hsmda-slope-policy-name
— no slope-policy
— secondary-shaper secondary-shaper-name
— no secondary-shaper
— multicast-group group-name
— no multicast-group
— [no] qinq-mark-top-only
— qos policy-id
— no qos
— [no] queue-override
— [no] queue queue-id
— adaptation-rule [pir adaptation-rule] [cir
  adaptation-rule]
— no adaptation-rule
— avg-frame-overhead percentage
— no avg-frame-overhead
— cbs size-in-kbytes
— no cbs
— high-prio-only percent
— no high-prio-only
— mbs size-in-kbytes

```

```

— no mbs
— rate pir-rate [cir cir-rate]
— no rate
— [no] scheduler-override
— [no] scheduler scheduler-name
— rate pir-rate [cir cir-rate]
— no rate
— scheduler-policy scheduler-policy-name
— no scheduler-policy
— fault-propagation-bmac [mac-name | ieee-address] [create]
— no fault-propagation-bmac [mac-name | ieee-address]
— [no] force-l2pt-boundary
— frame-relay
— [no] frf-12
— ete-fragment-threshold threshold
— no ete-fragment-threshold
— [no] interleave
— scheduling-class class-id
— no scheduling-class
— host-connectivity-verify source-ip ip-address [source-mac ieee-address] [interval interval] [action {remove | alarm}]
— igmp-host-tracking
— expiry-time expiry-time
— no expiry-time
— import policy-name
— no import
— max-num-groups max-num-groups
— no max-num-groups
— max-num-sources max-num-sources
— no max-num-sources
— igmp-snooping
— [no] fast-leave
— import policy-name
— no import
— last-member-query-interval interval
— no last-member-query-interval
— max-num-groups max-num-groups
— no max-num-groups
— max-num-sources max-num-sources
— no max-num-sources
— mcac
— mc-constraints
— level level-id bw bandwidth
— no level level-id
— number-down number-lag-port-down level level-id
— no number-down
— policy policy-name
— no policy
— unconstrained-bw bandwidth mandatory-bw mandatory-bw
— no unconstrained-bw
— [no] mrouter-port
— mvr
— from-vpls vpls-id

```

- **no from-vpls**
- **to-sap** *sap-id*
- **no to-sap**
- **query-interval** *interval*
- **no query-interval**
- **query-response-interval** *interval*
- **no query-response-interval**
- **robust-count** *count*
- **no robust-count**
- **[no] send-queries**
- **static**
 - **[no] group** *group-address*
 - **[no] source** *ip-address*
 - **[no] starg**
- **version** *version*
- **no version**
- **ingress**
 - **agg-rate-limit** *agg-rate*
 - **no agg-rate-limit**
 - **filter ip** *ip-filter-id*
 - **filter ipv6** *ipv6-filter-id*
 - **filter mac** *mac-filter-id*
 - **no filter** [*ip ip-filter-id*] [*mac mac-filter-id*] [*ipv6 ipv6-filter-id*]
 - **[no] hsmda-queue-override**
 - **packet-byte-offset** {*add add-bytes* | *subtract sub-bytes*}
 - **no packet-byte-offset**
 - **queue** *queue-id*
 - **no queue** *queue-id*
 - **rate** *pir-rate* [*cir cir-rate*]
 - **no rate**
 - **slope-policy** *hsmda-slope-policy-name*
 - **no slope-policy**
 - **match-qinq-dot1p** {*top* | *bottom*}
 - **no match-qinq-dot1p** *de*
 - **qos** *policy-id* [*shared-queuing* | *multipoint-shared*]
 - **no qos**
 - **[no] queue-override**
 - **[no] queue** *queue-id*
 - **adaptation-rule** [*pir* {*max*|*min*|*closest*}] [*cir* {*max* | *min* | *closest*}]
 - **no adaptation-rule**
 - **cbs** *size-in-kbytes*
 - **no cbs**
 - **high-prio-only** *percent*
 - **no high-prio-only**
 - **mbs** *size-in-kbytes*
 - **no mbs**
 - **rate** *pir-rate* [*cir cir-rate*]
 - **no rate**
 - **[no] scheduler-override**
 - **[no] scheduler** *scheduler-name*
 - **rate** *pir-rate* [*cir cir-rate*]
 - **no rate**

- **scheduler-policy** *scheduler-policy-name*
- **no scheduler-policy**
- **vlan-translation** {*vlan-id* | **copy-outer**}
- **no vlan-translation**
- **l2pt-termination** [**cdp**] [**dtp**] [**pagp**] [**stp**] [**udld**] [**vtp**]
- **no l2pt-termination**
- **limit-mac-move** [**blockable** | **non-blockable**]
- **no limit-mac-move**
- [**no**] **mac-pinning**
- **managed-vlan-list**
 - [**no**] **default-sap**
 - [**no**] **range** *vlan-range*
- **max-nbr-mac-addr** *table-size*
- **no max-nbr-mac-addr**
- **mld-snooping**
 - [**no**] **fast-leave**
 - **import** *policy-name*
 - **no import**
 - **last-member-query-interval** *interval*
 - **no last-member-query-interval**
 - **max-num-groups** *max-num-groups*
 - **no max-num-groups**
 - **mvr**
 - **fast-leave**
 - **no fast-leave**
 - **to-sap** *sap-id*
 - **no to-sap**
 - **query-interval** *seconds*
 - **no query-interval**
 - **query-response-interval** *seconds*
 - **no query-response-interval**
 - **robust-count** *robust-count*
 - **no robust-count**
 - [**no**] **send-queries**
- **mrp**
 - [**no**] **join-time** *value*
 - [**no**] **leave-all-time** *value*
 - [**no**] **leave-time** *value*
 - [**no**] **mrp-policy** *policy-name*
 - [**no**] **periodic-time** *value*
 - [**no**] **periodic-time**
- **msap-defaults**
 - [**no**] **service** *service-id*
 - **policy** *msap-policy-name*
 - **no policy**
- **multi-service-site** *customer-site-name*
- **no multi-service-site**
- **pim-snooping**
 - **max-num-groups** *num-groups*
- **pppoe-policy** *pppoe-policy-name*
- **no pppoe-policy**
- **restrict-protected-src** *alarm-only*
- **no restrict-protected-src**
- **restrict-unprotected-dst** *alarm-only*
- **no restrict-unprotected-dst**

```

— [no] shutdown
— static-host ip ip/did-address [mac ieee-address] [create]
— static-host mac ieee-address [create]
— no static-host [ip ip-address] mac ieee-address
— no static-host all [force]
— no static-host ip ip-address
    — ancp-string ancp-string
    — no ancp-string
    — app-profile app-profile-name
    — no app-profile
    — inter-dest-id intermediate-destination-id
    — no inter-dest-id
    — [no] shutdown
    — sla-profile sla-profile-name
    — no sla-profile
    — sub-profile sub-profile-name
    — no sub-profile
    — subscriber sub-ident
    — no subscriber
    — [no] subscriber-sap-id
— [no] static-mac ieee-address
— stp
    — [no] auto-edge
    — [no] edge-port
    — link-type {pt-pt | shared}
    — no link-type [pt-pt | shared]
    — mst-instance mst-inst-number
        — mst-path-cost inst-path-cost
        — no mst-path-cost
        — mst-port-priority stp-priority
        — no mst-port-priority
    — path-cost sap-path-cost
    — no path-cost
    — [no] port-num virtual-port-number
    — priority stp-priority
    — no priority
    — [no] root-guard
    — [no] shutdown
— [no] sub-sla-mgmt
    — def-sla-profile default-sla-profile-name
    — no def-sla-profile
    — def-sub-profile default-subscriber-profile-name
    — no def-sub-profile
    — [no] mac-da-hashing
    — multi-sub-sap [subscriber-limit]
    — [no] shutdown
    — single-sub-parameters
        — non-sub-traffic sub-profile sub-profile-name sla-profile
            file sla-profile-name [subscriber sub-ident-string]
        — no non-sub-traffic
        — [no] profiled-traffic-only
    — sub-ident-policy sub-ident-policy-name
    — no sub-ident-policy
— tod-suite tod-suite-name

```

- **no tod-suite**
- **trigger-packet** [dhcp] [pppoe] [arp]
- **no trigger-packet**

Mesh SDP Commands

```

config
  — service
    — [no] vpls service-id [customer customer-id] [vpn vpn-id] [mvpls] [b-vpls|i-vpls] [create]
      — mesh-sdp sdp-id[:vc-id] [vc-type {ether | vlan}]
      — no mesh-sdp sdp-id[:vc-id]
        — accounting-policy acct-policy-id
        — no accounting-policys
        — [no] collect-stats
        — [no] control-word
        — description description-string
        — no description
        — dhcp
          — description description-string
          — no description
          — snoop [l2-header]
          — no snoop
        — egress
          — filter ip ip-filter-id
          — filter ipv6 ipv6-filter-id
          — filter mac mac-filter-id
          — no filter [ip ip-filter-id] [mac mac-filter-id] [ipv6 ipv6-filter-id]
          — mfib-allowed-mda-destinations
            — [no] mda mda-id
          — vc-label egress-vc-label
          — no vc-label [egress-vc-label]
        — eth-cfm
          — mep mep-id domain md-index association ma-index [direction {up | down}]
          — no mep mep-id domain md-index association ma-index
            — [no] ais-enable
              — client-meg-level [[level [level...]]]
              — no client-meg-level
              — interval {1 | 60}
              — no interval
              — priority priority-value
              — no priority
            — [no] ccm-enable
            — ccm-ltm-priority priority
            — no ccm-ltm-priority
            — [no] eth-test-enable
              — test-pattern {all-zeros | all-ones} [crc-enable]
              — no test-pattern
            — fault-propagation-enable {use-if-tlv | suspend-ccm}
            — no fault-propagation-enable
            — low-priority-defect {allDef | macRemErrXcon | remErrXcon | errXcon | xcon | noXcon}
            — mac-address mac-address
            — no mac-address
            — [no] description
            — [no] shutdown
          — fault-propagation-bmac [mac-name | ieee-address] [create]

```

- **no** **fault-propagation-bmac** [*mac-name* | *ieee-address*]
- **[no]** **force-vlan-vc-forwarding**
- **[no]** **hash-label**
- **igmp-snooping**
 - **[no]** **fast-leave**
 - **import** *policy-name*
 - **no** **import**
 - **last-member-query-interval** *interval*
 - **no** **last-member-query-interval**
 - **max-num-groups** *max-num-groups*
 - **no** **max-num-groups**
 - **mcac**
 - **policy** *policy-name*
 - **no** **policy**
 - **unconstrained-bw** *bandwidth* **mandatory-bw** *mandatory-bw*
 - **no** **unconstrained-bw**
 - **[no]** **mrrouter-port**
 - **query-interval** *interval*
 - **no** **query-interval**
 - **query-response-interval** *interval*
 - **no** **query-response-interval**
 - **robust-count** *count*
 - **no** **robust-count**
 - **[no]** **send-queries**
 - **static**
 - **[no]** **group** *group-address*
 - **[no]** **source** *ip-address*
 - **[no]** **starg**
 - **version** *version*
 - **no** **version**
- **ingress**
 - **filter** **ip** *ip-filter-id*
 - **filter** **ipv6** *ipv6-filter-id*
 - **filter** **mac** *mac-filter-id*
 - **no** **filter** [**ip** *ip-filter-id*] [**mac** *mac-filter-id*] [**ipv6** *ipv6-filter-id*]
 - **mfib-allowed-mda-destinations**
 - **[no]** **mda** *mda-id*
 - **vc-label** *egress-vc-label*
 - **no** **vc-label** [*egress-vc-label*]
- **[no]** **mac-pinning**
- **mld-snooping**
 - **[no]** **fast-leave**
 - **import** *policy-name*
 - **no** **import**
 - **last-member-query-interval** *interval*
 - **no** **last-member-query-interval**
 - **max-num-groups** *max-num-groups*
 - **no** **max-num-groups**
 - **mvr**
 - **[no]** **fast-leave**
 - **to-sap** *sap-id*
 - **no** **to-sap**
 - **query-interval** *seconds*
 - **no** **query-interval**

- **query-response-interval** *seconds*
- **no query-response-interval**
- **robust-count** *robust-count*
- **no robust-count**
- **[no] send-queries**
- **mrp**
 - **[no] join-time** *value*
 - **[no] leave-all-time** *value*
 - **[no] leave-time** *value*
 - **[no] mrp-policy** *policy-name*
 - **[no] periodic-time** *value*
 - **[no] periodic-time**
- **[no] shutdown**
- **[no] static-mac** *ieee-address*
- **vlan-vc-tag** *0..4094*
- **no vlan-vc-tag** *[0..4094]*

Spoke SDP Commands

```

config
— service
— [no] vpls service-id [customer customer-id] [vpn vpn-id] [mvpls] [b-vpls|i-vpls] [create]
— spoke-sdp sdp-id[:vc-id] [vc-type {ether | vlan}] [split-horizon-group group-name]
— no spoke-sdp sdp-id[:vc-id]
— accounting-policy acct-policy-id
— no accounting-policies
— [no] block-on-mesh-failure
— bpdu-translation {auto | pvst | stp}
— no bpdu-translation
— [no] collect-stats
— [no] control-word
— description description-string
— no description
— dhcp
— description description-string
— no description
— [no] snoop
— [no] disable-aging
— [no] disable-learning
— [no] discard-unknown-source
— eth-cfm
— mep mep-id domain md-index association ma-index [direction {up | down}]
— no mep mep-id domain md-index association ma-index
— [no] ais-enable
— client-meg-level [[level [level...]]]
— no client-meg-level
— interval {1 | 60}
— no interval
— priority priority-value
— no priority
— [no] ccm-enable
— ccm-ltm-priority priority
— no ccm-ltm-priority
— [no] eth-test-enable
— test-pattern {all-zeros | a ll-ones} [crc-enable]
— no test-pattern
— fault-propagation-enable {use-if-tlv | suspend-ccm}
— no fault-propagation-enable
— low-priority-defect {allDef | macRemErrXcon | remErrXcon | errXcon | xcon | noXcon}
— mac-address mac-address
— no mac-address
— [no] description
— [no] shutdown
— [no] mip
— egress
— filter ip ip-filter-id
— filter ipv6 ipv6-filter-id
— filter mac mac-filter-id

```

```

— no filter [ip ip-filter-id] [mac mac-filter-id] [ipv6 ipv6-filter-id]
— mfib-allowed-mda-destinations
    — [no] mda mda-id
— vc-label egress-vc-label
— no vc-label [egress-vc-label]
— fault-propagation-bmac [mac-name | ieee-address] [create]
— no fault-propagation-bmac [mac-name | ieee-address]
— [no] force-vlan-vc-forwarding
— [no] hash-label
— igmp-snooping
    — [no] fast-leave
    — import policy-name
    — no import
    — last-member-query-interval interval
    — no last-member-query-interval
    — max-num-groups max-num-groups
    — no max-num-groups
    — mcac
        — policy policy-name
        — no policy
        — unconstrained-bw bandwidth mandatory-bw mandatory-bw
        — no unconstrained-bw
    — [no] mrouter-port
    — query-interval interval
    — no query-interval
    — query-response-interval interval
    — no query-response-interval
    — robust-count count
    — no robust-count
    — [no] send-queries
    — static
        — [no] group group-address
        — [no] source ip-address
        — [no] starg
    — version version
    — no version
— [no] ignore-standby-signaling
— ingress
    — filter ip ip-filter-id
    — filter ipv6 ipv6-filter-id
    — filter mac mac-filter-id
    — no filter [ip ip-filter-id] [mac mac-filter-id] [ipv6 ipv6-filter-id]
    — mfib-allowed-mda-destinations
        — [no] mda mda-id
    — vc-label egress-vc-label
    — no vc-label [egress-vc-label]
— [no] l2pt-termination
— limit-mac-move [blockable | non-blockable]
— no limit-mac-move
— [no] mac-pinning
— max-nbr-mac-addr table-size
— no max-nbr-mac-addr
— mld-snooping

```

- **[no] fast-leave**
- **import** *policy-name*
- **no import**
- **last-member-query-interval** *interval*
- **no last-member-query-interval**
- **max-num-groups** *max-num-groups*
- **no max-num-groups**
- **query-interval** *seconds*
- **no query-interval**
- **query-response-interval** *seconds*
- **no query-response-interval**
- **robust-count** *robust-count*
- **no robust-count**
- **[no] send-queries**
- **mrp**
 - **[no] join-time** *value*
 - **[no] leave-all-time** *value*
 - **[no] leave-time** *value*
 - **[no] mrp-policy** *policy-name*
 - **[no] periodic-time** *value*
- **pim-snooping**
 - **max-num-groups** *num-groups*
- **propagate-mac-flush** [*precedence-value* | *primary*]
- **no propagate-mac-flush**
- **[no] shutdown**
- **[no] static-mac** *ieee-address*
- **stp**
 - **[no] auto-edge**
 - **[no] edge-port**
 - **link-type** {*pt-pt* | *shared*}
 - **no link-type** [*pt-pt* | *shared*]
 - **path-cost** *sap-path-cost*
 - **no path-cost**
 - **[no] port-num** *virtual-port-number*
 - **priority** *stp-priority*
 - **no priority**
 - **[no] root-guard**
 - **[no] shutdown**
- **vlan-vc-tag** *0..4094*
- **no vlan-vc-tag** [*0..4094*]

Egress Multicast Group Commands

```

config
  — service
    — egress-multicast-group group-name [create]
    — no egress-multicast-group group-name
      — description description-string
      — no description
      — dest-chain-limit destinations per pass
      — no dest-chain-limit
      — sap-common-requirements
        — dot1q-etype 0x0600..0xffff
        — no dot1q-etype
        — egress-filter [ip ip-filter-id]
        — egress-filter [ipv6 ipv6-filter-id]
        — egress-filter [mac mac-filter-id]
        — no egress-filter [ip ip-filter-id] [ipv6 ipv6-filter-id] [mac mac-filter-id]
        — encap-type {dot1q | null}
        — no encap-type
        — qinq-etype [0x0600..0xffff]
        — no qinq-etype
        — qinq-fixed-tag-value tag-value
        — no qinq-fixed-tag-value

config
  — service
    — [no] vpls service-id [customer customer-id] [vpn vpn-id] [mvpls] [b-vpls|i-vpls] [create]
      — sap sap-id [split-horizon-group group-name]
      — no sap sap-id
        — egress
          — multicast-group group-name
          — no multicast-group

```

Provider Edge Discovery Policy Commands

```
config
  — service
    — [no] pe-discovery-policy name
      — password password
      — no password
      — polling-interval minutes
      — no polling-interval
      — server server-index address ip-address secret key [hash | hash2] [port port-num]
      — no server server-index
      — timeout seconds
      — no timeout
```


Show Commands

```

show
  — service
    — active-subscribers summary
    — active-subscribers [subscriber sub-ident-string] [sap-id sap-id] [sla-profile sla-profile-name] [detail | mirror]
    — active-subscribers hierarchy [subscriber sub-ident-string]
    — egress-label egress-label1 [egress-label2]
    — fdb-info
    — fdb-mac ieee-address [expiry]
    — id service-id
      — all
      — arp-host [wholesaler service-id] [sap sap-id | interface interface-name | ip-address ip-address[/mask] | mac ieee-address | {[port port-id] [no-inter-dest-id | inter-dest-id inter-dest-id]}] [detail]
      — arp-host statistics [sap sap-id | interface interface-name]
      — arp-host summary [interface interface-name]
      — authentication
        — statistics [policy name] [sap sap-id]
      — base [msap]
      — dhcp
        — lease-state [[sap sap-id] | [sdp sdp-id:vc-id] | [interface interface-name] | [ip-address ip-address]] [detail] |[mac ieee-address] |[wholesaler service-id] [detail]
        — lease-state [sap sap-id]
        — statistics [sdp sdp-id:vc-id]
        — statistics [interface interface-name]
        — summary
      — endpoint [endpoint-name]
      — fdb [sap sap-id] [expiry] | [sdp sdp-id [expiry]] | [mac ieee-address [expiry]] | endpoint endpoint | [detail] [expiry] [pbb]
      — gsm
        — neighbors group [name] [ip-address]
        — sessions [group name] neighbor ip-address [port port-number] [association] [statistics]
      — host [sap sap-id] [detail]
      — host summary
      — i-vpls
      — igmp-snooping
        — all
        — base
        — mrouters [detail]
        — mvr
        — port-db sap sap-id [detail]
        — port-db sap sap-id group grp-address
        — port-db sdp sdp-id:vc-id [detail]
        — port-db sdp sdp-id:vc-id group grp-address
        — proxy-db [detail]
        — proxy-db [group grp-ip-address]
        — querier
        — static [sap sap-id | sdp sdp-id:vc-id]
      — labels

```

- **l2pt** disabled
- **l2pt** [detail]
- **mac-move**
- **mac-protect**
- **mfib** [brief | statistics] [ip | mac] brief
- **mfib** [group grp-address | *] [statistics]
- **mld-snooping**
 - all
 - base
 - mrouters [detail]
 - mvr
 - port-db sap sap-id
 - port-db sap sap-id detail
 - port-db sap sap-id group grp-ipv6-address
 - port-db sdp sdp-id:vc-id
 - port-db sdp \sdp-id:vc-id detail
 - port-db sdp \sdp-id:vc-id group grp-ipv6-address
 - proxy-db [detail]
 - proxy-db group grp-ipv6-address
 - querier
 - static [sap sap-id | sdp sdp-id:vc-id]
 - static [sap sap-id | sdp sdp-id:vc-id]
- **mmrp** mac [ieee-address]
- **mrp-policy** [mrp-policy]
- **mrp-policy** mrp-policy [association]
- **mrp-policy** mrp-policy [entry entry-id]
- **mstp-configuration**
- **retailers**
- **sap** [sap-id [detail]]
- **sdp** [sdp-id | far-end ip-addr] [detail]
- **sdp** sdp-id:vc-id {mrp | mmrp}
- **site** [detail]
- **site** name
- **split-horizon-group** [group-name]
- **stp** mst-instance mst-inst-number
- **stp** [detail]
- **subscriber-hosts** [sap sap-id] [ip ip-address[/mask]] [mac ieee-address] [sub-profile sub-profile-name] [sla-profile sla-profile-name] [detail]
- **wholesalers**
- **ingress-label** start-label [end-label]
- **isid-using** [ISID]
- **sap-using** [sap sap-id]
- **sap-using** interface [ip-address | ip-int-name]
- **sap-using** [ingress | egress] atm-td-profile td-profile-id
- **sap-using** [ingress | egress] filter filter-id
- **sap-using** [ingress | egress] qos-policy qos-policy-id
- **sap-using** authentication-policy policy-name
- **sdp** [sdp-id | far-end ip-address] [detail | keep-alive-history]
- **sdp** [sdp-id[:vc-id] | far-end ip-address]
- **sdp** [sdp-id | far-end ip-addr] [detail | keep-alive-history]
- **sdp-using** [sdp-id[:vc-id] | far-end ip-address]
- **service-using** [vpls][b-vpls] [i-vpls] [m-vpls]
- **subscriber-using** [service-id service-id] [sap-id sap-id] [interface ip-int-name] [ip ip-address[/mask]] [mac ieee-address] [sub-profile sub-profile-name] [sla-profile sla-profile-name]

```

show
  — egress-replication
    — vpls vpls-service-id mda slot/mda
    — vpls vpls-service-id mda slot/mda [igmp-record grp-address {source source-ip-address |
      starg}] | [mRouter]

show
  — igmp
    — group [grp-ip-address]
    — ssm-translate
    — interface [ip-int-name | ip-address] [group grp-address] [detail]
    — static [ip-int-name | ip-addr]
    — statistics [ip-int-name | ip-address]
    — status

```

Show Multi-Chassis Endpoint Commands

```
show
  — service
    — id service-id
      — endpoint [endpoint-name]
  — redundancy
    — multi-chassis
      — mc-endpoint statistics
      — mc-endpoint peer [ip-address] statistics
      — mc-endpoint endpoint [mcep-id] statistics
      — mc-endpoint peer [ip-address]
```

Clear Commands

```

clear
  — service
    — id service-id
      — authentication
        — statistics
      — dhcp
        — lease-state [no-dhcp-release]
        — lease-state ip-address [ip-address[/mask]] [no-dhcp-release]
        — lease-state mac ieee-address [no-dhcp-release]
        — lease-state sap sap-id [no-dhcp-release]
        — lease-state sdp sdp-id:vc-id [no-dhcp-release]
        — statistics [sap sap-id | sdp sdp-id:vc-id | interface ip-int-name | ip-address]
      — fdb {all | mac ieee-address | sap sap-id | mesh-sdp sdp-id:vc-id | spoke-sdp sdp-id:vc-id}
      — igmp-snooping
        — port-db sap sap-id [group grp-address [source ip-address]]
        — port-db sdp sdp-id:vc-id [group grp-address [source ip-address]]
        — querier
        — statistics [all | sap sap-id | sdp sdp-id:vc-id]
      — mfib
        — statistics {all | ip | mac}
        — statistics group grp-address
      — mld-snooping
        — port-db sap sap-id [group grp-ipv6-address]
        — port-db sap sap-id group grp-ipv6-address source src-ipv6-address
        — port-db sdp sdp-id:vc-id [group grp-ipv6-address]
        — port-db sdp sdp-id:vc-id group grp-ipv6-address source src-ipv6-address
        — querier
        — statistics all
        — statistics sap sap-id
        — statistics sdp sdp-id:vc-id
      — mesh-sdp sdp-id[:vc-id] ingress-vc-label
      — msap msap-id
      — spoke-sdp sdp-id:vc-id ingress-vc-label
      — stp
        — detected-protocols [all | sap sap-id | spoke-sdp [sdp-id[:vc-id]]]
    — statistics
      — id service-id
        — capture-sap sap-id [trigger]
        — cem
        — counters
        — l2pt
        — mesh-sdp sdp-id[:vc-id] {all | counters | stp | mrp}
        — mrp
        — pip
        — spoke-sdp sdp-id[:vc-id] {all | counters | stp | l2pt | mrp}
        — spoke-sdp
        — stp
      — sap sap-id {all | cem | counters | l2pt | stp | mrp}
      — sdp sap-id {keep-alive}

```

```
clear
  — router
    — dhcp
      — statistics [interface ip-int-name | ip-address]
```

Debug Commands

```

debug
  — service
    — id service-id
      — [no] arp-host
      — igmp-snooping
        — detail-level {low | medium | high}
        — no detail-level
        — [no] mac ieee-address
        — mode {dropped-only | ingr-and-dropped | egr-ingr-and-dropped}
        — no mode
        — [no] sap sap-id
        — [no] sdp sdp-id:vc-id
      — mld-snooping
        — detail-level {low | medium | high}
        — no detail-level
        — [no] mac ieee-address
        — mode {dropped-only | ingr-and-dropped | egr-ingr-and-dropped}
        — no mode
        — [no] sap sap-id
        — [no] sdp sdp-id:vc-id
      — [no] mrp
        — all-events
        — [no] applicant-sm
        — [no] leave-all-sm
        — [no] mmrp-mac ieee-address
        — [no] mrpdu
        — [no] periodic-sm
        — [no] registrant-sm
        — [no] sap sap-id
        — [no] sdp sdp-id:vc-id
      — [no] event-type {config-change | svc-oper-status-change | sap-oper-status-change | sdpbinding-oper-status-change}
      — [no] host-connectivity-verify
        — [no] ip ip-address
        — [no] mac ieee-address
        — [no] sap sap-id
      — [no] sap sap-id
      — stp
        — all-events
        — [no] bpdu
        — [no] core-connectivity
        — [no] exception
        — [no] fsm-state-changes
        — [no] fsm-timers
        — [no] port-role
        — [no] port-state
        — [no] sap sap-id
        — [no] sdp sdp-id:vc-id

debug
  — igmp
    — router
      — [no] interface [ip-int-name | ip-address]

```

- [no] **mcs** [*ip-int-name*]
- [no] **mcs**
- [no] **packet** [*query|v1-report|v2-report|v3-report|v2-leave*] [*ip-int-name | ip-address*]

Tools Commands

- tools**
 - **perform**
 - **service**
 - **eval-pw-template** *policy-id* [**allow-service-impact**]
 - **id** *service-id*
 - **eval-pw-template** *policy-id* [**allow-service-impact**]

Refer to the 7750 SR OS OAM and Diagnostic Guide for information about CLI commands and syntax for OAM and diagnostics commands.

VPLS Service Configuration Commands

Generic Commands

shutdown

Syntax	[no] shutdown
Context	<pre> config>service>vpls config>service>vpls>snooping config>service>vpls>igmp-trk config>service>vpls>mac-move config>service>vpls>gsmp config>service>vpls>gsmp>group config>service>vpls>gsmp>group>neighbor config>service>vpls>interface config>service>vpls>split-horizon-group config>service>vpls>sap config>service>vpls>sap>stp config>service>vpls>sap>arp-host config>service>vpls>sap>sub-sla-mgmt config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp config>service>vpls>spoke-sdp>stp config>service>vpls>stp config>service>vpls>spoke-sdp>stp config>service>vpls>mrp config>service>vpls>sap>dhcp>proxy config>service>vpls>radius-discovery config>service>vpls>mesh-sdp>dot1ag>mep config>service>vpls>sap>eth-cfm>mep config>service>vpls>>spoke-sdp>eth-cfm>mep config>service>vpls>bgp-ad config>service>vpls>eth-cfm>mep config>service>vpls>mesh-sdp>eth-cfm>mep config>service>vpls>>spoke-sdp>eth-cfm>mep </pre>
Description	This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they may be deleted. Services are created in the administratively down (shutdown) state. When a no shutdown command is entered, the service becomes administratively up and then tries to enter the operationally up state. Default administrative states for services and service entities is described below in Special Cases. The no form of this command places the entity into an administratively enabled state.

- Special Cases**
- Service Admin State** — Bindings to an SDP within the service will be put into the out-of-service state when the service is shutdown. While the service is shutdown, all customer packets are dropped and counted as discards for billing and debugging purposes.
- Service Operational State** — A service is regarded as operational providing that two SAPs or if one SDP are operational.
- SDP (global)** — When an SDP is shutdown at the global service level, all bindings to that SDP are put into the out-of-service state and the SDP itself is put into the administratively and operationally down states. Packets that would normally be transmitted using this SDP binding will be discarded and counted as dropped packets.
- SDP (service level)** — Shutting down an SDP within a service only affects traffic on that service from entering or being received from the SDP. The SDP itself may still be operationally up for other services.
- SDP Keepalives** — Enables SDP connectivity monitoring keepalive messages for the SDP ID. Default state is disabled (shutdown) in which case the operational state of the SDP-ID is not affected by the keepalive message state.
- VPLS SAPs and SDPs** — SAPs are created in a VPLS and SDPs are bound to a VPLS in the administratively up default state. The created SAP will attempt to enter the operationally up state. An SDP will attempt to go into the in-service state once bound to the VPLS.

description

Syntax	description <i>description-string</i> no description
Context	config>service>vpls config>service>vpls>gsmp>group config>service>vpls>gsmp>group>neighbor config>service>vpls>igmp-snooping>mvr config>service>vpls>interface config>service>vpls>split-horizon-group config>service>vpls>sap config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp config>service>vpls>sap>dhcp config>service>vpls>mld-snooping>mvr
Description	This command creates a text description stored in the configuration file for a configuration context. The description command associates a text string with a configuration context to help identify the content in the configuration file. The no form of this command removes the string from the configuration.
Default	No description associated with the configuration context.
Parameters	<i>string</i> — The description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

VPLS Service Commands

vpls

Syntax	vpls <i>service-id</i> customer <i>customer-id</i> vpn <i>vpn-id</i> [m-vpls] [bvpls i-vpls] [create] no vpls <i>service-id</i>
Context	config>service
Description	This command creates or edits a Virtual Private LAN Services (VPLS) instance. The vpls command is used to create or maintain a VPLS service. If the <i>service-id</i> does not exist, a context for the service is created. If the <i>service-id</i> exists, the context for editing the service is entered. A VPLS service connects multiple customer sites together acting like a zero-hop, Layer 2 switched domain. A VPLS is always a logical full mesh. When a service is created, the create keyword must be specified if the create command is enabled in the environment context. When a service is created, the customer keyword and <i>customer-id</i> must be specified and associates the service with a customer. The <i>customer-id</i> must already exist having been created using the customer command in the service context. Once a service has been created with a customer association, it is not possible to edit the customer association. The service must be deleted and recreated with a new customer association. Once a service is created, the use of the customer <i>customer-id</i> is optional for navigating into the service configuration context. Attempting to edit a service with the incorrect <i>customer-id</i> specified will result in an error. More than one VPLS service may be created for a single customer ID. By default, no VPLS instances exist until they are explicitly created. The no form of this command deletes the VPLS service instance with the specified <i>service-id</i>. The service cannot be deleted until all SAPs and SDPs defined within the service ID have been shutdown and deleted, and the service has been shutdown.
Parameters	<i>service-id</i> — The unique service identification number identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The <i>service-id</i> must be the same number used for every 7750 SR, 7450 ESS and 7710 SR on which this service is defined. Values <i>service-id:</i> 1 — 2147483648 customer <i>customer-id</i> — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting. Values 1 — 2147483647 vpn <i>vpn-id</i> — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN identification number. Values 1 — 2147483647 Default null (0)

m-vpls — Specifies a management VPLS.

b-vpls | **i-vpls** — Creates a backbone-vpls or ISID-vpls.

create — This keyword is mandatory while creating a VPLS service.

backbone-smac

Syntax	backbone-smac <i>ieee-address</i>
Context	config>service>vpls
Description	This command configures the backbone source MAC address used for PBB. This command allows a per B-VPLS control of the B-SMAC and the B-Mcast MAC. All I-VPLS provisioned under this B-VPLS will share the provisioned value.
Default	backbone-smac address is chassis MAC address
Parameters	<i>ieee-address</i> — Specifies the backbone source MAC address.

backbone-vpls

Syntax	backbone-vpls <i>vpls-id[:isid]</i> no backbone-vpls				
Context	config>service>vpls				
Description	This command associated the I-VPLS with the B-VPLS service. The ISID value is used to mux/demux packets for the VPLS flowing through the B-VPLS.				
Parameters	<i>vpls-id</i> — This value represents the VPLS ID value associated with the B-VPLS. <i>isid</i> — Defines ISID associated with the I-VPLS. <table> <tr> <td>Default</td><td>The default is the service-id.</td></tr> <tr> <td>Values</td><td>0 — 16777215</td></tr> </table>	Default	The default is the service-id.	Values	0 — 16777215
Default	The default is the service-id.				
Values	0 — 16777215				

stp

Syntax	[no] stp
Context	config>service>vpls>backbone-vpls
Description	This command enables STP on the backbone VPLS service. The no form of the command disables STP on the backbone VPLS service.

block-on-mesh-failure

Syntax	[no] block-on-mesh-failure
Context	config>service>vpls>spoke-sdp config>service>vpls>endpoint
Description	This command enables blocking (brings the entity to an operationally down state) after all configured SDPs or endpoints are in operationally down state. This event is signalled to corresponding T-LDP peer by withdrawing service label (status-bit-signaling non-capable peer) or by setting “PW not forwarding” status bit in T-LDP message (status-bit-signaling capable peer).
Default	disabled

bpdu-translation

Syntax	bpdu-translation {auto pvst stp} no bpdu-translation
Context	config>service>vpls>spoke-sdp config>service>vpls>sap
Description	This command enables the translation of BPDUs to a given format, meaning that all BPDUs transmitted on a given SAP or spoke SDP will have a specified format. The no form of this command reverts to the default setting.
Default	no bpdu-translation
Parameters	auto — Specifies that appropriate format will be detected automatically, based on type of bpdus received on such port. pvst — Specifies the BPDU-format as PVST. Note that the correct VLAN tag is included in the payload (depending on encapsulation value of outgoing SAP). stp — Specifies the BPDU-format as STP.

calling-station-id

Syntax	calling-station-id {mac remote-id sap-id sap-string} no calling-station-id
Context	config>service>vpls>sap
Description	This command enables the inclusion of the calling-station-id attribute in RADIUS authentication requests and RADIUS accounting messages.
Default	no calling-station-id
Parameters	mac — Specifies that the mac-address will be sent. remote-id — Specifies that the remote-id will be sent.

sap-id — Specifies that the sap-id will be sent.

sap-string — Specifies that the value is the inserted value set at the SAP level. If no **calling-station-id** value is set at the SAP level, the **calling-station-id** attribute will not be sent.

l2pt-termination

Syntax	l2pt-termination [cdp] [dtp] [pagp] [stp] [udld] [vtp] no l2pt-termination
Context	config>service>vpls>spoke-sdp config>service>vpls>sap
Description	This command enables Layer 2 Protocol Tunneling (L2PT) termination on a given SAP or spoke SDP. L2PT termination will be supported only for STP BPDUs. PDUs of other protocols will be discarded. This feature can be enabled only if STP is disabled in the context of the given VPLS service.
Default	no l2pt-termination
Parameters	cdp — Specifies the Cisco discovery protocol. dtp — Specifies the digital trunking protocol. pagp — Specifies the port aggregation protocol. stp — Specifies all spanning tree protocols: stp, rstp, mstp, pvst (default). udld — Specifies unidirectional link detection. vtp — Specifies the virtual trunk protocol.

def-mesh-vc-id

Syntax	[no] def-mesh-vc-id vc-id
Context	config>service>vpls
Description	This command configures the value used by each end of a tunnel to identify the VC. If this command is not configured, then the service ID value is used as the VC-ID. This VC-ID is used instead of a label to identify a virtual circuit. The VC-ID is significant between peer nodes on the same hierarchical level. The value of a VC-ID is conceptually independent from the value of the label or any other datalink specific information of the VC. The no form of this command disables the VC-ID.
Default	none
Parameters	vc-id — Specifies the default mesh vc-id. Values 1 — 4294967295

default-gtw

Syntax	default-gtw
Context	config>service>vpls
Description	This command configures a service default gateway.

ip

Syntax	ip <i>ip-address</i> no ip
Context	config>service>vpls>defgw
Description	This command configures the default gateway IP address.

mac

Syntax	mac <i>ieee-address</i>
Context	config>service>vpls>defgw
Description	This command configures the default gateway MAC address.

disable-aging

Syntax	[no] disable-aging
Context	config>service>vpls config>service>vpls>spoke-sdp config>service>vpls>sap
Description	This command disables MAC address aging across a VPLS service or on a VPLS service SAP or spoke SDP. Like in a Layer 2 switch, learned MACs can be aged out if no packets are sourced from the MAC address for a period of time (the aging time). In each VPLS service instance, there are independent aging timers for local learned MAC and remote learned MAC entries in the VPLS forwarding database (FDB). The disable-aging command turns off aging for local and remote learned MAC addresses. When no disable-aging is specified for a VPLS, it is possible to disable aging for specific SAPs and/or spoke SDPs by entering the disable-aging command at the appropriate level. When the disable-aging command is entered at the VPLS level, the disable-aging state of individual SAPs or SDPs will be ignored. The no form of this command enables aging on the VPLS service.
Default	no disable-aging

disable-learning

Syntax	[no] disable-learning
Context	config>service>vpls config>service>vpls>sap config>service>vpls>spoke-sdp
Description	This command disables learning of new MAC addresses in the VPLS forwarding database (FDB) for the service instance, SAP instance or spoke SDP instance. When disable-learning is enabled, new source MAC addresses will not be entered in the VPLS service forwarding database. This is true for both local and remote MAC addresses. When disable-learning is disabled, new source MAC addresses will be learned and entered into the VPLS forwarding database. This parameter is mainly used in conjunction with the discard-unknown command. The no form of this command enables learning of MAC addresses.
Default	no disable-learning (Normal MAC learning is enabled)

discard-unknown

Syntax	[no] discard-unknown
Context	config>service>vpls
Description	By default, packets with unknown destination MAC addresses are flooded. If discard-unknown is enabled at the VPLS level, packets with unknown destination MAC address will be dropped instead (even when configured FIB size limits for VPLS or SAP are not yet reached). The no form of this command allows flooding of packets with unknown destination MAC addresses in the VPLS.
Default	no discard-unknown — Packets with unknown destination MAC addresses are flooded.

endpoint

Syntax	endpoint endpoint-name [create] no endpoint
Context	config>service>vpls
Description	This command configures a service endpoint.
Parameters	<i>endpoint-name</i> — Specifies an endpoint name up to 32 characters in length. create — This keyword is mandatory while creating a service endpoint.

description

Syntax	description <i>description-string</i> no description
Context	config>service>vpls>endpoint This command creates a text description stored in the configuration file for a configuration context. The description command associates a text string with a configuration context to help identify the content in the configuration file. The no form of this command removes the string from the configuration.
Default	No description associated with the configuration context.
Parameters	<i>string</i> — The description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

ignore-standby-signaling

Syntax	[no] ignore-standby-signaling
Context	config>service>vpls>endpoint config>service>vpls>spoke-sdp
Description	When this command is enabled, the node will ignore standby-bit received from TLDP peers for the given spoke SDP and performs internal tasks without taking it into account. This command is present at endpoint level as well as spoke SDP level. If the spoke SDP is part of the explicit-endpoint, it is not possible to change this setting at the spoke SDP level. The existing spoke SDP will become part of the explicit-endpoint only if the setting is not conflicting. The newly created spoke SDP which is a part of the given explicit-endpoint will inherit this setting from the endpoint configuration.
Default	enabled

revert-time

Syntax	revert-time <i>revert-time</i> infinite no revert-time
Context	config>service>vpls>endpoint
Description	This command configures the time to wait before reverting to primary spoke SDP. In a regular endpoint the revert-time setting affects just the pseudowire defined as primary (precedence 0). For a failure of the primary pseudowire followed by restoration the revert-timer is started. After it expires the primary pseudowire takes the active role in the endpoint. This behavior does not apply for the case when both pseudowires are defined as secondary. For example, if the

active secondary pseudowire fails and is restored it will stay in standby until a configuration change or a force command occurs.

Parameters *revert-time* — Specifies the time to wait, in seconds, before reverting back to the primary spoke SDP defined on this service endpoint, after having failed over to a backup spoke SDP.

Values 0 — 600

infinite — Specifying this keyword makes endpoint non-revertive.

static-mac

Syntax **static-mac** *ieee-address* [**create**]
no static-mac

Context config>service>vpls>endpoint

Description This command assigns a static MAC address to the endpoint. In the FDB, the static MAC is then associated with the active spoke SDP.

Default none

Parameters *ieee-address* — Specifies the static MAC address to the endpoint.

Values 6-byte mac-address (xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx). Cannot be all zeros.

create — This keyword is mandatory while creating a static MAC.

suppress-standby-signaling

Syntax [**no**] **suppress-standby-signaling**

Context config>service>vpls>endpoint

Description When this command is enabled, the pseudowire standby bit (value 0x00000020) will not be sent to T-LDP peer when the given spoke is selected as a standby. This allows faster switchover as the traffic will be sent over this SDP and discarded at the blocking side of the connection. This is particularly applicable to multicast traffic.

Default enabled

propagate-mac-flush

Syntax [**no**] **propagate-mac-flush**

Context config>service>vpls

Description This command enabled propagation of mac-flush messages received from the given T-LDP on all spoke and mesh-sdps within the context of the VPLS service. The propagation will follow split-horizon principles and any data-path blocking in order to avoid looping of these messages.

Default disabled

fdb-table-high-wmark

Syntax [no] **fdb-table-high-wmark** *high-water-mark*

Context config>service>vpls

Description This command specifies the value to send logs and traps when the threshold is reached.

Parameters *high-water-mark* — Specify the value to send logs and traps when the threshold is reached.

Values 0— 100

Default 95%

fdb-table-low-wmark

Syntax [no] **fdb-table-low-wmark** *low-water-mark*

Context config>service>vpls

Description This command specifies the value to send logs and traps when the threshold is reached.

Parameters *low-water-mark* — Specify the value to send logs and traps when the threshold is reached.

Values 0— 100

Default 90%

fdb-table-size

Syntax **fdb-table-size** *table-size*
no fdb-table-size [*table-size*]

Context config>service>vpls

Description This command specifies the maximum number of MAC entries in the forwarding database (FDB) for the VPLS instance on this node.

The **fdb-table-size** specifies the maximum number of forwarding database entries for both learned and static MAC addresses for the VPLS instance.

The **no** form of this command returns the maximum FDB table size to default.

Default 250 — Forwarding table of 250 MAC entries.

Parameters *table-size* — Specifies the maximum number of MAC entries in the FDB.

Values 1 — 511999
Chassis-mode A or B limit: 131071
Chassis-mode C limit: 196607
Chassis-mode D limit: 511999

interface

Syntax	[no] interface <i>ip-int-name</i>
Context	config>service>vpls
Description	This command creates an IP interface.

address

Syntax	address <i>ip-address</i> [/ <i>mask</i>]> [<i>netmask</i>] no address
Context	config>service>vpls>interface
Description	This command assigns an IP address, IP subnet, and broadcast address format to an IES IP router interface. Only one IP address can be associated with an IP interface. An IP address must be assigned to each IES IP interface. An IP address and a mask are used together to create a local IP prefix. The defined IP prefix must be unique within the context of the routing instance. It cannot overlap with other existing IP prefixes defined as local subnets on other IP interfaces in the same routing context within the 7750 SR. The local subnet that the address command defines must be part of the services address space within the routing context using the config router service-prefix command. The default is to disallow the complete address space to services. Once a portion of the address space is allocated as a service prefix, that portion can be made unavailable for IP interfaces defined within the config router interface CLI context for network core connectivity with the exclude option in the config router service-prefix command. The IP address for the interface can be entered in either CIDR (Classless Inter-Domain Routing) or traditional dotted decimal notation. The show commands display CIDR notation and is stored in configuration files. By default, no IP address or subnet association exists on an IP interface until it is explicitly created. Use the no form of this command to remove the IP address assignment from the IP interface. When the no address command is entered, the interface becomes operationally down.

Address	Admin State	Oper State
No address	up	down
No address	down	down
1.1.1.1	up	up
1.1.1.1	down	down

The operational state is a read-only variable and the only controlling variables are the address and admin states. The address and admin states are independent and can be set independently. If an interface is in an administratively up state and an address is assigned, it becomes operationally up and the protocol interfaces and the MPLS LSPs associated with that IP interface will be reinitialized.

ip-address — The IP address of the IP interface. The *ip-address* portion of the **address** command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP netmask

The subnet mask in dotted decimal notation. When the IP prefix is not specified in CIDR notation, a space separates the *ip-address* from a traditional dotted decimal mask. The *mask* parameter indicates the complete mask that will be used in a logical ‘AND’ function to derive the local subnet of the IP address. Allowed values are dotted decimal addresses in the range 128.0.0.0 – 255.255.255.252. Note that a mask of 255.255.255.255 is reserved for system IP addresses.

arp-timeout

Syntax	arp-timeout <i>seconds</i> no arp-timeout
Context	config>service>vpls>interface
Description	This command configures the minimum time in seconds an ARP entry learned on the IP interface will be stored in the ARP table. ARP entries are automatically refreshed when an ARP request or gratuitous ARP is seen from an IP host, otherwise, the ARP entry is aged from the ARP table. If arp-timeout is set to a value of zero seconds, ARP aging is disabled. When the arp-populate and lease-populate commands are enabled on an IES interface, the ARP table entries will no longer be dynamically learned, but instead by snooping DHCP ACK message from a DHCP server. In this case the configured arp-timeout value has no effect. The default value for arp-timeout is 14400 seconds (4 hours). The no form of this command restores arp-timeout to the default value.
Default	14400 seconds
Parameters	<i>seconds</i> — The minimum number of seconds a learned ARP entry will be stored in the ARP table, expressed as a decimal integer. A value of zero specifies that the timer is inoperative and learned ARP entries will not be aged. Values 0 — 65535

mac

Syntax	mac <i>ieee-address</i> no mac
Context	config>service>vpls>interface
Description	This command assigns a specific MAC address to an IP interface. For Routed Central Office (CO), a group interface has no IP address explicitly configured but inherits an address from the parent subscriber interface when needed. For example, a MAC will respond to an ARP request when an ARP is requested for one of the IPs associated with the subscriber interface through the group interface.

The **no** form of the command returns the MAC address of the IP interface to the default value.

Default	The physical MAC address associated with the Ethernet interface that the SAP is configured on (the default MAC address assigned to the interface, assigned by the system).
Parameters	<i>ieee-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

static-arp

Syntax	static-arp <i>ip-address</i> <i>ieee-address</i> no static-arp <i>ip-address</i> [<i>ieee-address</i>]
Context	config>service>vpls>interface
Description	This command configures a static address resolution protocol (ARP) entry associating a subscriber IP address with a MAC address for the core router instance. This static ARP appears in the core routing ARP table. A static ARP can only be configured if it exists on the network attached to the IP interface. If an entry for a particular IP address already exists and a new MAC address is configured for the IP address, the existing MAC address will be replaced with the new MAC address. The no form of the command removes a static ARP entry.
Default	None
Parameters	<i>ip-address</i> — Specifies the IP address for the static ARP in IP address dotted decimal notation. <i>ieee-mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

local-age

Syntax	local-age <i>aging-timer</i> no local-age
Context	config>service>vpls
Description	Specifies the aging time for locally learned MAC addresses in the forwarding database (FDB) for the Virtual Private LAN Service (VPLS) instance. In a VPLS service, MAC addresses are associated with a Service Access Point (SAP) or with a Service Distribution Point (SDP). MACs associated with a SAP are classified as local MACs, and MACs associated with an SDP are remote MACs. Like in a Layer 2 switch, learned MACs can be aged out if no packets are sourced from the MAC address for a period of time (the aging time). In each VPLS service instance, there are independent aging timers for local learned MAC and remote learned MAC entries in the FDB. The local-age timer specifies the aging time for local learned MAC addresses. The no form of this command returns the local aging timer to the default value.

Default	local age 300 — Local MACs aged after 300 seconds.
Parameters	<i>aging-timer</i> — The aging time for local MACs expressed in seconds.
Values	60 — 86400

mac-move

Syntax	[no] mac-move
Context	config>service>vpls
Description	This command enables the context to configure MAC move attributes. A sustained high re-learn rate can be a sign of a loop somewhere in the VPLS topology. Typically, STP detects loops in the topology, but for those networks that do not run STP, the mac-move feature is an alternative way to protect your network against loops. When enabled in a VPLS, mac-move monitors the re-learn rate of each MAC. If the rate exceeds the configured maximum allowed limit, it disables the SAP where the source MAC was last seen. The SAP can be disabled permanently (until a shutdown/no shutdown command is executed) or for a length of time that grows linearly with the number of times the given SAP was disabled. You have the option of marking a SAP as non-blockable in the config>service>vpls>sap>limit-mac-move or config>service>vpls>spoke-sdp>limit-mac-move contexts. This means that when the re-learn rate has exceeded the limit, another (blockable) SAP will be disabled instead. The mac-move command enables the feature at the service level for SAPs and spoke SDPs, as only those objects can be blocked by this feature. Mesh SDPs are never blocked, but their re-learn rates (sap-to-mesh/spoke-to-mesh or vice versa) are still measured. The operation of this feature is the same on the SAP and spoke SDP. For example, if a MAC address moves from SAP to SAP, from SAP to spoke SDP, or between spoke SDPs, one will be blocked to prevent thrashing. If the MAC address moves between a SAP and mesh SDP or spoke SDP and mesh SDP combinations, the respective SAP or spoke SDP will be blocked. mac-move will disable a VPLS port when the number of relearns detected has reached the number of relearns needed to reach the move-frequency in the 5-second interval. For example, when the move-frequency is configured to 1 (relearn per second) mac-move will disable one of the VPLS ports when 5 relearns were detected during the 5-second interval because then the average move-frequency of 1 relearn per second has been reached. This can already occur in the first second if the real relearn rate is 5 relearns per second or higher. The no form of this command disables MAC move.

mac-protect

Syntax	mac-protect
Context	config>service>vpls
Description	This command indicates whether or not this MAC is protected. When enabled, the agent will protect the MAC from being learned or re-learned on a SAP that has restricted learning enabled.
Default	disabled

Sample Output

```
A:ALA-48# show service id <service-id> mac-protect
=====
Mac Protection
=====
ServId      MAC
-----
1           aa:aa:aa:aa:aa:ab
-----
No. of MAC Entries: 1
=====
```

mac

Syntax	[no] mac <i>ieee-address</i>
Context	config>service>vpls>mac-protect
Description	This command adds a protected MAC address entry.
Parameters	<i>ieee-address</i> — Specifies the 48-bit MAC address in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers.

mac-subnet-length

Syntax	mac-subnet-length <i>subnet-length</i> no mac-subnet-length
Context	config>service>vpls
Description	This command specifies the number of bits to be considered when performing MAC learning (MAC source) and MAC switching (MAC destination). Specifically, this value identifies how many bits, starting from the beginning of the MAC address are used. For example, if the mask-value of 28 is used, MAC learning will only do a lookup for the first 28 bits of the source MAC address when comparing with existing FIB entries. Then, it will install the first 28 bits in the FIB while zeroing out the last 20 bits of the MAC address. When performing switching in the reverse direction, only the first 28 bits of the destination MAC address will be used to perform a FIB lookup to determine the next hop. The no form of this command switches back to full MAC lookup.
Parameters	<i>subnet-length</i> — Specifies the number of bits to be considered when performing MAC learning or MAC switching.
Values	24 — 48

move-frequency

Syntax	move-frequency <i>frequency</i> no move-frequency
Context	config>service>vpls>mac-move
Description	This command indicates the maximum rate at which MAC's can be re-learned in the VPLS service, before the SAP where the moving MAC was last seen is automatically disabled in order to protect the system against undetected loops or duplicate MAC's. The no form of the command reverts to the default value.
Default	2 (when mac-move is enabled). For example, 10 relearns in a 5 second period.
Parameters	<i>frequency</i> — Specifies the rate, in 5-second intervals for the maximum number of relearns. Values 1 — 100

number-retries

Syntax	number-retries <i>number-retries</i> no number-retries
Context	config>service>vpls>mac-move
Description	This command configures the number of times retries are performed for reenabling the SAP/SDP.
Parameters	<i>number-retries</i> Specifies number of retries for reenabling the SAP/SDP. A zero (0) value indicates unlimited number of retries. Values 0 — 255

primary-ports

Syntax	primary-ports
Context	config>service>vpls>mac-move
Description	This command enables the context to define primary VPLS ports. VPLS ports that were declared as secondary prior to the execution of this command will be moved from secondary port-level to primary port-level. Changing a port to the tertiary level can only be done by first removing it from the secondary port-level.

cumulative-factor

Syntax	cumulative-factor <i>cumulative-factor</i> no cumulative-factor
Context	configure->service->vpls->mac-move->primary-ports configure->service->vpls->mac-move->secondary-ports
Description	This command configures a factor for the primary or secondary ports defining how many MAC relearn periods should be used to measure the MAC relearn rate . This rate must be exceeded during consecutive periods before the corresponding ports (SAP and/or spoke-SDP) are blocked by the MAC-move feature.
Parameters	<i>cumulative-factor</i> — Specifies a MAC relearn period to be used for MAC relearn rate.
Values	3 — 10

sap

Syntax	[no] sap <i>sap-id</i>
Context	config>service>vpls>mac-move>primary-ports config>service>vpls>mac-move>secondary-ports
Description	This command declares a given SAP as a primary (or secondary) VPLS port.
Parameters	<i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.

spoke-sdp

Syntax	[no] spoke-sdp <i>spoke-id</i>
Context	config>service>vpls>mac-move>primary-ports config>service>vpls>mac-move>seocndary-ports
Description	This command declares a given spoke SDP as a primary (or secondary) VPLS port.
Parameters	<i>spoke-id</i> — Specifies the SDP ID to configure as the primary VPLS port.
Values	1 — 17407
	<i>vc-id</i> — The virtual circuit identifier.
Values	1 — 4294967295

cumulative-factor

Syntax	[no] cumulative-factor <i>factor</i>
Context	config>service>vpls>mac-move>primary-ports

```
config>service>vpls>mac-move>secondary-ports
```

Description	This command defines a factor defining how many mac-relearn measurement periods can be used to measure mac-relearn rate. The rate must be exceeded during the defined number of consecutive periods before the corresponding port is blocked by the mac-move feature. The cumulative-factor of primary ports must be higher than cumulative-factor of secondary ports.
Default	2 — secondary ports 3 — primary ports
Parameters	<i>factor</i> — Specifies the factor defining the number of mac-relearn measurement periods can be used to measure mac-relearn rate.
Values	2 — 10

secondary-ports

Syntax	secondary-ports
Context	config>service>vpls>mac-move
Description	This command opens configuration context for defining secondary vpls-ports. VPLS ports that were declared as primary prior to the execution of this command will be moved from primary port-level to secondary port-level. Changing a port to the tertiary level can only be done by first removing it from the primary port-level.

retry-timeout

Syntax	retry-timeout <i>timeout</i> no retry-timeout
Context	config>service>vpls>mac-move
Description	This indicates the time in seconds to wait before a SAP that has been disabled after exceeding the maximum relearn rate is reenabled. It is recommended that the retry-timeout value is larger or equal to 5s * cumulative factor of the highest priority port so that the sequential order of port blocking will not be disturbed by re-initializing lower priority ports. A zero value indicates that the SAP will not be automatically re-enabled after being disabled. If, after the SAP is reenabled it is disabled again, the effective retry timeout is doubled in order to avoid thrashing. The no form of the command reverts to the default value.
Default	10 (when mac-move is enabled)
Parameters	<i>timeout</i> — Specifies the time, in seconds, to wait before a SAP that has been disabled after exceeding the maximum relearn rate is reenabled.
Values	0 — 120

mfib-table-high-wmark

Syntax	[no] mfib-table-high-wmark <i>high-water-mark</i>
Context	config>service>vpls
Description	This command specifies the multicast FIB high watermark. When the percentage filling level of the multicast FIB exceeds the configured value, a trap is generated and/or a log entry is added.
Parameters	<i>high-water-mark</i> — Specifies the multicast FIB high watermark as a percentage.
Values	1 — 100
Default	95%

mfib-table-low-wmark

Syntax	[no] mfib-table-low-wmark <i>low-water-mark</i>
Context	config>service>vpls
Description	This command specifies the multicast FIB low watermark. When the percentage filling level of the Multicast FIB drops below the configured value, the corresponding trap is cleared and/or a log entry is added.
Parameters	<i>low-water-mark</i> — Specifies the multicast FIB low watermark as a percentage.
Values	1 — 100
Default	90%

mfib-table-size

Syntax	mfib-table-size <i>size</i> no mfib-table-size
Context	config>service>vpls
Description	This command specifies the maximum number of (s,g) entries in the multicast forwarding database (MFIB) for this VPLS instance. The <i>mfib-table-size</i> parameter specifies the maximum number of multicast database entries for both learned and static multicast addresses for the VPLS instance. When a table-size limit is set on the mfib of a service which is lower than the current number of dynamic entries present in the mfib then the number of entries remains above the limit. The no form of this command removes the configured maximum MFIB table size.
Default	none
Parameters	<i>size</i> — The maximum number of (s,g) entries allowed in the Multicast FIB.
Values	1 — 16383

mld-snooping

Syntax	mld-snooping
Context	config>service>vpls config>service>vpls>sap
Description	This command configures MLD snooping parameters.

remote-age

Syntax	remote-age <i>seconds</i> no remote-age
Context	config>service>vpls
Description	Specifies the aging time for remotely learned MAC addresses in the forwarding database (FDB) for the Virtual Private LAN Service (VPLS) instance. In a VPLS service, MAC addresses are associated with a Service Access Point (SAP) or with a Service Distribution Point (SDP). MACs associated with a SAP are classified as local MACs, and MACs associated with an SDP are remote MACs. Like in a layer 2 switch, learned MACs can be aged out if no packets are sourced from the MAC address for a period of time (the aging time). In each VPLS service instance, there are independent aging timers for local learned MAC and remote learned MAC entries in the FDB. The remote-age timer specifies the aging time for remote learned MAC addresses. To reduce the amount of signaling required between switches configure this timer larger than the local-age timer. The no form of this command returns the remote aging timer to the default value.
Default	remote age 900 — Remote MACs aged after 900 seconds
Parameters	<i>seconds</i> — The aging time for remote MACs expressed in seconds.
	Values 60 — 86400

send-bvpls-flush

Syntax	send-bvpls-flush {[all-but-mine] [all-from-me]} no send-bvpls-flush
Context	config>service>vpls
Description	This command enables generation of LDP MAC withdrawl “flush-all-from-me” in the B-VPLS domain when the following triggers occur in the related IVPLS: • MC-LAG failure • Failure of a local SAP • Failure of a local pseudowire/SDP binding Note that failure means transition of link SAP/pseudowire to either down or standby status.

This command does not require send-flush-on-failure in B-VPLS to be enabled on an IVPLS trigger to send an MAC flush into the BVPLS.

Default	no send-bvpls-flush
Parameters	all-but-mine — Specifies to send an LDP flush all-but-mine and also sent into the B-VPLS. Note that both parameters can be set together. all-from-me — Specifies to send an LDP flush-all-from and when STP initiates a flush, it is sent into the B-VPLS using LDP MAC flush all-from-me. Note that both parameters can be set together.

send-flush-on-bvpls-failure

Syntax	[no] send-flush-on-bvpls-failure
Context	config>service>vpls ivpls
Description	This command enables the generation in the local I-VPLS of a LDP MAC flush-all-from-me following a failure of SAP/the whole endpoint/spoke-SDP in the related B-VPLS. Note that the failure of mesh-SDP in B-VPLS does not generate the I-VPLS MAC flush. The no form of this command disables the generation of LDP MAC flush in I-VPLS on failure of SAP/endpoint/spoke-SDP in the related B-VPLS.
Default	no send-flush-on-bvpls-failure

propagate-mac-flush-from-bvpls

Syntax	[no] propagate-mac-flush-from-bvpls
Context	config>service>vpls ivpls
Description	This command enables the propagation in the local I-VPLS of any regular LDP MAC Flush received in the related B-VPLS. If an LDP MAC flush-all-but-mine is received in the B-VPLS context, the command controls also whether a flush is performed for all the customer MACs in the associated I-VPLS FIB. The command does not have any effect on a PBB MAC Flush (LDP MAC flush with PBB TLV) received in the related B-VPLS context. The no form of this command disables the propagation of LDP MAC Flush in I-VPLS from the related B-VPLS.
Default	no propagate-mac-flush-from-bvpls

send-flush-on-failure

Syntax	[no] send-flush-on-failure
Context	config>service>vpls
Description	This command enables sending out “flush-all-from-ME” messages to all LDP peers included in affected VPLS, in the event of physical port failures or “oper-down” events of individual SAPs. This

feature provides an LDP-based mechanism for recovering a physical link failure in a dual-homed connection to a VPLS service. This method provides an alternative to RSTP solutions where dual homing redundancy and recovery, in the case of link failure, is resolved by RSTP running between a PE router and CE devices. If the endpoint is configured within the VPLS and send-flush-on-failure is enabled, flush-all-from-me messages will be sent out only when all spoke SDPs associated with the endpoint go down.

This feature cannot be enabled on management VPLS.

Default no send-flush-on-failure

service-mtu

Syntax **service-mtu** *octets*
no service-mtu

Context config>service>vpls

Description This command configures the service payload (Maximum Transmission Unit – MTU), in bytes, for the service. This MTU value overrides the service-type default MTU. The **service-mtu** defines the payload capabilities of the service. It is used by the system to validate the SAP and SDP binding's operational state within the service.

The service MTU and a SAP's service delineation encapsulation overhead (i.e., 4 bytes for a dot1q tag) is used to derive the required MTU of the physical port or channel on which the SAP was created. If the required payload is larger than the port or channel MTU, then the SAP will be placed in an inoperative state. If the required MTU is equal to or less than the port or channel MTU, the SAP will be able to transition to the operative state.

When binding an SDP to a service, the service MTU is compared to the path MTU associated with the SDP. The path MTU can be administratively defined in the context of the SDP. The default or administrative path MTU can be dynamically reduced due to the MTU capabilities discovered by the tunneling mechanism of the SDP or the egress interface MTU capabilities based on the next hop in the tunnel path. If the service MTU is larger than the path MTU, the SDP binding for the service will be placed in an inoperative state. If the service MTU is equal to or less than the path MTU, then the SDP binding will be placed in an operational state.

In the event that a service MTU, port or channel MTU, or path MTU is dynamically or administratively modified, then all associated SAP and SDP binding operational states are automatically re-evaluated.

For i-VPLS and EPIPEs bound to a b-VPLS, the service-mtu must be at least 18 bytes smaller than the b-VPLS service MTU to accommodate the PBB header.

The **no** form of this command returns the default **service-mtu** for the indicated service type to the default value.

Default VPLS: 1514

The following table displays MTU values for specific VC types.

VC-Type	Example Service MTU	Advertised MTU

Ethernet	1514	1500
Ethernet (with preserved dot1q)	1518	1504
VPLS	1514	1500
VPLS (with preserved dot1q)	1518	1504
VLAN (dot1p transparent to MTU value)	1514	1500
VLAN (QinQ with preserved bottom Qtag)	1518	1504

The size of the MTU in octets, expressed as a decimal integer.

Values 1 — 9194

service-name

Syntax	service-name <i>service-name</i> no service-name
Context	config>service>vpls
Description	This command configures an optional service name, up to 64 characters in length, which adds a name identifier to a given service to then use that service name in configuration references as well as display and use service names in show commands throughout the system. This helps the service provider/administrator to identify and manage services within the 7750 SR, 7450 ESS and 7710 SR platforms. All services are required to assign a service ID to initially create a service. However, either the service ID or the service name can be used to identify and reference a given service once it is initially created.
Parameters	<i>service-name</i> — Specifies a unique service name to identify the service. Service names may not begin with an integer (0-9).

site

Syntax	site <i>name</i> [create] no site <i>name</i>
Context	config>service>vpls
Description	This command configures a VPLS site. The no form of the command removes the name from the configuration.
Parameters	<i>name</i> — Specifies a site name up to 32 characters in length. create — This keyword is mandatory while creating a VPLS service.

boot-timer

Syntax	boot-timer <i>seconds</i> no boot-timer
Context	config>service>vpls>site
Description	This command configures for how long the service manger waits after a node reboot before running the DF election algorithm. The boot-timer value should be configured to allow for the BGP sessions to come up and for the NLRI information to be refreshed/exchanged. The no form of the command reverts the default.
Default	no boot-timer
Parameters	<i>seconds</i> — Specifies the site boot-timer. Values 1 — 100

failed-threshold

Syntax	failed-threshold [1..1000] failed-threshold all
Context	config>service>vpls>site
Description	This command defines the number of objects should be down for the site to be declared down. Both administrative and operational status must be evaluated and if at least one is down, the related object is declared down.
Default	failed-threshold all
Parameters	1 .. 1000 — Specifies the threshold for the site to be declared down.

mesh-sdp-binding

Syntax	[no] mesh-sdp-binding
Context	config>service>vpls>site
Description	This command enables applications to all mesh SDPs. The no form of reverts the default.
Default	no mesh-sdp-binding

sap

Syntax	sap <i>sap-id</i> no sap
Context	config>service>vpls>site
Description	This command configures a SAP for the site. The no form of the command removes the SAP ID from the configuration.
Parameters	<i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.

site-activation-timer

Syntax	site-activation-timer <i>seconds</i> no site-activation-timer
Context	config>service>vpls>site
Description	This command configures the time-period the system keeps the local sites in standby status, waiting for BGP updates from remote PEs before running the DF (designated-forwarder) election algorithm to decide whether the site should be unblocked. The no form of the command removes the value from the configuration.
Default	no site-activation-timer
Parameters	<i>seconds</i> — Specifies the site activation timer. Values 1 — 100

site-id

Syntax	site-id <i>value</i> no site-id
Context	config>service>vpls>site
Description	This command configures the identifier for the site in this service.
Parameters	<i>value</i> — Specifies the site identifier. Values 1 — 65535

split-horizon-group

Syntax	split-horizon-group <i>group-name</i> no split-horizon-group
Context	config>service>vpls>site
Description	This command configures the value of split-horizon group associated with this site. The no form of the command reverts the default.
Default	no split-horizon-group
Parameters	<i>group-name</i> — Specifies a split-horizon group name.

spoke-sdp

Syntax	spoke-sdp <i>sdp-id:vc-id</i> no spoke-sdp
Context	config>service>vpls>site
Description	This command binds a service to an existing Service Distribution Point (SDP). The no form of the command removes the parameter from the configuration.

split-horizon-group

Syntax	[no] split-horizon-group [<i>group-name</i>] [<i>residential-group</i>]
Context	config>service>vpls
Description	This command creates a new split horizon group for the VPLS instance. Traffic arriving on a SAP or spoke SDP within this split horizon group will not be copied to other SAPs or spoke SDPs in the same split horizon group. A split horizon group must be created before SAPs and spoke SDPs can be assigned to the group. The split horizon group is defined within the context of a single VPLS. The same group-name can be re-used in different VPLS instances. Up to 30 split horizon groups can be defined per VPLS instance. Half are supported in i-VPLS. The no form of the command removes the group name from the configuration.
Parameters	<i>group-name</i> — Specifies the name of the split horizon group to which the SDP belongs. <i>residential-group</i> — Defines a split horizon group as a residential split horizon group (RSHG). Doing so entails that: a) SAPs which are members of this Residential Split Horizon Group will have: – Double-pass queuing at ingress as default setting (can be disabled) – STP disabled (cannot be enabled)

- ARP reply agent enabled per default (can be disabled)
 - MAC pinning enabled per default (can be disabled)
 - Downstream broadcast packets are discarded thus also blocking the unknown, flooded traffic
 - Downstream multicast packets are allowed when IGMP snooping is enabled
- b) Spoke SDPs which are members of this Residential Split Horizon Group will have:
- Downstream multicast traffic supported
 - Double-pass queuing is not applicable
 - STP is disabled (can be enabled)
 - ARP reply agent is not applicable (dhcp-lease-states are not supported on spoke SDPs)
 - MAC pinning enabled per default (can be disabled)

Default A split horizon group is by default not created as a residential-group.

pppoe-policy

Syntax	pppoe-policy <i>pppoe-policy-name</i> no pppoe-policy
Context	config>service>vpls>sap
Description	This command specifies an existing PPPoE policy. These policies are referenced from interfaces configured for PPPoE. Multiple PPPoE policies may be configured.
Default	none
Parameters	<i>pppoe-policy-name</i> — Specifies an existing PPPoE policy name up to 32 characters in length.

restrict-protected-src

Syntax	restrict-protected-src <i>alarm-only</i> no restrict-protected-src
Context	config>service>vpls>split-horizon-group config>service>vpls>sap
Description	This command indicates how the agent will handle relearn requests for protected MAC addresses. While enabled all packets entering the configured SAP, or any SAP that is part of the configured split horizon group (SHG) will be verified not to contain a protected source MAC address. If the packet is found to contain such an address the packet will be discarded, a trap will be generated and the SAP will be made operationally down. The SAP must be shutdown and enabled (no shutdown) for this state to be cleared. Notice that the use of restrict-protected-src under the SAP is designed only to allow this capability for SAPs that are not part of a SHG. If a SAP is part of a SHG that has restrict-protected-src enabled the SAP will be restricted.
Default	no restrict-protected-src

restrict-unprotected-dst

Syntax	restrict-unprotected-dst <i>alarm-only</i> no restrict-unprotected-dst
Context	config>service>vpls>split-horizon-group config>service>vpls>sap
Description	This command indicates how the system will forward packets destined to an unprotected MAC address. While enabled all packets entering the configured SAP will be verified to contain a protected destination MAC address. If the packet is found to contain a non-protected destination MAC, it will be discarded. Detecting a non-protected destination MAC on the SAP will not cause the SAP to be placed in the operationally down state. If a MAC is defined with a static address, after that MAC was already learned by the system on a restricted SAP, the system will bring the SAP to an operationally down state, flush the MAC and generate a trap. If the destination MAC address of a packet entering a restricted SAP with restrict-unprotected-dst enabled, and if it is not a protected MAC, the packet will be discarded. If the destination MAC address is unknown, even if the packet is entering a restricted SAP, with restrict-unprotected-dst enabled, it will be flooded. You can specify a static MAC in the mac-protect list. This action fails if the static MAC is defined under a restricted SAP. If the MAC is protected first, the system does not allow it to be added as static under a restricted SAP.
Default	no restrict-unprotected-dst

root-guard

Syntax	[no] root-guard
Context	config>service>vpls>sap>stp config>service>vpls>spoke-sdp>stp
Description	This command specifies whether this port is allowed to become an STP root port. It corresponds to the restrictedRole parameter in 802.1Q. If set, it can cause lack of spanning tree connectivity.
Default	no root-guard

static-host

Syntax	static-host ip <i>ip/did-address</i> [mac <i>ieee-address</i>] [create] static-host mac <i>ieee-address</i> [create] no static-host [ip <i>ip-address</i> >] mac <i>ieee-address</i> > no static-host all [force] no static-host ip <i>ip-address</i>
Context	config>service>vpls>sap

Description	This command configures a static host on this SAP.
Syntax	ip <i>ip-address</i> — Specifies the IPv4 unicast address. mac <i>ieee-address</i> — Specify this optional parameter when defining a static host. Every static host definition must have at least one address defined, IP or MAC. force — Specifies the forced removal of the static host addresses. sla-profile <i>sla-profile-name</i> — This optional parameter is used to specify an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the config>subscr-mgmt>sla-profile context. create — This keyword is mandatory while configuring a static host.

ancp-string

Syntax	ancp-string <i>ancp-string</i> no ancp-string
Context	config>service>vpls>sap>static-host
Description	This command specifies the ANCP string associated to this SAP host.
Parameters	<i>ancp-string</i> — Specifies the ANCP string up to 63 characters in length.

app-profile

Syntax	app-profile <i>app-profile-name</i> no app-profile
Context	config>service>vpls>sap>static-host
Description	This command specifies an application profile name.
Parameters	<i>app-profile-name</i> — Specifies the application profile name up to 32 characters in length.

inter-dest-id

Syntax	inter-dest-id <i>intermediate-destination-id</i> no inter-dest-id
Context	config>service>vpls>sap>static-host
Description	Specifies to which intermediate destination (for example a DSLAM) this host belongs.
Parameters	<i>intermediate-destination-id</i> — Specifies the intermediate destination ID.

sla-profile

Syntax	sla-profile <i>sla-profile-name</i> no sla-profile
Context	config>service>vpls>sap>static-host
Description	This command specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the config>subscr-mgmt>sla-profile context.
Parameters	<i>sla-profile-name</i> — Specifies the SLA profile name.

sub-profile

Syntax	sub-profile <i>sub-profile-name</i> no sub-profile
Context	config>service>vpls>sap>static-host
Description	This command specifies an existing subscriber profile name to be associated with the static subscriber host.
Parameters	<i>sub-profile-name</i> — Specifies the sub-profile name.

subscriber

Syntax	subscriber <i>sub-ident</i> no subscriber
Context	config>service>vpls>sap>static-host
Description	This command specifies an existing subscriber identification profile to be associated with the static subscriber host.
Parameters	<i>sub-ident</i> — Specifies the subscriber identification/

subscriber-sap-id

Syntax	[no] subscriber-sap-id
Context	config>service>vpls>sap>static-host
Description	This command enables using the SAP ID as subscriber id.
Parameters	subscriber-sap-id — Specifies to use the sap-id as the subscriber-id.

tod-suite

Syntax	tod-suite <i>tod-suite-name</i> no tod-suite
Context	config>service>vpls>sap
Description	This command applies a time-based policy (filter or QoS policy) to the service SAP. The suite name must already exist in the config>cron context.
Default	no tod-suite
Parameters	<i>tod-suite-name</i> — Specifies collection of policies (ACLs, QoS) including time-ranges that define the full or partial behavior of a SAP. The suite can be applied to more than one SAP.

trigger-packet

Syntax	trigger-packet [dhcp] [pppoe] [arp] no trigger-packet
Context	config>service>vpls>sap
Description	This command enables triggering packet to initiate RADIUS authentication that provides a service context. The authentication, together with the service context for this request, creates a managed SAP. The VLAN is the same as the triggering packet. This SAP behaves as a regular SAP but the configuration is not user-editable and not maintained in the configuration file. The managed SAP remains active as long as the session is active.
Default	none
Parameters	dhcp — Specifies whether the receipt of DHCP trigger packets on this VPLS SAP when the keyword capture-sap is specified in the sap command creation string, will result in a RADIUS authentication that will provide a service context and the creation of a SAP with a value of 'managed'. pppoe — Specifies whether the receipt of PPPoE trigger packets on this VPLS SAP when the keyword capture-sap is specified in the sap command creation string, will result in a RADIUS authentication that will provide a service context and the creation of a SAP with a value of 'managed'. arp — indicates that ARP is the type of trigger packets for this entry.

General Switch Management Protocol Commands

gsmp

Syntax	gsmp
Context	config>service>vpls
Description	This command enables the context to configure General Switch Management Protocol (GSMP) connections maintained in this service.
Default	not enabled

group

Syntax	[no] group <i>name</i>
Context	config>service>vpls>gsmp
Description	This command specifies a GSMP name. A GSMP group name is unique only within the scope of the service in which it is defined.

ancp

Syntax	ancp
Context	config>service>vpls>gsmp>group
Description	This command configures Access Node Control Protocol (ANCP) parameters for this GSMP group.

dynamic-topology-discover

Syntax	[no] dynamic-topology-discover
Context	config>service>vpls>gsmp>group>ancp
Description	This command enables the ANCP dynamic topology discovery capability. The no form of this command disables the feature.

line-configuration

Syntax	[no] line-configuration
Context	config>service>vpls>gsmp>group>ancp
Description	This command enables the ANCP line-configuration capability. The no form of this command disables the feature.

oam

Syntax	[no] oam
Context	config>service>vpls>gsmp>group>ancp
Description	This command specifies whether or not the GSMP ANCP OAM capability should be negotiated at startup of the GSMP connection. The no form of this command disables the feature.

hold-multiplier

Syntax	hold-multiplier <i>multiplier</i> no hold-multiplier
Context	config>service>vpls>gsmp>group
Description	This command configures the hold-multiplier for the GSMP connections in this group.
Parameters	<i>multiplier</i> — Specifies the GSMP hold multiplier value. Values 1 — 100

keepalive

Syntax	keepalive <i>seconds</i> no keepalive
Context	config>service>vpls>gsmp>group
Description	This command configures keepalive values for the GSMP connections in this group.
Parameters	<i>seconds</i> — Specifies the GSMP keepalive timer value in seconds. Values 1 — 25

neighbor

Syntax	[no] neighbor <i>ip-address</i>
Context	config>service>vpls>gsmp>group
Description	This command configures a GSMP ANCP neighbor.
Parameters	<i>ip-address</i> — Specifies the IP address of the GSMP ANCP neighbor.

local-address

Syntax	local-address <i>ip-address</i> no local-address
Context	config>service>vpls>gsmp>group>neighbor
Description	This command configures the source ip-address used in the connection towards the neighbor. The local address is optional. If specified the node will accept connections only for that address in the service running ANCP. The address may be created after the reference but connections will not be accepted until it is created. If the local address is not used, the system accepts connections on any interface within the routing context.
Parameters	<i>ip-address</i> — Specifies the source IP address to be used in the connection toward the neighbor.

priority-marking

Syntax	priority-marking dscp <i>dscp-name</i> priority-marking prec <i>ip-prec-value</i> no priority-marking
Context	config>service>vpls>gsmp>group>neighbor
Description	This command configures the type of priority marking to be used.
Parameters	dscp <i>dscp-name</i> — Specifies the DSCP code-point to be used. Values be, cp1, cp2, cp3, cp4, cp5, cp6, cp7, cs1, cp9, af11, cp11, af12, cp13, af13, cp15, cs2, cp17, af21, cp19, af22, cp21, af23, cp23, cs3, cp25, af31, cp27, af32, cp29, af33, cp31, cs4, cp33, af41, cp35, af42, cp37, af43, cp39, cs5, cp41, cp42, cp43, cp44, cp45, ef, cp47, nc1, cp49, cp50, cp51, cp52, cp53, cp54, cp55, nc2, cp57, cp58, cp59, cp60, cp61, cp62, cp63 prec <i>ip-prec-value</i> — Specifies the precedence value to be used. Values 0 — 7

VPLS DHCP Commands

dhcp

Syntax	dhcp
Context	config>service>vpls>sap config>service>vpls>spoke-sdp config>service>vpls>mesh-sdp
Description	This command enables the context to configure DHCP parameters.

lease-populate

Syntax	lease-populate [<i>nmb-of-entries</i>] no lease-populate
Context	config>service>vpls>sap>dhcp
Description	This command enables and disables dynamic host lease state management for VPLS SAPs. For VPLS, DHCP snooping must be explicitly enabled (using the snoop command) at all points where DHCP messages requiring snooping enter the VPLS instance (both from the DHCP server and from the subscribers). Lease state information is extracted from snooped DHCP ACK messages to populate lease state table entries for the SAP. The optional number-of-entries parameter is used to define the number of lease state table entries allowed for this SAP or IP interface. If number-of-entries is omitted, only a single entry is allowed. Once the maximum number of entries has been reached, subsequent lease state entries are not allowed and subsequent DHCP ACK messages are discarded. The retained lease state information representing dynamic hosts may be used to: • populate a SAP based anti-spoof filter table to provide dynamic anti-spoof filtering. If the system is unable to populate the dynamic host information in the anti-spoof filter table on the SAP, the DHCP ACK message must be discarded without adding a new lease state entry or updating an existing lease state entry. • generate dynamic ARP replies if arp-reply-agent is enabled.
Default	no lease-populate
Parameters	<i>nbr-of-entries</i> — Specifies the number of DHCP leases allowed.
	Values 1 — 8000

option

Syntax	[no] option
Context	config>service>vpls>sap>dhcp
Description	This command enables DHCP Option 82 (Relay Agent Information Option) parameters processing and enters the context for configuring Option 82 sub-options. The no form of this command returns the system to the default.
Default	no option

action

Syntax	action [<i>dhcp-action</i>] no action
Context	config>service>vpls>sap>dhcp>option
Description	This command configures the Relay Agent Information Option (Option 82) processing. The no form of this command returns the system to the default value.
Default	The default is to keep the existing information intact.
Parameters	<i>dhcp-action</i> — Specifies the DHCP option action. replace — In the upstream direction (from the user), the Option 82 field from the router is inserted in the packet (overwriting any existing Option 82 field). In the downstream direction (towards the user) the Option 82 field is stripped (in accordance with RFC 3046). drop — The DHCP packet is dropped if an Option 82 field is present, and a counter is incremented. keep — The existing information is kept in the packet and the router does not add any additional information. In the downstream direction the Option 82 field is not stripped and is sent on towards the client. The behavior is slightly different in case of Vendor Specific Options (VSOs). When the keep parameter is specified, the router will insert his own VSO into the Option 82 field. This will only be done when the incoming message has already an Option 82 field. If no Option 82 field is present, the router will not create the Option 82 field. In this in that case, no VSO will be added to the message.

circuit-id

Syntax	circuit-id [<i>ascii-tuple</i> <i>vlan-ascii-tuple</i>]
Context	config>service>vpls>sap>dhcp>option
Description	When enabled, the router sends an ASCII-encoded tuple in the circuit-id suboption of the DHCP packet. This ASCII-tuple consists of the access-node-identifier, service-id, and SAP-ID, separated by

“|”. If no keyword is configured, then the circuit-id suboption will not be part of the information option (Option 82).

If disabled, the **circuit-id** suboption of the DHCP packet will be left empty.

Default	no circuit-id
Parameters	ascii-tuple — Specifies that the ASCII-encoded concatenated tuple consisting of the access-node-identifier, service-id, and interface-name is used. vlan-ascii-tuple — Specifies that the format will include VLAN-id and dot1p bits in addition to what is included in ascii-tuple already. The format is supported on dot1q and qinq encapsulated ports only. Thus, when the Option 82 bits are stripped, dot1p bits will be copied to the Ethernet header of an outgoing packet.

remote-id

Syntax	[no] remote-id [mac string string]
Context	config>service>vpls>sap>dhcp>option
Description	This command specifies what information goes into the remote-id suboption in the DHCP Relay packet. If disabled, the remote-id suboption of the DHCP packet will be left empty. The no form of this command returns the system to the default.
Default	no remote-id
Parameters	mac — This keyword specifies the MAC address of the remote end is encoded in the suboption. string string — Specifies the remote-id.

vendor-specific-option

Syntax	[no] vendor-specific-option
Context	config>service>vpls>sap>dhcp>option config>service>ies>if>dhcp>option
Description	This command configures the vendor specific suboption of the DHCP relay packet.

client-mac-address

Syntax	[no] client-mac-address
Context	config>service>vpls>sap>dhcp>option>vendor
Description	This command enables the sending of the MAC address in the vendor specific suboption of the DHCP relay packet.

The **no** form of the command disables the sending of the MAC address in the vendor specific suboption of the DHCP relay packet.

sap-id

Syntax	[no] sap-id
Context	config>service>vpls>sap>dhcp>option>vendor
Description	This command enables the sending of the SAP ID in the vendor specific suboption of the DHCP relay packet. The no form of the command disables the sending of the SAP ID in the vendor specific suboption of the DHCP relay packet.

service-id

Syntax	[no] service-id
Context	config>service>vpls>sap>dhcp>option>vendor
Description	This command enables the sending of the service ID in the vendor specific suboption of the DHCP relay packet. The no form of the command disables the sending of the service ID in the vendor specific suboption of the DHCP relay packet.

string

Syntax	[no] string <i>text</i>
Context	config>service>vpls>sap>dhcp>option>vendor
Description	This command specifies the string in the vendor specific suboption of the DHCP relay packet. The no form of the command returns the default value.
Parameters	<i>text</i> — The string can be any combination of ASCII characters up to 32 characters in length. If spaces are used in the string, enclose the entire string in quotation marks (“ ”).

system-id

Syntax	[no] system-id
Context	config>service>vpls>sap>dhcp>option>vendor
Description	This command specifies whether the system-id is encoded in the vendor specific sub-option of Option 82.

proxy-server

Syntax	proxy-server
Context	config>service>vpls>sap>dhcp
Description	This command configures the DHCP proxy server.

emulated-server

Syntax	emulated-server <i>ip-address</i> no emulated-server
Context	config>service>vpls>sap>dhcp>proxy
Description	This command configures the IP address which will be used as the DHCP server address in the context of this VPLS SAP. Typically, the configured address should be in the context of the subnet represented by the VPLS. The no form of of this command reverts to the default setting. The local proxy server will not become operational without the emulated-server address being specified.
Parameters	<i>ip-address</i> — Specifies the emulated server address.

lease-time

Syntax	lease-time [<i>days days</i>] [<i>hrs hours</i>] [<i>min minutes</i>] [<i>sec seconds</i>] [<i>radius-override</i>] no lease-time
Context	config>service>vpls>sap>dhcp>proxy
Description	This command defines the length of lease time that will be provided to DHCP clients. By default, the local-proxy-server will always make use of the lease-time information provide by either a RADIUS or DHCP server. The no form of this command disables the use of the lease-time command. The local proxy server will use the lease time offered by either a RADIUS or DHCP server.
Default	7 days 0 hours 0 seconds
Parameters	<i>days</i> — Specifies the number of days that the given IP address is valid. Values 0 — 3650 <i>hours</i> — Specifies the number of hours that the given IP address is valid. Values 0 — 23 <i>minutes</i> — Specifies the number of minutes that the given IP address is valid. Values 0 — 59 <i>seconds</i> — Specifies the number of seconds that the given IP address is valid. Values 0 — 59

snoop

Syntax	[no] snoop
Context	config>service>vpls>sap>dhcp config>service>vpls>spoke-sdp>dhcp config>service>vpls>mesh-sdp>dhcp
Description	This command enables DHCP snooping of DHCP messages on the SAP or SDP. Enabling DHCP snooping on VPLS interfaces (SAPs and SDP bindings) is required where DHCP messages important to lease state table population are received, or where Option 82 information is to be inserted. This includes interfaces that are in the path to receive messages from either DHCP servers or from subscribers. Use the no form of the command to disable DHCP snooping on the specified VPLS SAP or SDP binding.
Default	no snoop

VPLS STP Commands

stp

Syntax	stp
Context	config>service>vpls config>service>vpls>sap config>service>vpls>spoke-sdp
Description	This command enables the context to configure the Spanning Tree Protocol (STP) parameters. Alcatel-Lucent's STP is simply the Spanning Tree Protocol (STP) with a few modifications to better suit the operational characteristics of VPLS services. The most evident change is to the root bridge election. Since the core network operating between Alcatel-Lucent's service routers should not be blocked, the root path is calculated from the core perspective.

auto-edge

Syntax	auto-edge no auto-edge
Context	config>service>vpls>sap>stp config>service>vpls>spoke-sdp>stp
Description	This command configures automatic detection of the edge port characteristics of the SAP or spoke SDP. If auto-edge is enabled, and STP concludes there is no bridge behind the spoke SDP, the OPER_EDGE variable will dynamically be set to true. If auto-edge is enabled, and a BPDU is received, the OPER_EDGE variable will dynamically be set to true (see edge-port on page 662). The no form of this command returns the auto-detection setting to the default value.
Default	auto-edge

edge-port

Syntax	[no] edge-port
Context	config>service>vpls>sap>stp config>service>vpls>spoke-sdp>stp
Description	This command configures the SAP or SDP as an edge or non-edge port. If auto-edge is enabled for the SAP, this value will be used only as the initial value. NOTE: The function of the edge-port command is similar to the rapid-start command. It tells RSTP that it is on the edge of the network (for example, there are no other bridges connected to that port)

and, as a consequence, it can immediately transition to a forwarding state if the port becomes available.

RSTP, however, can detect that the actual situation is different from what **edge-port** may indicate.

Initially, the value of the SAP or spoke SDP parameter is set to edge-port. This value will change if:

- A BPDU is received on that port. This means that after all there is another bridge connected to this port. Then the edge-port becomes disabled.
- If auto-edge is configured and no BPDU is received within a certain period of time, RSTP concludes that it is on an edge and enables the edge-port.

The **no** form of this command returns the edge port setting to the default value.

Default no edge-port

forward-delay

Syntax **forward-delay** *seconds*
no forward-delay

Context config>service>vpls>stp

Description RSTP, as defined in the IEEE 802.1D-2004 standards, will normally transition to the forwarding state via a handshaking mechanism (rapid transition), without any waiting times. If handshaking fails (e.g. on shared links, see below), the system falls back to the timer-based mechanism defined in the original STP (802.1D-1998) standard.

A shared link is a link with more than two nodes (for example, a shared 10/100BaseT segment). The `port-type` command is used to configure a link as point-to-point or shared.

For timer-based transitions, the 802.1D-2004 standard defines an internal variable forward-delay, which is used in calculating the default number of seconds that a SAP or spoke SDP spends in the discarding and learning states when transitioning to the forwarding state.

The value of the forward-delay variable depends on the STP operating mode of the VPLS instance:

- in `rstp` or `mstp` mode, but only when the SAP or spoke SDP has not fallen back to legacy STP operation, the value configured by the `hello-time` command is used;
- in all other situations, the value configured by the `forward-delay` command is used.

Default 15 seconds

Parameters *seconds* — The forward delay timer for the STP instance in seconds.

Values 4 — 30

hello-time

Syntax **hello-time** *hello-time*
no hello-time

Context config>service>vpls>stp

Description	This command configures the Spanning Tree Protocol (STP) hello time for the Virtual Private LAN Service (VPLS) STP instance. The hello time parameter defines the default timer value that controls the sending interval between BPDU configuration messages by this bridge, on ports where this bridge assumes the designated role. The active hello time for the spanning tree is determined by the root bridge (except when the STP is running in RSTP mode, then the hello time is always taken from the locally configured parameter). The configured hello-time can also be used to calculate the forward delay. See auto-edge on page 662. The no form of this command returns the hello time to the default value.
Default	2 seconds
Parameters	<i>hello-time</i> — The hello time for the STP instance in seconds.
Values	1 — 10

hold-count

Syntax	hold-count <i>BDPU tx hold count</i> no hold-count
Context	config>service>vpls>stp
Description	This command configures the peak number of BPDUs that can be transmitted in a period of one second. The no form of this command returns the hold count to the default value
Default	6
Parameters	<i>BDPU tx hold count</i> — The hold count for the STP instance in seconds.
Values	1 — 10

link-type

Syntax	link-type {pt-pt shared} no link-type
Context	config>service>vpls>sap>stp config>service>vpls>spoke-sdp>stp
Description	This command instructs STP on the maximum number of bridges behind this SAP or spoke SDP. If there is only a single bridge, transitioning to forwarding state will be based on handshaking (fast transitions). If more than two bridges are connected via a shared media, their SAP or spoke SDPs should all be configured as shared, and timer-based transitions are used. The no form of this command returns the link type to the default value.
Default	pt-pt

mst-instance

Syntax	mst-instance <i>mst-inst-number</i>
Context	config>service>vpls>sap>stp
Description	This command enables the context to configure MSTI related parameters at SAP level. This context can be open only for existing mst-instances defined at the service level (see mst-instance).
Default	none
Parameters	<i>mst-inst-number</i> — Specifies an existing Multiple Spanning Tree Instance number. Values 1 — 4094

mst-path-cost

Syntax	mst-path-cost <i>inst-path-cost</i> no mst-path-cost
Context	config>service>vpls>sap>stp>mst-instance
Description	This commands specifies path-cost within a given instance, expressing probability that a given port will be put into the forwarding state in case a loop occurs (the highest value expresses lowest priority). The no form of this command sets port-priority to its default value.
Default	The path-cost is proportional to link speed.
Parameters	<i>inst-path-cost</i> — Specifies the contribution of this port to the MSTI path cost of paths towards the spanning tree regional root which include this port. Values 1 — 200000000

mst-port-priority

Syntax	mst-port-priority <i>stp-priority</i> no mst-port-priority
Context	config>service>vpls>sap>stp>mst-instance
Description	This commands specifies the port priority within a given instance, expressing probability that a given port will be put into the forwarding state if a loop occurs. The no form of this command sets port-priority to its default value.
Default	128
Parameters	<i>stp-priority</i> — Specifies the value of the port priority field.

max-age

Syntax	max-age <i>seconds</i> no max-age
Context	config>service>vpls>stp
Description	This command indicates how many hops a BPDU can traverse the network starting from the root bridge. The message age field in a BPDU transmitted by the root bridge is initialized to 0. Each other bridge will take the message_age value from BPDUs received on their root port and increment this value by 1. The message_age thus reflects the distance from the root bridge. BPDUs with a message age exceeding max-age are ignored. STP uses the max-age value configured in the root bridge. This value is propagated to the other bridges via the BPDUs. The no form of this command returns the max age to the default value.
Default	20 seconds
Parameters	<i>seconds</i> — The max info age for the STP instance in seconds. Allowed values are integers in the range 6 to 40.

mode

Syntax	mode { rstp comp-dot1w dot1w mstp pmstp } no mode
Context	config>service>vpls>stp
Description	This command specifies the version of Spanning Tree Protocol the bridge is currently running. See section Spanning Tree Operating Modes on page 435 for details on these modes. The no form of this command returns the STP variant to the default.
Default	rstp
Parameters	rstp — Corresponds to the Rapid Spanning Tree Protocol specified in IEEE 802.1D/D4-2003. dot1w — Corresponds to the mode where the Rapid Spanning Tree is backward compatible with IEEE 802.1w. compdot1w — Corresponds to the Rapid Spanning Tree Protocol fully conformant to IEEE 802.1w. mstp — Sets MSTP as the STP mode of operation. Corresponds to the Multiple Spanning Tree Protocol specified in 802.1Q REV/D5.0-09/2005 pmstp — The PMSTP mode is only supported in VPLS services where the mVPLS flag is configured.

mst-instance

Syntax	[no] mst-instance <i>mst-inst-number</i>
Context	config>service>vpls>stp
Description	This command creates the context to configure MST instance (MSTI) related parameters. Up to 16 instances will be supported by MSTP. The instance 0 is mandatory by protocol and therefore, it cannot be created by the CLI. The software will maintain this instance automatically.
Default	none
Parameters	<i>mst-inst-number</i> — Specifies the Multiple Spanning Tree instance.
Values	1 — 4094

mst-priority

Syntax	mst-priority <i>bridge-priority</i> no mst-priority
Context	config>service>vpls>stp>mst-instance
Description	This command specifies the bridge priority for this specific Multiple Spanning Tree Instance for this service. The <i>bridge-priority</i> value reflects likelihood that the switch will be chosen as the regional root switch (65535 represents the least likely). It is used as the highest 4 bits of the Bridge ID included in the MSTP BPDU's generated by this bridge. The priority can only take on values that are multiples of 4096 (4k). If a value is specified that is not a multiple of 4K, then the value will be replaced by the closest multiple of 4K, which is lower than the value entered. The no form of this command sets the bridge-priority to its default value.
Default	32768 — All instances created by vlan-range command and not having explicit definition of bridge-priority will inherit default value.
Parameters	<i>bridge-priority</i> — Specifies the priority of this specific Multiple Spanning Tree Instance for this service.
Values	0 — 65535

vlan-range

Syntax	[no] vlan-range [<i>vlan-range</i>]
Context	config>service>vpls>stp>mst-instance
Description	This command specifies a range of VLANs associated with a certain MST-instance. This range applies to all SAPs of the mVPLS. Every VLAN range that is not assigned within any of the created mst-instance is automatically assigned to mst-instance 0. This instance is automatically maintained by the software and cannot be

modified. Changing the VLAN range value can be performed only when the given mst-instance is shutdown.

The **no** form of this command removes the **vlan-range** from given **mst-instance**.

Parameters	<i>vlan-range</i> — The first VLAN range specifies the left-bound (i.e., minimum value) of a range of VLANs that are associated with the mVPLS SAP. This value must be smaller than (or equal to) the second VLAN range value. The second VLAN range specifies the right-bound (i.e., maximum value) of a range of VLANs that are associated with the mVPLS SAP. Values 1 to 4094 — 1 to 4094

mst-max-hops

Syntax	mst-max-hops <i>hops-count</i> no mst-max-hops
Context	config>service>vpls>stp
Description	This command specifies the number of hops in the region before BPDU is discarded and the information held for the port is aged out. The root bridge of the instance sends a BPDU (or M-record) with remaining-hop-count set to configured <<i>max-hops</i>>. When a bridge receives the BPDU (or M-record), it decrements the received remaining-hop-count by 1 and propagates it in BPDU (or M-record) it generates. The no form of this command sets the <i>hops-count</i> to its default value.
Default	20
Parameters	<i>hops-count</i> — Specifies the maximum number of hops. Values 1 — 40

mst-name

Syntax	mst-name <i>region-name</i> no mst-name
Context	config>service>vpls>stp
Description	This command defines an MST region name. Two bridges are considered as a part of the same MST region as soon as their configuration of the MST region name, the MST-revision and VLAN-to-instance assignment is identical. The no form of this command removes <i>region-name</i> from the configuration.
Default	no mst-name
Parameters	<i>region-name</i> — Specifies an MST-region name up to 32 characters in length.

mst-revision

Syntax	mst-revision <i>revision-number</i>
Context	config>service>vpls>stp
Description	This command defines the MST configuration revision number. Two bridges are considered as a part of the same MST region as soon as their configuration of MST-region name, MST-revision and VLAN-to-instance assignment is identical. The no form of this command returns MST configuration revision to its default value.
Default	0
Parameters	<i>revision-number</i> — Specifies the MSTP region revision number to define the MSTP region.
Values	0 — 65535

path-cost

Syntax	path-cost <i>sap-path-cost</i> no path-cost
Context	config>service>vpls>sap>stp config>service>vpls>spoke-sdp>stp
Description	This command configures the Spanning Tree Protocol (STP) path cost for the SAP or spoke SDP. The path cost is used by STP to calculate the path cost to the root bridge. The path cost in BPDUs received on the root port is incremented with the configured path cost for that SAP or spoke SDP. When BPDUs are sent out other egress SAPs or spoke SDPs, the newly calculated root path cost is used. These are the values used for CIST when running MSTP. STP suggests that the path cost is defined as a function of the link bandwidth. Since SAPs and spoke SDPs are controlled by complex queuing dynamics, in the 7750 SR the STP path cost is a purely static configuration. The no form of this command returns the path cost to the default value. <i>path-cost</i> — The path cost for the SAP or spoke SDP. Values 1 — 200000000 (1 is the lowest cost) Default 10

port-num

Syntax	[no] port-num <i>virtual-port-number</i>
Context	config>service>vpls>sap>stp config>service>vpls>spoke-sdp>stp
Description	This command configures the virtual port number which uniquely identifies a SAP within configuration bridge protocol data units (BPDUs). The internal representation of a SAP is unique to a

system and has a reference space much bigger than the 12 bits definable in a configuration BPDU. STP takes the internal representation value of a SAP and identifies it with its own virtual port number that is unique to every other SAP defined on the TLS. The virtual port number is assigned at the time that the SAP is added to the TLS. Since the order that the SAP was added to the TLS is not preserved between reboots of the system, the virtual port number may change between restarts of the STP instance.

The virtual port number cannot be administratively modified.

priority

Syntax	priority <i>bridge-priority</i> no priority
Context	config>service>vpls>stp
Description	The bridge-priority command is used to populate the priority portion of the bridge ID field within outbound BPDUs (the most significant 4 bits of the bridge ID). It is also used as part of the decision process when determining the best BPDU between messages received and sent. All values will be truncated to multiples of 4096, conforming with IEEE 802.1t and 802.1D-2004. The no form of this command returns the bridge priority to the default value.
Default	By default, the bridge priority is configured to 4096 which is the highest priority.
Parameters	<i>bridge-priority</i> — The bridge priority for the STP instance. Values Allowed values are integers in the range of 4096 — 65535 with 4096 being the highest priority. The actual bridge priority value stored/used is the number entered with the lowest 12 bits masked off which means the actual range of values is 4096 to 61440 in increments of 4096.

priority

Syntax	priority <i>stp-priority</i> no priority
Context	config>service>vpls>spoke-sdp config>service>vpls>sap>stp
Description	This command configures the Alcatel-Lucent Spanning Tree Protocol (STP) priority for the SAP or spoke SDP. STP priority is a configurable parameter associated with a SAP or spoke SDP. When configuration BPDUs are received, the priority is used in some circumstances as a tie breaking mechanism to determine whether the SAP or spoke SDP will be designated or blocked. In traditional STP implementations (802.1D-1998), this field is called the port priority and has a value of 0 to 255. This field is coupled with the port number (0 to 255 also) to create a 16 bit value. In the latest STP standard (802.1D-2004) only the upper 4 bits of the port priority field are used to encode the SAP or spoke SDP priority. The remaining 4 bits are used to extend the port ID field into a 12 bit

virtual port number field. The virtual port number uniquely references a SAP or spoke SDP within the STP instance.

STP computes the actual priority by taking the input value and masking out the lower four bits. The result is the value that is stored in the SDP priority parameter. For instance, if a value of 0 is entered, masking out the lower 4 bits results in a parameter value of 0. If a value of 255 is entered, the result is 240.

The **no** form of this command returns the STP priority to the default value.

Default 128

Parameters *stp-priority* — The STP priority value for the SAP or spoke SDP. Allowed values are integer in the range of 0 to 255, 0 being the highest priority. The actual value used for STP priority (and stored in the configuration) will be the result of masking out the lower 4 bits, thus the actual value range is 0 to 240 in increments of 16.

Default 128

VPLS SAP Commands

sap

Syntax	sap <i>sap-id</i> [split-horizon-group <i>group-name</i>][capture-sap] [create] no sap <i>sap-id</i>
Context	config>service>vpls
Description	This command creates a Service Access Point (SAP) within a service. A SAP is a combination of port and encapsulation parameters which identifies the service access point on the interface and within the 7750. Each SAP must be unique. All SAPs must be explicitly created. If no SAPs are created within a service or on an IP interface, a SAP will not exist on that object. Enter an existing SAP without the create keyword to edit SAP parameters. The SAP is owned by the service in which it was created. A SAP can only be associated with a single service. A SAP can only be defined on a port that has been configured as an access port using the config interface port-type port-id mode access command. Channelized TDM ports are always access ports. If a port is shutdown, all SAPs on that port become operationally down. When a service is shutdown, SAPs for the service are not displayed as operationally down although all traffic traversing the service will be discarded. The operational state of a SAP is relative to the operational state of the port on which the SAP is defined. The no form of this command deletes the SAP with the specified port. When a SAP is deleted, all configuration parameters for the SAP will also be deleted. For Internet Enhanced Service (IES), the IP interface must be shutdown before the SAP on that interface may be removed.
Default	No SAPs are defined.
Special Cases	A VPLS SAP can be defined with Ethernet ports, SONET/SDH or TDM channels. Up to 127 SAPs can be defined in a VPLS service per Media Dependent Adapter (MDA). Attempts to create more than 127 SAPs will generate an error. Up to 49 SDPs can be associated with a VPLS in a single router. Each SDP must have a unique destination or an error will be generated. Split horizon groups can only be created in the scope of a VPLS service. A default SAP has the following format: port-id:*. This type of SAP is supported only on Ethernet MDAs and its creation is allowed only in the scope of Layer 2 services (Epipe and VPLS). This type of SAP is mutually exclusive with a SAP defined by explicit null encapsulation (for example, 1/1/1:0).
Parameters	sap-id — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax. create — Keyword used to create a SAP instance. The create keyword requirement can be enabled/disabled in the environment>create context. split-horizon-group group-name — Specifies the name of the split horizon group to which the SAP belongs.

capture-sap — Specifies a capturing SAP in which triggering packets will be sent to the CPM. Non-triggering packets captured by the capture SAP will be dropped.

discard-unknown-source

Syntax	[no] discard-unknown-source
Context	config>service>vpls>sap config>service>vpls>spoke-sdp
Description	When this command is enabled, packets received on a SAP or a spoke SDP with an unknown source MAC address will be dropped only if the maximum number of MAC addresses for that SAP or spoke SDP (see max-nbr-mac-addr on page 681) has been reached. If max-nbr-mac-addr has not been set for the SAP or spoke SDP, enabling discard-unknown-source has no effect. When disabled, the packets are forwarded based on the destination MAC addresses. The no form of this command causes packets with an unknown source MAC addresses to be forwarded by destination MAC addresses in VPLS.
Default	no discard-unknown

ETH-CFM Service Commands

eth-cfm

Syntax	eth-cfm
Context	config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp config>service>vpls config>service>vpls>sap
Description	This command enables the context to configure ETH-CFM parameters.

eth-tunnel

Syntax	eth-tunnel
Context	config>service>vpls>sap
Description	The command enables the context to configure Ethernet Tunnel SAP parameters.

path

Syntax	path <i>path-index</i> tag <i>qtag</i> [<i>.qtag</i>] no path <i>path-index</i>
Context	config>service>vpls>sap>eth-tunnel
Description	This command configures Ethernet tunnel SAP path parameters. The no form of the command removes the values from the configuration.
Default	none
Parameters	<i>path-index</i> — Specifies the path index value. Values 1 — 16 tag <i>qtag</i> [<i>.qtag</i>] — Specifies the qtag value. Values 0 — 4094, *

mep

Syntax	mep <i>mep-id</i> domain <i>md-index</i> association <i>ma-index</i> [direction { up down }] no mep <i>mep-id</i> domain <i>md-index</i> association <i>ma-index</i>
Context	config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp>eth-cfm config>service>vpls>eth-cfm config>service>vpls>sap>eth-cfm
Description	This command configures a SAP ETH-CFM maintenance endpoint (MEP).
Parameters	<i>mep-id</i> — Specifies the maintenance association end point identifier. Values 1 — 8191 <i>md-index</i> — Specifies the maintenance domain (MD) index value. Values 1 — 4294967295 <i>ma-index</i> — Specifies the MA index value. Values 1 — 4294967295 direction up down — Indicates the direction in which the maintenance association (MEP or MIP) faces on the bridge port. down — Sends continuity check messages away from the MAC relay entity. up — Sends continuity check messages towards the MAC relay entity.

mip

Syntax	[no] mip
Context	config>service>vpls>eth-cfm config>service>vpls>sap>eth-cfm config>service>vpls>spoke-sdp>eth-cfm
Description	This command allows Maintenance Intermediate Points (MIPs) to be created if mhf-creation for the MA is set to default. The no form of the command disables the MIP creation.

ais-enable

Syntax	[no] ais-enable
Context	config>service>vpls>sap>eth-cfm>mep config>service>vpls>mesh-sdp>eth-cfm>mep config>service>vpls>spoke-sdp>eth-cfm>mep
Description	This command enables the generation and the reception of AIS messages.

client-meg-level

Syntax	client-meg-level <i>[[level [level ...]]</i> no client-meg-level				
Context	config>service>vpls>sap>eth-cfm>mep>ais-enable config>service>vpls>sap>eth-cfm>mep>ais-enable config>service>vpls>mesh-sdp>eth-cfm>mep>ais-enable config>service>vpls>spoke-sdp>eth-cfm>mep>ais-enable				
Description	This command configures the client maintenance entity group (MEG) level(s) to use for AIS message generation. Up to 7 levels can be provisioned with the restriction that the client MEG level must be higher than the local MEG level.				
Parameters	<i>level</i> — Specifies the client MEG level. <table> <tr> <td>Values</td><td>1 — 7</td></tr> <tr> <td>Default</td><td>1</td></tr> </table>	Values	1 — 7	Default	1
Values	1 — 7				
Default	1				

interval

Syntax	interval {1 60} no interval		
Context	config>service>vpls>sap>eth-cfm>mep>ais-enable config>service>vpls>mesh-sdp>eth-cfm>mep>ais-enable config>service>vpls>spoke-sdp>eth-cfm>mep>ais-enable		
Description	This command specifies the transmission interval of AIS messages in seconds.		
Parameters	1 60 — The transmission interval of AIS messages in seconds. <table> <tr> <td>Default</td><td>1</td></tr> </table>	Default	1
Default	1		

priority

Syntax	priority <i>priority-value</i> no priority				
Context	config>service>vpls>sap>eth-cfm>mep>ais-enable config>service>vpls>mesh-sdp>eth-cfm>mep>ais-enable config>service>vpls>spoke-sdp>eth-cfm>mep>ais-enable				
Description	This command specifies the priority of AIS messages originated by the node.				
Parameters	<i>priority-value</i> — Specify the priority value of the AIS messages originated by the node. <table> <tr> <td>Values</td><td>0 — 7</td></tr> <tr> <td>Default</td><td>1</td></tr> </table>	Values	0 — 7	Default	1
Values	0 — 7				
Default	1				

ais-enable

Syntax	[no] ais-enable
Context	config>service>vpls>sap>eth-cfm>mep
Description	This command configures the generation and reception of Alarm Indication Signal (AIS) message parameters.

client-meg-level

Syntax	client-meg-level [<i>level</i> [<i>level</i> ...]] no client-meg-level
Context	config>service>vpls>sap>eth-cfm>mep>ais-enable
Description	This command configures the client meg level.
Parameters	<i>level</i> — Specifies the level(s).
Values	1..7

interval

Syntax	interval {1 60} no interval
Context	config>service>vpls>sap>eth-cfm>mep>ais-enable
Description	This command configures the transmission interval of AIS messages.
Parameters	1 60 — Specifies, in seconds, the interval.
Default	1 second

priority

Syntax	priority <i>priority-value</i> no priority
Context	config>service>vpls>sap>eth-cfm>mep>ais-enable
Description	This command configures the priority of AIS messages originated by the node.
Parameters	<i>priority</i> — Specifies the priority.
Values	0..7
Default	7

ccm-enable

Syntax	[no] ccm-enable
Context	config>service>vpls>eth-cfm>mep config>service>vpls>sap>eth-cfm>mep config>service>vpls>mesh-sdp>mep config>service>vpls>spoke-sdp>eth-cfm>mep
Description	This command enables the generation of CCM messages. The no form of the command disables the generation of CCM messages.

ccm-ltm-priority

Syntax	ccm-ltm-priority <i>priority</i> no ccm-ltm-priority
Context	config>service>vpls>eth-cfm>mep config>service>vpls>sap>eth-cfm>mep config>service>vpls>mesh-sdp>mep config>service>vpls>spoke-sdp>eth-cfm>mep
Description	This command specifies the priority value for CCMs and LTMs transmitted by the MEP. The no form of the command removes the priority value from the configuration.
Default	The highest priority on the bridge-port.
Parameters	<i>priority</i> — Specifies the priority of CCM and LTM messages. Values 0 — 7

eth-test-enable

Syntax	[no] eth-test-enable
Context	config>service>vpls>sap>eth-cfm>mep config>service>vpls>spoke-sdp>eth-cfm>mep
Description	For ETH-test to work, operators need to configure ETH-test parameters on both sender and receiver nodes. The ETH-test then can be done using the following OAM commands: oam eth-cfm eth-test <i>mac-address</i> mep <i>mep-id</i> domain <i>md-index</i> association <i>ma-index</i> [priority <i>priority</i>] [data-length <i>data-length</i>] A check is done for both the provisioning and test to ensure the MEP is an Y.1731 MEP (MEP provisioned with domain format none, association format icc-based). If not, the operation fails. An error message in the CLI and SNMP will indicate the problem.

test-pattern

Syntax	test-pattern {all-zeros all-ones} [crc-enable] no test-pattern
Context	config>service>vpls>sap>eth-cfg>mep config>service>vpls>spoke-sdp>eth-cfm>mep
Description	This command configures the test pattern for eth-test frames. The no form of the command removes the values from the configuration.
Parameters	all-zeros — Specifies to use all zeros in the test pattern. all-ones — Specifies to use all ones in the test pattern. crc-enable — Generates a CRC checksum.
Default	all-zeros

fault-propagation-enable

Syntax	fault-propagation-enable {use-if-tlv suspend-ccm} no fault-propagation-enable
Context	config>service>vpls>mesh-sdp>eth-cfm>mep config>service>vpls>sap>eth-cfm>mep config>service>vpls>spoke-sdp>eth-cfm>mep
Description	This command configures the fault propagation for the MEP.
Parameters	use-if-tlv — Specifies to use the interface TLV. suspend-ccm — Specifies to suspend the continuity check messages.

low-priority-defect

Syntax	low-priority-defect {allDef macRemErrXcon remErrXcon errXcon xcon noXcon}						
Context	config>service>vpls>mesh-sdp>eth-cfm>mep config>service>vpls>>spoke-sdp>eth-cfm>mep config>service>vpls>eth-cfm>mep config>service>vpls>sap>eth-cfm>mep						
Description	This command specifies the lowest priority defect that is allowed to generate a fault alarm.						
Default	remErrXcon						
Values	<table> <tr> <td>allDef</td><td>DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>macRemErrXconOnly</td><td>DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>remErrXcon</td><td>Only DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> </table>	allDef	DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM	macRemErrXconOnly	DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM	remErrXcon	Only DefRemoteCCM, DefErrorCCM, and DefXconCCM
allDef	DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM						
macRemErrXconOnly	DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM						
remErrXcon	Only DefRemoteCCM, DefErrorCCM, and DefXconCCM						

errXcon	Only DefErrorCCM and DefXconCCM
xcon	Only DefXconCCM; or
noXcon	No defects DefXcon or lower are to be reported

mac-address

Syntax	mac-address <i>mac-address</i> no mac-address
Context	config>service>vpls>eth-cfm>mep config>service>vpls>>spoke-sdp>eth-cfm>mep config>service>vpls>mesh-sdp>eth-cfm>mep config>service>vpls>sap>eth-cfm>mep
Description	This command specifies the MAC address of the MEP. The no form of this command reverts the MAC address of the MEP back to that of the port (if the MEP is on a SAP) or the bridge (if the MEP is on a spoke).
Parameters	<i>mac-address</i> — Specifies the MAC address of the MEP. Values 6-byte mac-address in the form of xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx of the MEP. Must be unicast. Using the all zeros address is equivalent to the no form of this command.

one-way-delay-threshold

Syntax	one-way-delay-threshold <i>seconds</i>
Context	config>service>vpls>sap>eth-cfm>mep
Description	This command enables/disables eth-test functionality on MEP.
Parameters	<i>seconds</i> — Specifies the one way delay threshold, in seconds. Values 0..600 Default 3

limit-mac-move

Syntax	limit-mac-move [blockable non-blockable] no limit-mac-move
Context	config>service>vpls>spoke-sdp config>service>vpls>sap
Description	This command indicates whether or not the mac-move agent, when enabled using config>service>vpls>mac-move or config>service>epipe>mac-move , will limit the MAC re-learn (move) rate on this SAP.

Default	blockable
Parameters	blockable — The agent will monitor the MAC re-learn rate on the SAP, and it will block it when the re-learn rate is exceeded. non-blockable — When specified, this SAP will not be blocked, and another blockable SAP will be blocked instead.

mac-pinning

Syntax	[no] mac-pinning
Context	<pre>config>service>vpls>spoke-sdp config>service>vpls>mesh-sdp config>service>vpls>sap config>service>vpls>endpoint</pre>
Description	Enabling this command will disable re-learning of MAC addresses on other SAPs within the VPLS. The MAC address will remain attached to a given SAP for duration of its age-timer. The age of the MAC address entry in the FIB is set by the age timer. If mac-aging is disabled on a given VPLS service, any MAC address learned on a SAP/SDP with mac-pinning enabled will remain in the FIB on this SAP/SDP forever. Every event that would otherwise result in re-learning will be logged (MAC address; original-SAP; new-SAP). Note that MAC addresses learned during DHCP address assignment (DHCP snooping enabled) are not impacted by this command. MAC-pinning for such addresses is implicit.
Default	When a SAP or spoke SDP is part of a Residential Split Horizon Group (RSHG), MAC pinning is activated at creation of the SAP. Otherwise, MAC pinning is not enabled by default.

max-nbr-mac-addr

Syntax	max-nbr-mac-addr <i>table-size</i> no max-nbr-mac-addr
Context	<pre>config>service>vpls>sap config>service>vpls>spoke-sdp config>service>vpls>endpoint</pre>
Description	This command specifies the maximum number of FDB entries for both learned and static MAC addresses for this SAP, spoke SDP or endpoint. When the configured limit has been reached, and discard-unknown-source has been enabled for this SAP or spoke SDP (see discard-unknown-source on page 673), packets with unknown source MAC addresses will be discarded. The no form of the command restores the global MAC learning limitations for the SAP or spoke SDP.
Default	no max-nbr-mac-addr
Parameters	<i>table-size</i> — Specifies the maximum number of learned and static entries allowed in the FDB of this service.

Values 1 — 511999
 Chassis-mode C limit: 196607
 Chassis-mode D limit: 511999

mc-endpoint

Syntax **mc-endpoint** *mc-ep-id*
mc-endpoint

Context config>service>vpls>endpoint

Description This command specifies the identifier associated with the multi-chassis endpoint. This value should be the same on both MC-EP peers for the pseudowires that must be part of the same group.
 The **no** form of this command removes the endpoint from the MC-EP. Single chassis behavior applies.

Default no mc-endpoint

Parameters *mc-ep-id* — Specifies a multi-chassis endpoint ID.
Values 1 — 4294967295

mc-ep-peer

Syntax **mc-ep-peer** *name*
mc-ep-peer *ip-address*
no mc-ep-peer

Context config>service>vpls>endpoint>mc-ep

Description This command adds multi-chassis endpoint object.
 The **no** form of this command removes the MC-Endpoint object.

Default mc-endpoint is not provisioned.

Parameters *name* — Specifies the name of the multi-chassis end-point peer.
ip-address — Specifies the IP address of multi-chassis end-point peer.

msap-defaults

Syntax **msap-defaults**

Context config>service>vpls>sap

Description This command configures the msap-defaults.

service

Syntax	[no] service <i>service-id</i>
Context	config>service>vpls>sap>msap-defaults
Description	This command sets default service for all subscribers created based on trigger packets received on the given capture SAP in case the corresponding VSA is not included in RADIUS authentication response. This command is applicable to capture SAP only.
Default	no service.

policy

Syntax	policy <i>msap-policy-name</i> no policy
Context	config>service>vpls>sap>msap-defaults
Description	This command sets default msap-policy for all subscribers created based on trigger packets received on the given capture-sap in case the corresponding VSA is not included in the RADIUS authentication response. This command is applicable to capture SAP only.
Default	no policy

multi-service-site

Syntax	multi-service-site <i>customer-site-name</i> no multi-service-site
Context	config>service>vpls>sap
Description	This command associates the SAP with a <i>customer-site-name</i>. If the specified <i>customer-site-name</i> does not exist in the context of the service customer ID an error occurs and the command will not execute. If <i>customer-site-name</i> exists, the current and future defined queues on the SAP (ingress and egress) will attempt to use the scheduler hierarchies created within <i>customer-site-name</i> as parent schedulers. This command is mutually exclusive with the SAP ingress and egress scheduler-policy commands. If a scheduler-policy has been applied to either the ingress or egress nodes on the SAP, the multi-service-site command will fail without executing. The locally applied scheduler policies must be removed prior to executing the multi-service-site command. The no form of the command removes the SAP from any multi-service customer site the SAP belongs to. Removing the site can cause existing or future queues to enter an orphaned state.
Default	None

customer-site-name — The customer-site-name must exist in the context of the customer-id defined as the service owner. If customer-site-name exists and local scheduler policies have not been applied to the SAP, the current and future queues defined on the SAP will look for their parent schedulers within the scheduler hierarchies defined on customer-site-name.

Values Any valid customer-site-name created within the context of the customer-id.

precedence

Syntax	precedence [<i>precedence-value</i> primary] no precedence
Context	config>service>vpls>spoke-sdp
Description	This command configures the precedence of this SDP bind when there are multiple SDP binds attached to one service endpoint. When an SDP bind goes down, the next highest precedence SDP bind begins forwarding traffic.
Parameters	<i>precedence-value</i> — Specifies the precedence of this SDP bind. Values 1 — 4 <i>primary</i> — Assigns this as the primary spoke-sdp.

static-mac

Syntax	[no] static-mac <i>ieee-mac-address</i> [create]
Context	config>service>vpls>sap config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp
Description	This command creates a local static MAC entry in the Virtual Private LAN Service (VPLS) forwarding database (FDB) associated with the Service Access Point (SAP). In a VPLS service, MAC addresses are associated with a Service Access Point (SAP) or with a Service Distribution Point (SDP). MACs associated with a SAP are classified as local MACs, and MACs associated with an SDP are remote MACs. Local static MAC entries create a permanent MAC address to SAP association in the forwarding database for the VPLS instance so that MAC address will not be learned on the edge device. Note that static MAC definitions on one edge device are not propagated to other edge devices participating in the VPLS instance, that is, each edge device has an independent forwarding database for the VPLS. Only one static MAC entry (local or remote) can be defined per MAC address per VPLS instance. By default, no static MAC address entries are defined for the SAP. The no form of this command deletes the static MAC entry with the specified MAC address associated with the SAP from the VPLS forwarding database.
Parameters	<i>ieee-mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i>, <i>bb</i>, <i>cc</i>, <i>dd</i>, <i>ee</i> and <i>ff</i> are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses. create — This keyword is mandatory when specifying a static MAC address.

managed-vlan-list

Syntax	managed-vlan-list
Context	config>service>vpls>sap
Description	This command enables the context to configure VLAN ranges to be managed by a management VPLS. The list indicates, for each SAP, the ranges of associated VLANs that will be affected when the SAP changes state. This managed-vlan-list is not used when STP mode is MSTP in which case the vlan-range is taken from the config>service>vpls>stp>msti configuration. This command is only valid when the VPLS in which it is entered was created as a management VPLS.

default-sap

Syntax	[no] default-sap
Context	config>service>vpls>sap>managed-vlan-list
Description	This command adds a default SAP to the managed VLAN list. The no form of the command removes the default SAP to the managed VLAN list.

range

Syntax	[no] range <i>vlan-range</i>
Context	config>service>vpls>sap>managed-vlan-list
Description	This command configures a range of VLANs on an access port that are to be managed by an existing management VPLS. This command is only valid when the VPLS in which it is entered was created as a management VPLS, and when the SAP in which it was entered was created on an Ethernet port with encapsulation type of dot1q or qinq, or on a Sonet/SDH port with encapsulation type of bcp-dot1q. To modify the range of VLANs, first the new range should be entered and afterwards the old range removed. See Modifying VPLS Service Parameters on page 586.
Default	None
Parameters	<i>vlan-range</i> — Specify the VLAN start value and VLAN end value. The end-vlan must be greater than start-vlan. The format is <start-vlan>-<end-vlan> Values start-vlan: 0 — 4094 end-vlan: 0 — 4094

VPLS SAP ATM Commands

atm

Syntax	atm
Context	config>service>vpls>sap
Description	This command enables access to the context to configure ATM-related attributes. This command can only be used when a given context (for example, a channel or SAP) supports ATM functionality such as: • Configuring ATM port or ATM port-related functionality on MDAs supporting ATM functionality • Configuring ATM-related configuration for ATM-based SAPs that exist on MDAs supporting ATM functionality. If ATM functionality is not supported for a given context, the command returns an error.

egress

Syntax	egress
Context	config>service>vpls>sap>atm
Description	This command enables the context to configure egress ATM attributes for the SAP.

encapsulation

Syntax	encapsulation <i>atm-encap-type</i>		
Context	config>service>vpls>sap>atm		
Description	This command specifies the data encapsulation for an ATM PVCC delimited SAP. The definition references RFC 2684, <i>Multiprotocol Encapsulation over ATM AAL5</i>, and to the ATM Forum LAN Emulation specification. Ingress traffic that does not match the configured encapsulation will be dropped.		
Default	The encapsulation is driven by the services for which the SAP is configured. For IES and VPRN service SAPs, the default is aal5snap-routed.		
Parameters	<i>atm-encap-type</i> — Specify the encapsulation type. <table> <tr> <td>Values</td><td> aal5snap-routed — Routed encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684. aal5mux-ip — Routed IP encapsulation for VC multiplexed circuit as defined in RFC 2684. </td></tr> </table>	Values	aal5snap-routed — Routed encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684. aal5mux-ip — Routed IP encapsulation for VC multiplexed circuit as defined in RFC 2684.
Values	aal5snap-routed — Routed encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684. aal5mux-ip — Routed IP encapsulation for VC multiplexed circuit as defined in RFC 2684.		

ingress

Syntax	ingress
Context	config>service>vpls>sap>atm
Description	This command enables the context to configure ingress ATM attributes for the SAP.

traffic-desc

Syntax	traffic-desc <i>traffic-desc-profile-id</i> no traffic-desc
Context	config>service>vpls>sap>atm>ingress config>service>vpls>sap>atm>egress
Description	This command assigns an ATM traffic descriptor profile to a given context (for example, a SAP). When configured under the ingress context, the specified traffic descriptor profile defines the traffic contract in the forward direction. When configured under the egress context, the specified traffic descriptor profile defines the traffic contract in the backward direction. The no form of the command reverts the traffic descriptor to the default traffic descriptor profile.
Default	The default traffic descriptor (trafficDescProfileId. = 1) is associated with newly created PVCC-delimited SAPs.
Parameters	<i>traffic-desc-profile-id</i> — Specify a defined traffic descriptor profile (see the QoS atm-td-profile command).

oam

Syntax	oam
Context	config>service>vpls>sap>atm
Description	This command enables the context to configure OAM functionality for a PVCC delimiting a SAP. The ATM-capable MDAs support F5 end-to-end OAM functionality (AIS, RDI, Loopback): • ITU-T Recommendation I.610 - B-ISDN Operation and Maintenance Principles and Functions version 11/95 • GR-1248-CORE - Generic Requirements for Operations of ATM Network Elements (NEs). Issue 3 June 1996 • GR-1113-CORE - Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994

alarm-cells

Syntax	[no] alarm-cells
Context	config>service>vpls>sap>atm
Description	This command configures AIS/RDI fault management on a PVCC. Fault management allows PVCC termination to monitor and report the status of their connection by propagating fault information through the network and by driving PVCC's operational status. When alarm-cells functionality is enabled, a PVCC's operational status is affected when a PVCC goes into an AIS or RDI state because of an AIS/RDI processing (assuming nothing else affects PVCC's operational status, for example, if the PVCC goes DOWN, or enters a fault state and comes back UP, or exits that fault state). RDI cells are generated when PVCC is operationally DOWN. No OAM-specific SNMP trap is raised whenever an endpoint enters/exits an AIS or RDI state, however, if as result of an OAM state change, the PVCC changes operational status, then a trap is expected from an entity the PVCC is associated with (for example a SAP). The no command disables alarm-cells functionality for a PVCC. When alarm-cells functionality is disabled, the PVCC's operational status is no longer affected by the PVCC's OAM state changes due to AIS/RDI processing. Note that when alarm-cells is disabled, a PVCC will change operational status to UP from DOWN due to alarm-cell processing). RDI cells are not generated as result of PVCC going into an AIS or RDI state, however, the PVCC's OAM status will record OAM faults as described above.
Default	Enabled for PVCCs delimiting VPLS SAPs.

VPLS Filter and QoS Policy Commands

egress

Syntax	egress
Context	config>service>vpls>sap
Description	This command enables the context to configure egress filter policies. If no sap-egress QoS policy is defined, the system default sap-egress QoS policy is used for egress processing. If no egress filter is defined, no filtering is performed.

ingress

Syntax	ingress
Context	config>service>vpls>sap
Description	This command enables the context to configure ingress SAP Quality of Service (QoS) policies and filter policies. If no sap-ingress QoS policy is defined, the system default sap-ingress QoS policy is used for ingress processing. If no ingress filter is defined, no filtering is performed.

agg-rate-limit

Syntax	agg-rate-limit <i>agg-rate</i> [queue-frame-based-accounting] no agg-rate-limit
Context	config>service>vpls>sap>egress
Description	This command defines a maximum total rate for all egress queues on a service SAP or multi-service site. The agg-rate-limit command is mutually exclusive with the egress scheduler policy. When an egress scheduler policy is defined, the agg-rate-limit command will fail. If the agg-rate-limit command is specified, an attempt to bind a scheduler-policy to the SAP or multi-service site will fail. A multi-service site must have a port scope defined that ensures all queues associated with the site are on the same port or channel. If the scope is not set to a port, the agg-rate-limit command will fail. Once an agg-rate-limit has been assigned to a multi-service site, the scope cannot be changed to card level. A port scheduler policy must be applied on the egress port or channel the SAP or multi-service site are bound to in order for the defined agg-rate-limit to take effect. The egress port scheduler enforces the aggregate queue rate as it distributes its bandwidth at the various port priority levels. The port scheduler stops offering bandwidth to member queues once it has detected that the aggregate rate limit has been reached.

If a port scheduler is not defined on the egress port, the queues are allowed to operate based on their own bandwidth parameters.

The **no** form of the command removes the aggregate rate limit from the SAP or multi-service site.

Parameters *agg-rate* — Defines the rate, in kilobits-per-second, that the maximum aggregate rate that the queues on the SAP or MSS can operate.

Values 1 — 40000000, max

queue-frame-based-accounting — This keyword enables frame based accounting on all queues associated with the SAP or Multi-Service Site. If frame based accounting is required when an aggregate limit is not necessary, the max keyword should precede the queue-frame-based-accounting keyword. If frame based accounting must be disabled, execute agg-rate-limit without the queue-frame-based-accounting keyword present.

Default Frame based accounting is disabled by default

agg-rate-limit

Syntax **agg-rate-limit** *agg-rate*
no agg-rate-limit

Context config>service>vpls>sap>ingress

Description This command defines a maximum total rate for all ingress queues on a service SAP or multi-service site. The **agg-rate-limit** command is mutually exclusive with the egress scheduler policy. When an egress scheduler policy is defined, the **agg-rate-limit** command will fail. If the **agg-rate-limit** command is specified, an attempt to bind a **scheduler-policy** to the SAP or multi-service site will fail.

A multi-service site must have a port scope defined that ensures all queues associated with the site are on the same port or channel. If the scope is not set to a port, the **agg-rate-limit** command will fail. Once an agg-rate-limit has been assigned to a multi-service site, the scope cannot be changed to card level.

A port scheduler policy must be applied on the egress port or channel the SAP or multi-service site are bound to in order for the defined agg-rate-limit to take effect. The egress port scheduler enforces the aggregate queue rate as it distributes its bandwidth at the various port priority levels. The port scheduler stops offering bandwidth to member queues once it has detected that the aggregate rate limit has been reached.

If a port scheduler is not defined on the egress port, the queues are allowed to operate based on their own bandwidth parameters.

The **no** form of the command removes the aggregate rate limit from the SAP or multi-service site.

Parameters *agg-rate* — Defines the rate, in Kbps, that the maximum aggregate rate that the queues on the SAP or MSS can operate.

Values 1 — 40000000, max

filter

Syntax	filter ip <i>ip-filter-id</i> filter ipv6 <i>ipv6-filter-id</i> filter mac <i>mac-filter-id</i> no filter [ip <i>ip-filter-id</i>] [mac <i>mac-filter-id</i>] [ipv6 <i>ipv6-filter-id</i>]
Context	config>service>vpls>mesh-sdp>egress config>service>vpls>mesh-sdp>ingress config>service>vpls>spoke-sdp>egress config>service>vpls>spoke-sdp>ingress config>service>vpls>sap>egress config>service>vpls>sap>ingress
Description	This command associates an IP filter policy or MAC filter policy with an ingress or egress Service Access Point (SAP) or IP interface. Filter policies control the forwarding and dropping of packets based on IP or MAC matching criteria. There are two types of filter policies: IP and MAC. Only one type may be applied to a SAP at a time. The filter command is used to associate a filter policy with a specified filter ID with an ingress or egress SAP. The filter ID must already be defined before the filter command is executed. If the filter policy does not exist, the operation will fail and an error message returned. In general, filters applied to SAPs (ingress or egress) apply to all packets on the SAP. One exception is non-IP packets are not applied to IP match criteria, so the default action in the filter policy applies to these packets. The no form of this command removes any configured filter ID association with the SAP or IP interface. The filter ID itself is not removed from the system unless the scope of the created filter is set to local. To avoid deletion of the filter ID and only break the association with the service object, use scope command within the filter definition to change the scope to local or global. The default scope of a filter is local.
Special Cases	VPLS — Both MAC and IP filters are supported on a VPLS service SAP.
Parameters	ip <i>ip-filter-id</i> — Specifies IP filter policy. The filter ID must already exist within the created IP filters. Values 1 — 65535 ipv6 <i>ipv6-filter-id</i> — Specifies the IPv6 filter policy. The filter ID must already exist within the created IPv6 filters. Values 1 — 65535 mac <i>mac-filter-id</i> — Specifies the MAC filter policy. The specified filter ID must already exist within the created MAC filters. The filter policy must already exist within the created MAC filters. Values 1 — 65535

hsmda-queue-override

Syntax	[no] hsmda-queue-override
Context	config>service>vpls>sap>egress config>service>vpls>sap>ingress
Description	This command enables the context to configure HSMDA queue overrides.

queue

Syntax	queue <i>queue-id</i> [create] no queue <i>queue-id</i>
Context	config>service>vpls>sap>egress>hsmda-queue-override config>service>vpls>sap>ingress>hsmda-queue-overider
Description	This command configures overrides for a HSMDA queue. The actual valid values are those defined in the given SAP QoS policy.
Parameters	<i>queue-id</i> — Specifies the queue ID to override. Values 1 — 8 create — This keyword is mandatory while creating a new queue override.

packet-byte-offset

Syntax	packet-byte-offset {add <i>add-bytes</i> subtract <i>sub-bytes</i>} no packet-byte-offset
Context	config>service>vpls>sap>egress>hsmda-queue-over config>service>vpls>sap>ingress>hsmda-queue-over
Description	This command adds or subtracts the specified number of bytes to the accounting function for each packet handled by the HSMDA queue. Normally, the accounting and leaky bucket functions are based on the Ethernet DLC header, payload and the 4 byte CRC (everything except the preamble and inter-frame gap). As an example, the packet-byte-offset command can be used to add the frame encapsulation overhead (20 bytes) to the queues accounting functions. The accounting functions affected include: • Offered High Priority / In-Profile Octet Counter • Offered Low Priority / Out-of-Profile Octet Counter • Discarded High Priority / In-Profile Octet Counter • Discarded Low Priority / Out-of-Profile Octet Counter • Forwarded In-Profile Octet Counter • Forwarded Out-of-Profile Octet Counter • Peak Information Rate (PIR) Leaky Bucket Updates

- Committed Information Rate (CIR) Leaky Bucket Updates
- Queue Group Aggregate Rate Limit Leaky Bucket Updates

The secondary shaper leaky bucket, scheduler priority level leaky bucket and the port maximum rate updates are not affected by the configured packet-byte-offset. Each of these accounting functions are frame based and always include the preamble, DLC header, payload and the CRC regardless of the configured byte offset.

The packet-byte-offset command accepts either add or subtract as valid keywords which define whether bytes are being added or removed from each packet traversing the queue. Up to 31 bytes may be added to the packet and up to 32 bytes may be removed from the packet. An example use case for subtracting bytes from each packet is an IP based accounting function. Given a Dot1Q encapsulation, the command packet-byte-offset subtract 14 would remove the DLC header and the Dot1Q header from the size of each packet for accounting functions only. The 14 bytes are not actually removed from the packet, only the accounting size of the packet is affected.

As inferred above, the variable accounting size offered by the packet-byte-offset command is targeted at the queue and queue group level. The packet-byte-offset, when set, applies to all queues in the queue group. The accounting size of the packet is ignored by the secondary shapers, the scheduling priority level shapers and the scheduler maximum rate. The actual on-the-wire frame size is used for these functions to allow an accurate representation of the behavior of the subscribers packets on an Ethernet aggregation network.

The packet-byte-offset value may be overridden at the queue-group level.

Parameters	add <i>add-bytes</i> — Indicates that the byte value should be added to the packet for queue and queue group level accounting functions. Either the add or subtract keyword must be specified. The corresponding byte value must be specified when executing the packet-byte-offset command. The add keyword is mutually exclusive with the subtract keyword. Values 0 — 31 subtract <i>sub-bytes</i> — Indicates that the byte value should be subtracted from the packet for queue and queue group level accounting functions. The subtract keyword is mutually exclusive with the add keyword. Either the add or subtract keyword must be specified. The corresponding byte value must be specified when executing the packet-byte-offset command. Values 1 — 32

slope-policy

Syntax	slope-policy <i>hsmda-slope-policy-name</i> no slope-policy
Context	config>service>vpls>sap>egress>hsmda-queue-over>queue config>service>vpls>sap>ingress>hsmda-queue-over>queue
Description	This command specifies an existing slope policy name.

secondary-shaper

secondary-shaper *secondary-shaper-name*
no secondary-shaper

Context	config>service>vpls>sap>egress>hsmda-queue-over
Description	This command configures an HSMDA secondary shaper. Note that an shaper override can only be configured on an HSMDA SAP.
Parameters	<i>secondary-shaper-name</i> — Specifies a secondary shaper name up to 32 characters in length.

multicast-group

Syntax	multicast-group <i>group-name</i> no multicast-group
Context	config>service>vpls>sap>egress
Description	This command places a VPLS Ethernet SAP into an egress multicast group. The SAP must comply with the egress multicast group's common requirements for member SAPs. If the SAP does not comply, the command will fail and the SAP will not be a member of the group. Common requirements for an egress multicast group are listed below: • If an egress-filter is specified on the egress multicast group, the SAP must have the same egress filter applied. • If an egress-filter is not defined on the egress multicast group, the SAP cannot have an egress filter applied. • If the egress multicast group has an encap-type set to null, the SAP must be defined on a port with the port encapsulation type set to null. • If the egress multicast group has an encap-type set to dot1q, the SAP must be defined on a port with the port encapsulation type set to dot1q and the port's dot1q-etype must match the dot1q-etype defined on the egress multicast group. • The access port the SAP is created on cannot currently be an egress mirror source.

Once a SAP is a member of an egress multicast group, the following rules apply:

- The egress filter defined on the SAP cannot be removed or modified. Egress filtering is managed at the egress multicast group for member SAPs.
- If the encapsulation type for the access port the SAP is created on is set to dot1q, the port's dot1q-etype value cannot be changed.
- Attempting to define an access port with a SAP that is currently defined in an egress multicast group as an egress mirror source will fail.

Once a SAP is included in an egress multicast group, it is then eligible for efficient multicast replication if the egress forwarding plane performing replication for the SAP is capable. If the SAP is defined as a Link Aggregation Group (LAG) SAP, it is possible that some links in the LAG are on forwarding planes that support efficient multicast replication while others are not. The fact that some or all the forwarding planes associated with the SAP cannot perform efficient multicast replication does not affect the ability to place the SAP into an Egress multicast group.

A SAP may be a member of one and only one egress multicast group. If the multicast-group command is executed with another egress multicast group name, the system will attempt to move the SAP to the specified group. If the SAP is not placed into the new group, the SAP will remain a member of the previous egress multicast group. Moving a SAP into an egress multicast group may cause a momentary gap in replications to the SAP destination while the move is being processed.

The **no** form of the command removes the SAP from any egress multicast group in which it may currently have membership. The SAP will be removed from all efficient multicast replication chains and normal replication will apply to the SAP. A momentary gap in replications to the SAP destination while it is being moved is possible. If the SAP is not currently a member in an egress multicast group, the command has no effect.

Default	no multicast-group
Parameters	<i>group-name</i> — The <i>group-name</i> is required when specifying egress multicast group membership on a SAP. An egress multicast group with the specified egress-multicast-group-name must exist and the SAP must pass all common requirements or the command will fail.
Values	Any valid egress multicast group name.
Default	None, an egress multicast group name must be explicitly specified.

qinq-mark-top-only

Syntax	[no] qinq-mark-top-only
Context	config>service>vpls>sap>egress
Description	When enabled (the encapsulation type of the access port where this SAP is defined as qinq), the qinq-mark-top-only command specifies which P-bits to mark during packet egress. When disabled, both set of P-bits are marked. When enabled, only the P-bits in the top Q-tag are marked. The no form of this command disables the command.
Default	no qinq-mark-top-only

qos

Syntax	qos policy-id [shared-queuing multipoint-shared] no qos
Context	config>service>vpls>sap>egress config>service>vpls>sap>ingress
Description	This command associates a Quality of Service (QoS) policy with an ingress or egress Service Access Point (SAP) or IP interface. QoS ingress and egress policies are important for the enforcement of SLA agreements. The policy ID must be defined prior to associating the policy with a SAP or IP interface. If the <i>policy-id</i> does not exist, an error will be returned.

The **qos** command is used to associate both ingress and egress QoS policies. The **qos** command only allows ingress policies to be associated on SAP or IP interface ingress and egress policies on SAP or IP interface egress. Attempts to associate a QoS policy of the wrong type returns an error.

Only one ingress and one egress QoS policy can be associated with a SAP or IP interface at one time. Attempts to associate a second QoS policy of a given type will return an error.

When an ingress QoS policy is defined on IES ingress IP interface that is bound to a VPLS, the policy becomes associated with every SAP on the VPLS and augments the QoS policy that is defined on each SAP. Packets that are bridged will be processed using the policy defined on the VPLS SAP; packets that are routed will be processed using the policy defined in the IES IP interface-binding context.

When an egress QoS policy is associated with an IES IP interface that has been bound to a VPLS, the policy becomes associated with every SAP on the VPLS and augments the egress QoS policy that is defined on each SAP. Packets that are bridged will be processed using the policy defined on the VPLS SAP; packets that are routed will be processed using the policy defined in the IES IP interface-binding context.

By default, if no specific QoS policy is associated with the SAP or IP interface for ingress or egress , so the default QoS policy is used.

The **no** form of this command removes the QoS policy association from the SAP or IP interface, and the QoS policy reverts to the default.

policy-id — The ingress/egress policy ID to associate with SAP or IP interface on ingress/egress. The policy ID must already exist.

Values 1 — 65535

shared-queuing — This keyword can only be specified on SAP ingress. Specify the ingress shared queue policy used by this SAP. When the value of this object is null, the SAP will use individual ingress QoS queues, instead of the shared ones.

multipoint-shared — This keyword can only be specified on SAP ingress. Multipoint shared queuing is a superset of shared queuing. When multipoint shared queuing keyword is set, in addition to the unicast packets, multipoint packets also used shared queues.

Ingress unicast service queues are mapped one-for-one with hardware queues and unicast packets traverse the ingress forwarding plane twice, similar to the shared-queuing option. In addition, the multipoint queues defined in the ingress SAP QoS policy are not created. Instead, multipoint packets (broadcast, multicast and unknown unicast destined) are treated to the same dual pass ingress forwarding plane processing as unicast packets.

When the value of this object is null, the SAP will use individual ingress QoS queues, instead of the shared ones.

Values Multipoint or not present.

Default Present (the queue is created as non-multipoint).

queue-override

Syntax [no] queue-override

Context config>service>vpls>sap>egress

```
config>service>vpls>sap>ingress
config>service>vpls>sap>egress>hsmda-queue-over>queue
config>service>vpls>sap>ingress>hsmda-queue-over>queue
```

Description This command enables the context to configure override values for the specified SAP egress or ingress QoS queue. These values override the corresponding ones specified in the associated SAP egress or ingress QoS policy.

queue

Syntax **[no] queue** *queue-id*

Context config>service>vpls>sap>egress>queue-override
config>service>vpls>sap>ingress>queue-override

Description This command specifies the ID of the queue whose parameters are to be overridden.

Parameters *queue-id* — The queue ID whose parameters are to be overridden.

Values 1 — 32

adaptation-rule

Syntax **adaptation-rule** [**pir** {**max** | **min** | **closest**}] [**cir** {**max** | **min** | **closest**}]
no adaptation-rule

Context config>service>vpls>sap>egress>queue-override>queue
config>service>vpls>sap>ingress>queue-override>queue

Description This command can be used to override specific attributes of the specified queue's adaptation rule parameters. The adaptation rule controls the method used by the system to derive the operational CIR and PIR settings when the queue is provisioned in hardware. For the CIR and PIR parameters individually, the system attempts to find the best operational rate depending on the defined constraint. The **no** form of the command removes any explicitly defined constraints used to derive the operational CIR and PIR created by the application of the policy. When a specific **adaptation-rule** is removed, the default constraints for **rate** and **cir** apply.

Default no adaptation-rule

Parameters **pir** — The **pir** parameter defines the constraints enforced when adapting the PIR rate defined within the **queue queue-id rate** command. The **pir** parameter requires a qualifier that defines the constraint used when deriving the operational PIR for the queue. When the **rate** command is not specified, the default applies.

cir — The **cir** parameter defines the constraints enforced when adapting the CIR rate defined within the **queue queue-id rate** command. The **cir** parameter requires a qualifier that defines the constraint used when deriving the operational CIR for the queue. When the **cir** parameter is not specified, the default constraint applies.

adaptation-rule — Specifies the criteria to use to compute the operational CIR and PIR values for this queue, while maintaining a minimum offset.

- Values**
- max** — The **max** (maximum) keyword is mutually exclusive with the **min** and **closest** options. When **max** is defined, the operational PIR for the queue will be equal to or less than the administrative rate specified using the **rate** command.
 - min** — The **min** (minimum) keyword is mutually exclusive with the **max** and **closest** options. When **min** is defined, the operational PIR for the queue will be equal to or greater than the administrative rate specified using the **rate** command.
 - closest** — The **closest** parameter is mutually exclusive with the **min** and **max** parameter. When **closest** is defined, the operational PIR for the queue will be the rate closest to the rate specified using the **rate** command.

avg-frame-overhead

Syntax	avg-frame-overhead <i>percent</i> no avg-frame-overhead
Context	config>service>vpls>sap>egress>queue-override>queue
Description	This command configures the average frame overhead to define the average percentage that the offered load to a queue will expand during the frame encapsulation process before sending traffic on-the-wire. While the avg-frame-overhead value may be defined on any queue, it is only used by the system for queues that egress a Sonet or SDH port or channel. Queues operating on egress Ethernet ports automatically calculate the frame encapsulation overhead based on a 20 byte per packet rule (8 bytes for preamble and 12 bytes for Inter-Frame Gap).

When calculating the frame encapsulation overhead for port scheduling purposes, the system determines the following values:

- Offered-load — The offered-load of a queue is calculated by starting with the queue depth in octets, adding the received octets at the queue and subtracting queue discard octets. The result is the number of octets the queue has available to transmit. This is the packet based offered-load.
- Frame encapsulation overhead — Using the avg-frame-overhead parameter, the frame encapsulation overhead is simply the queue's current offered-load (how much has been received by the queue) multiplied by the avg-frame-overhead. If a queue had an offered load of 10000 octets and the avg-frame-overhead equals 10%, the frame encapsulation overhead would be 10000 x 0.1 or 1000 octets.

For egress Ethernet queues, the frame encapsulation overhead is calculated by multiplying the number of offered-packets for the queue by 20 bytes. If a queue was offered 50 packets then the frame encapsulation overhead would be 50 x 20 or 1000 octets.

- Frame based offered-load — The frame based offered-load is calculated by adding the offered-load to the frame encapsulation overhead. If the offered-load is 10000 octets and the encapsulation overhead was 1000 octets, the frame based offered-load would equal 11000 octets.
- Packet to frame factor — The packet to frame factor is calculated by dividing the frame encapsulation overhead by the queue's offered-load (packet based). If the frame encapsulation overhead is 1000 octets and the offered-load is 10000 octets then the packet to frame factor would be 1000 / 10000 or 0.1. When in use, the avg-frame-overhead will be the same as the packet to frame factor making this calculation unnecessary.
- Frame based CIR — The frame based CIR is calculated by multiplying the packet to frame factor with the queue's configured CIR and then adding that result to that CIR. If the queue CIR is set at

500 octets and the packet to frame factor equals 0.1, the frame based CIR would be 500×1.1 or 550 octets.

- **Frame based within-cir offered-load** — The frame based within-cir offered-load is the portion of the frame based offered-load considered to be within the frame-based CIR. The frame based within-cir offered-load is the lesser of the frame based offered-load and the frame based CIR. If the frame based offered-load equaled 11000 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would be limited to 550 octets. If the frame based offered-load equaled 450 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would equal 450 octets (or the entire frame based offered-load).

As a special case, when a queue or associated intermediate scheduler is configured with a CIR-weight equal to 0, the system automatically sets the queue's frame based within-cir offered-load to 0, preventing it from receiving bandwidth during the port scheduler's within-cir pass.

- **Frame based PIR** — The frame based PIR is calculated by multiplying the packet to frame factor with the queue's configured PIR and then adding the result to that PIR. If the queue PIR is set to 7500 octets and the packet to frame factor equals 0.1, the frame based PIR would be 7500×1.1 or 8250 octets.
- **Frame based within-pir offered-load** — The frame based within-pir offered-load is the portion of the frame based offered-load considered to be within the frame based PIR. The frame based within-pir offered-load is the lesser of the frame based offered-load and the frame based PIR. If the frame based offered-load equaled 11000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered-load would be limited to 8250 octets. If the frame based offered-load equaled 7000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered load would equal 7000 octets.

Port scheduler operation using frame transformed rates — The port scheduler uses the frame based rates to calculate the maximum rates that each queue may receive during the within-cir and above-cir bandwidth allocation passes. During the within-cir pass, a queue may receive up to its frame based within-cir offered-load. The maximum it may receive during the above-cir pass is the difference between the frame based within-pir offered load and the amount of actual bandwidth allocated during the within-cir pass.

SAP and subscriber SLA-profile average frame overhead override — The average frame overhead parameter on a sap-egress may be overridden at an individual egress queue basis. On each SAP and within the sla-profile policy used by subscribers an avg-frame-overhead command may be defined under the queue-override context for each queue. When overridden, the queue instance will use its local value for the average frame overhead instead of the sap-egress defined overhead.

The **no** form of this command restores the average frame overhead parameter for the queue to the default value of 0 percent. When set to 0, the system uses the packet based queue statistics for calculating port scheduler priority bandwidth allocation. If the no avg-frame-overhead command is executed in a queue-override queue id context, the avg-frame-overhead setting for the queue within the sap-egress QoS policy takes effect.

Default	0
Parameters	<i>percent</i> — This parameter sets the average amount of packet-to-frame encapsulation overhead expected for the queue. This value is not used by the system for egress Ethernet queues.
Values	0 — 100

cbs

Syntax	cbs <i>size-in-kbytes</i> no cbs
Context	config>service>vpls>sap>egress>queue-override>queue config>service>vpls>sap>ingress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's CBS parameters. It is permissible, and possibly desirable, to oversubscribe the total CBS reserved buffers for a given access port egress buffer pool. Oversubscription may be desirable due to the potential large number of service queues and the economy of statistical multiplexing the individual queue's CBS setting into the defined reserved total. When oversubscribing the reserved total, it is possible for a queue depth to be lower than its CBS setting and still not receive a buffer from the buffer pool for an ingress frame. As more queues are using their CBS buffers and the total in use exceeds the defined reserved total, essentially the buffers are being removed from the shared portion of the pool without the shared in use average and total counts being decremented. This can affect the operation of the high and low priority RED slopes on the pool, causing them to miscalculate when to start randomly drop packets. If the CBS value is larger than the MBS value, an error will occur, preventing the CBS change. The no form of this command returns the CBS size to the default value.
Default	no cbs
Parameters	<i>size-in-kbytes</i> — The size parameter is an integer expression of the number of kilobytes reserved for the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that no reserved buffers are required by the queue (a minimal reserved size can still be applied for scheduling purposes). Values 0 — 131072 or default

high-prio-only

Syntax	high-prio-only <i>percent</i> no high-prio-only
Context	config>service>vpls>sap>egress>queue-override>queue config>service>vpls>sap>ingress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's high-prio-only parameters. The high-prio-only command configures the percentage of buffer space for the queue, used exclusively by high priority packets. The priority of a packet can only be set in the SAP ingress QoS policy and is only applicable on the ingress queues for a SAP. The high-prio-only parameter is used to override the default value derived from the network-queue command. The defined high-prio-only value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the high-prio-only value larger than the current MBS size will also result in an error and fail execution.

The **no** form of this command restores the default high priority reserved size.

Parameters	<i>percent</i> — The <i>percent</i> parameter is the percentage reserved for high priority traffic on the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that none of the MBS of the queue will be reserved for high priority traffic. This does not affect RED slope operation for packets attempting to be queued.
Values	0 — 100, default

mbs

Syntax	mbs { <i>size-in-kbytes</i> default } no mbs
Context	config>service>vpls>sap>egress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's MBS parameters. The MBS is a mechanism to override the default maximum size for the queue. The sum of the MBS for all queues on an egress access port can oversubscribe the total amount of buffering available. When congestion occurs and buffers become scarce, access to buffers is controlled by the RED slope a packet is associated with. A queue that has not exceeded its MBS size is not guaranteed that a buffer will be available when needed or that the packet's RED slope will not force the discard of the packet. Setting proper CBS parameters and controlling CBS oversubscription is one major safeguard to queue starvation (when a queue does not receive its fair share of buffers). Another is properly setting the RED slope parameters for the needs of services on this port or channel. If the CBS value is larger than the MBS value, an error will occur, preventing the MBS change. The no form of this command returns the MBS size assigned to the queue.
Default	default
Parameters	<i>size-in-kbytes</i> — The size parameter is an integer expression of the maximum number of kilobytes of buffering allowed for the queue. For a value of 100 kbps, enter the value 100. A value of 0 causes the queue to discard all packets. Values 0 — 131072 or default

mbs

Syntax	mbs { <i>size-in-kbytes</i> default } no mbs
Context	config>service>vpls>sap>ingress>queue-override>queue
Description	This command can be used to override specific attributes of the specified queue's MBS parameters. The MBS value is used by a queue to determine whether it has exhausted all of its buffers while enqueueing packets. Once the queue has exceeded the amount of buffers allowed by MBS, all packets are discarded until packets have been drained from the queue. The sum of the MBS for all queues on an ingress access port can oversubscribe the total amount of buffering available. When congestion occurs and buffers become scarce, access to buffers is

controlled by the RED slope a packet is associated with. A queue that has not exceeded its MBS size is not guaranteed that a buffer will be available when needed or that the packets RED slope will not force the discard of the packet. Setting proper CBS parameters and controlling CBS oversubscription is one major safeguard to queue starvation (when a queue does not receive its fair share of buffers). Another is properly setting the RED slope parameters for the needs of services on this port or channel.

If the CBS value is larger than the MBS value, an error will occur, preventing the MBS change.

The defined high-prio-only value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the high-prio-only value larger than the current MBS size will also result in an error and fail execution.

The **no** form of this command returns the MBS size assigned to the queue to the default value.

Default	default
Parameters	<i>size-in-kbytes</i> — The size parameter is an integer expression of the maximum number of kilobytes of buffering allowed for the queue. For a value of 100 kbps, enter the value 100. A value of 0 causes the queue to discard all packets.
Values	0 — 131072 or default

rate

Syntax	rate <i>pir-rate</i> [cir <i>cir-rate</i>] no rate
Context	config>service>vpls>sap>egress>queue-override>queue config>service>vpls>sap>ingress>queue-override>queue config>service>vpls>sap>egress>hsmda-queue-over>queue
Description	This command can be used to override specific attributes of the specified queue's Peak Information Rate (PIR) and the Committed Information Rate (CIR) parameters. The PIR defines the maximum rate that the queue can transmit packets out an egress interface (for SAP egress queues). Defining a PIR does not necessarily guarantee that the queue can transmit at the intended rate. The actual rate sustained by the queue can be limited by oversubscription factors or available egress bandwidth. The CIR defines the rate at which the system prioritizes the queue over other queues competing for the same bandwidth. In-profile packets are preferentially queued by the system at egress and at subsequent next hop nodes where the packet can traverse. To be properly handled as in- or out-of-profile throughout the network, the packets must be marked accordingly for profiling at each hop. The CIR can be used by the queue's parent commands <i>cir-level</i> and <i>cir-weight</i> parameters to define the amount of bandwidth considered to be committed for the child queue during bandwidth allocation by the parent scheduler. The rate command can be executed at any time, altering the PIR and CIR rates for all queues created through the association of the SAP egress QoS policy with the <i>queue-id</i>. The no form of the command returns all queues created with the <i>queue-id</i> by association with the QoS policy to the default PIR and CIR parameters (max, 0).

Default	rate max cir 0 — The max default specifies the amount of bandwidth in kilobits per second (thousand bits per second). The max value is mutually exclusive to the pir-rate value.
Parameters	pir-rate — Defines the administrative PIR rate, in kilobits, for the queue. When the rate command is executed, a valid PIR setting must be explicitly defined. When the rate command has not been executed, the default PIR of max is assumed. Fractional values are not allowed and must be given as a positive integer. The actual PIR rate is dependent on the queue's adaptation-rule parameters and the actual hardware where the queue is provisioned. Values 1 — 100000000 Default max cir cir-rate — The cir parameter overrides the default administrative CIR used by the queue. When the rate command is executed, a CIR setting is optional. When the rate command has not been executed or the cir parameter is not explicitly specified, the default CIR (0) is assumed. Fractional values are not allowed and must be given as a positive integer. The sum keyword specifies that the CIR be used as the summed CIR values of the children schedulers or queues. Values 0 — 100000000, max, sum Default 0

scheduler-override

Syntax	[no] scheduler-override
Context	config>service>vpls>sap>egress config>service>vpls>sap>ingress
Description	This command specifies the set of attributes whose values have been overridden via management on this virtual scheduler. Clearing a given flag will return the corresponding overridden attribute to the value defined on the SAP's ingress scheduler policy.

scheduler

Syntax	scheduler scheduler-name no scheduler scheduler-name
Context	config>service>vpls>sap>egress>sched-override
Description	This command can be used to override specific attributes of the specified scheduler name. A scheduler defines a bandwidth controls that limit each child (other schedulers and queues) associated with the scheduler. Scheduler objects are created within the hierarchical tiers of the policy. It is assumed that each scheduler created will have queues or other schedulers defined as child associations. The scheduler can be a child (take bandwidth from a scheduler in a higher tier, except for schedulers created in tier 1). A total of 32 schedulers can be created within a single scheduler policy with no restriction on the distribution between the tiers.

Each scheduler must have a unique name within the context of the scheduler policy; however the same name can be reused in multiple scheduler policies. If *scheduler-name* already exists within the policy tier level (regardless of the inclusion of the keyword *create*), the context changes to that scheduler name for the purpose of editing the scheduler parameters. Modifications made to an existing scheduler are executed on all instantiated schedulers created through association with the policy of the edited scheduler. This can cause queues or schedulers to become orphaned (invalid parent association) and adversely affect the ability of the system to enforce service level agreements (SLAs).

If the *scheduler-name* exists within the policy on a different tier (regardless of the inclusion of the keyword *create*), an error occurs and the current CLI context will not change.

If the *scheduler-name* does not exist in this or another tier within the scheduler policy, it is assumed that an attempt is being made to create a scheduler of that name. The success of the command execution is dependent on the following:

1. The maximum number of schedulers has not been configured.
2. The provided *scheduler-name* is valid.
3. The **create** keyword is entered with the command if the system is configured to require it (enabled in the **environment create** command).

When the maximum number of schedulers has been exceeded on the policy, a configuration error occurs and the command will not execute, nor will the CLI context change.

If the provided scheduler-name is invalid according to the criteria below, a name syntax error will occur, the command will not execute, and the CLI context will not change.

Parameters *scheduler-name* — The name of the scheduler.

Values Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

Default None. Each scheduler must be explicitly created.

create — This optional keyword explicitly specifies that it is acceptable to create a scheduler with the given *scheduler-name*. If the **create** keyword is omitted, **scheduler-name** is not created when the system environment variable *create* is set to true. This safeguard is meant to avoid accidental creation of system objects (such as schedulers) while attempting to edit an object with a mistyped name or ID. The keyword has no effect when the object already exists.

rate

Syntax	rate <i>pir-rate</i> [<i>cir cir-rate</i>] no rate
Context	config>service>vpls>sap>egress>sched-override>scheduler
Description	This command can be used to override specific attributes of the specified scheduler rate. The rate command defines the maximum bandwidth that the scheduler can offer its child queues or schedulers. The maximum rate is limited to the amount of bandwidth the scheduler can receive from its parent scheduler. If the scheduler has no parent, the maximum rate is assumed to be the amount available to the scheduler. When a parent is associated with the scheduler, the CIR parameter provides the amount of bandwidth to be considered during the parent scheduler's 'within CIR' distribution phase.

The actual operating rate of the scheduler is limited by bandwidth constraints other than its maximum rate. The scheduler's parent scheduler may not have the available bandwidth to meet the scheduler's needs or the bandwidth available to the parent scheduler could be allocated to other child schedulers or child queues on the parent based on higher priority. The children of the scheduler may not need the maximum rate available to the scheduler due to insufficient offered load or limits to their own maximum rates.

When a scheduler is defined without specifying a rate, the default rate is **max**. If the scheduler is a root scheduler (no parent defined), the default maximum rate must be changed to an explicit value. Without this explicit value, the scheduler will assume that an infinite amount of bandwidth is available and allow all child queues and schedulers to operate at their maximum rates.

The **no** form of this command returns all queues created with this *queue-id* by association with the QoS policy to the default PIR and CIR parameters.

Parameters

pir-rate — The **pir** parameter accepts a step multiplier value that specifies the multiplier used to determine the PIR rate at which the queue will operate. A value of 0 to 100000000 or the keyword **max** is accepted. Any other value will result in an error without modifying the current PIR rate.

To calculate the actual PIR rate, the rate described by the queue's **rate** is multiplied by the *pir-rate*.

The SAP ingress context for PIR is independent of the defined forwarding class (fc) for the queue. The default **pir** and definable range is identical for each class. The PIR in effect for a queue defines the maximum rate at which the queue will be allowed to forward packets in a given second, thus shaping the queue's output.

The PIR parameter for SAP ingress queues do not have a negate (**no**) function. To return the queue's PIR rate to the default value, that value must be specified as the PIR value.

Values 1 — 100000000, **max**

Default max

cir *cir-rate* — The **cir** parameter accepts a step-multiplier value that specifies the multiplier used to determine the CIR rate at which the queue will operate. A value of 0 — 100000000 or the keyword **max** or **sum** is accepted. Any other value will result in an error without modifying the current CIR rate.

To calculate the actual CIR rate, the rate described by the **rate pir** *pir-rate* is multiplied by the *cir* *cir-rate*. If the **cir** is set to max, then the CIR rate is set to infinity.

The SAP ingress context for CIR is dependent on the defined forwarding class (fc) for the queue. The default CIR and definable range is different for each class. The CIR in effect for a queue defines both its profile (in or out) marking level as well as the relative importance compared to other queues for scheduling purposes during congestion periods.

Values 0 — 100000000, **max**, **sum**

Default sum

scheduler-policy

Syntax **scheduler-policy** *scheduler-policy-name*

no scheduler-policy

Context	config>service>vpls>sap>ingress config>service>vpls>sap>egress
Description	This command applies an existing scheduler policy to an ingress or egress scheduler used by SAP queues associated with this multi-service customer site. The schedulers defined in the scheduler policy can only be created once the customer site has been appropriately assigned to a chassis port, channel or slot. Scheduler policies are defined in the config>qos>scheduler-policy scheduler-policy-name context. The no form of this command removes the configured ingress or egress scheduler policy from the multi-service customer site. When the policy is removed, the schedulers created due to the policy are removed also making them unavailable for the ingress SAP queues associated with the customer site. Queues that lose their parent scheduler association are deemed to be orphaned and are no longer subject to a virtual scheduler. The SAPs that have ingress queues reliant on the removed schedulers enter into an operational state depicting the orphaned status of one or more queues. When the no scheduler-policy command is executed, the customer site ingress or egress node will not contain an applied scheduler policy. <i>scheduler-policy-name:</i> — The <i>scheduler-policy-name</i> parameter applies an existing scheduler policy that was created in the config>qos>scheduler-policy scheduler-policy-name context to create the hierarchy of ingress or egress virtual schedulers. The scheduler names defined within the policy are created and made available to any ingress or egress queues created on associated SAPs. Values Any existing valid scheduler policy name.

vlan-translation

Syntax	vlan-translation {vlan-id copy-outer} no vlan-translation
Context	cconfig>service>vpls>sap>ingress
Description	This command configures ingress VLAN translation. If enabled with an explicit VLAN value, the preserved VLAN ID will be overwritten with this value. This setting is applicable to Dot1q-encapsulated ports. If enabled with the copy-outer keyword, the outer VLAN ID will be copied to the inner position on QinQ-encapsulated ports. The feature is not supported on default-dot1q SAPs (1/1/1:* and 1/1/1:0), as well as on TopQ SAPs. The no form of this command sets the default value, and no action will be taken.
Default	per default the preserved VLAN values will not be overwritten
Parameters	<i>vlan-id</i> — Specifies the to use the VLAN ID of the SAP. Values 0 — 4094 <i>copy-outer</i> — Specifies that the outer VLAN ID will be copied to the inner position on QinQ-encapsulated ports

match-qinq-dot1p

Syntax	match-qinq-dot1p {top bottom} no match-qinq-dot1p de
Context	config>service>vpls>sap>ingress
Description	This command specifies which Dot1Q tag position Dot1P bits in a Qinq encapsulated packet should be used to evaluate Dot1P QoS classification. The match-qinq-dot1p command allows the top or bottom PBits to be used when evaluating the applied sap-ingress QoS policy's Dot1P entries. The top and bottom keywords specify which position should be evaluated for Qinq encapsulated packets. The mandatory de keyword is added to the above command line to specify on a per SAP basis the source for the DE bit. The de keyword is effective if there is an explicit command in the sap ingress policy that specifies the use of DE bit for QoS Classification – for example, de-1-out-profile. Otherwise the rules for the matching of dot1p bits will apply the same way for the DE bit whenever the usage is activated explicitly. The text will be updated to include also the DE bit in the header of the tables next to the dot1p bits. The no form of this command reverts the dot1p and de bits matching to the default tag By default, the bottom most service delineating Dot1Q tags Dot1P bits are used. The following defines the default behavior for Dot1P evaluation when the match-qinq-dot1p command is not executed .

Port / SAP Type	Existing Packet Tags	PBits Used for Match
Null	None	None
Null	Dot1P (VLAN-ID 0)	Dot1P PBits
Null	Dot1Q	Dot1Q PBits
Null	TopQ BottomQ	TopQ PBits
Null	TopQ (No BottomQ)	TopQ PBits
Dot1Q	None (Default SAP)	None
Dot1Q	Dot1P (Default SAP VLAN-ID 0)	Dot1P PBits
Dot1Q	Dot1Q	Dot1Q PBits
Qinq / TopQ	TopQ	TopQ PBits
Qinq / TopQ	TopQ BottomQ	TopQ PBits
Qinq / TopQ	TopQ BottomQ	BottomQ PBits

Default no match-qinq-dot1p (no filtering based on p-bits)
top or bottom must be specified to override the default Qinq dot1p behavior

Parameters **top** — The top parameter is mutually exclusive to the bottom parameter. When the top parameter is specified, the top most PBits are used (if existing) to match any dot1p *dot1p-value* entries. The following table defines the Dot1p evaluation behavior when the top parameter is specified.

Port / SAP Type	Existing Packet Tags	PBits Used for Match
Null	None	None
Null	Dot1P (VLAN-ID 0)	Dot1P PBits
Null	Dot1Q	Dot1Q PBits
Null	TopQ BottomQ	TopQ PBits
Null	TopQ (No BottomQ)	TopQ PBits
Dot1Q	None (Default SAP)	None
Dot1Q	Dot1P (Default SAP VLAN-ID 0)	Dot1P PBits
Dot1Q	Dot1Q	Dot1Q PBits
QinQ / TopQ	TopQ	TopQ PBits
QinQ / TopQ	TopQ BottomQ	TopQ PBits
QinQ / QinQ	TopQ BottomQ	TopQ PBits

bottom — The bottom parameter is mutually exclusive to the top parameter. When the bottom parameter is specified, the bottom most PBits are used (if existing) to match any dot1p *dot1p-value* entries. The following table defines the Dot1p evaluation behavior when the bottom parameter is specified.

Port / SAP Type	Existing Packet Tags	PBits Used for Match
Null	None	None
Null	Dot1P (VLAN-ID 0)	Dot1P PBits
Null	Dot1Q	Dot1Q PBits
Null	TopQ BottomQ	BottomQ PBits
Null	TopQ (No BottomQ)	TopQ PBits
Dot1Q	None (Default SAP)	None
Dot1Q	Dot1P (Default SAP VLAN-ID 0)	Dot1P PBits
Dot1Q	Dot1Q	Dot1Q PBits
QinQ / TopQ	TopQ	TopQ PBits
QinQ / TopQ	TopQ BottomQ	BottomQ PBits
QinQ / QinQ	TopQ BottomQ	BottomQ PBits

Egress SAP Type	Ingress Packet Preserved Dot1P State	Marked (or Remarked) PBits
Null	No preserved Dot1P bits	None
Null	Preserved Dot1P bits	Preserved tag PBits remarked using dot1p-value
Dot1Q	No preserved Dot1P bits	New PBits marked using dot1p-value
Dot1Q	Preserved Dot1P bits	Preserved tag PBits remarked using dot1p-value
TopQ	No preserved Dot1P bits	TopQ PBits marked using dot1p-value
TopQ	Preserved Dot1P bits (used as TopQ and BottomQ PBits)	TopQ PBits marked using dot1p-value, BottomQ PBits preserved
QinQ	No preserved Dot1P bits	TopQ PBits and BottomQ PBits marked using dot1p-value
QinQ	Preserved Dot1P bits (used as TopQ and BottomQ PBits)	TopQ PBits and BottomQ PBits marked using dot1p-value

Egress SAP Type	Ingress Packet Preserved Dot1P State	Marked (or Remarked) PBits
Null	No preserved Dot1P bits	None
Null	Preserved Dot1P bits	Preserved tag PBits remarked using dot1p-value
Dot1Q	No preserved Dot1P bits	New PBits marked using dot1p-value
Dot1Q	Preserved Dot1P bits	Preserved tag PBits remarked using dot1p-value
TopQ	No preserved Dot1P bits	TopQ PBits marked using dot1p-value
TopQ	Preserved Dot1P bits (used as TopQ and BottomQ PBits)	TopQ PBits marked using dot1p-value, BottomQ PBits preserved
QinQ	No preserved Dot1P bits	TopQ PBits marked using dot1p-value, BottomQ PBits marked with zero
QinQ	Preserved Dot1P bits (used as TopQ and BottomQ PBits)	TopQ PBits marked using dot1p-value, BottomQ PBits marked using preserved value

The QinQ and TopQ SAP PBit marking follows the default behavior defined in the above tables when **qinq-mark-top-only** is not specified.

The **dot1p dot1p-value** command must be configured without the **qinq-mark-top-only** parameter to remove the TopQ PBits only marking restriction.

authentication-policy

Syntax	authentication-policy <i>name</i> no authentication-policy
Context	config>service>vpls>sap
Description	This command defines which subscriber authentication policy must be applied when a DHCP message is received on the interface. The authentication policies must already be defined. The policy will only be applied when DHCP snooping is enabled on the SAP.

accounting-policy

Syntax	accounting-policy <i>acct-policy-id</i> no accounting-policy
Context	config>service>vpls>spoke-sdp config>service>vpls>mesh-sdp config>service>vpls>sap
Description	This command creates the accounting policy context that can be applied to a SAP or SDP. An accounting policy must be defined before it can be associated with a SAP or SDP. If the <i>policy-id</i> does not exist, an error message is generated. A maximum of one accounting policy can be associated with a SAP or SDP at one time. Accounting policies are configured in the config>log context. The no form of this command removes the accounting policy association from the SAP or SDP, and the accounting policy reverts to the default.
Default	Default accounting policy.
Parameters	<i>acct-policy-id</i> — Enter the accounting <i>policy-id</i> as configured in the config>log>accounting-policy context. Values 1 — 99

collect-stats

Syntax	[no] collect-stats
Context	config>service>vpls>spoke-sdp config>service>vpls>mesh-sdp config>service>vpls>sap
Description	This command enables accounting and statistical data collection for either the SAP or SDP, network port, or IP interface. When applying accounting policies the data, by default, is collected in the appropriate records and written to the designated billing file. When the no collect-stats command is issued the statistics are still accumulated by the IOM cards. However, the CPU will not obtain the results and write them to the billing file. If a subsequent

collect-stats command is issued then the counters written to the billing file include all the traffic while the **no collect-stats** command was in effect.

Default collect-stats

VPLS SDP Commands

mesh-sdp

Syntax	mesh-sdp <i>sdp-id</i> [: <i>vc-id</i>] [vc-type { ether vlan }] no mesh-sdp <i>sdp-id</i> [: <i>vc-id</i>]
Context	config>service>vpls
Description	This command binds a VPLS service to an existing Service Distribution Point (SDP). Mesh SDPs bound to a service are logically treated like a single bridge “port” for flooded traffic where flooded traffic received on any mesh SDP on the service is replicated to other “ports” (spoke SDPs and SAPs) and not transmitted on any mesh SDPs. Note that this command creates a binding between a service and an SDP. The SDP has an operational state which determines the operational state of the SDP within the service. For example, if the SDP is administratively or operationally down, the SDP for the service will be down. The SDP must already be defined in the config>service>sdp context in order to associate the SDP with a valid service. If the sdp sdp-id is not already configured, an error message is generated. If the <i>sdp-id</i> does exist, a binding between that <i>sdp-id</i> and the service is created. SDPs must be explicitly associated and bound to a service. If an SDP is not bound to a service, no far-end 7750 SR devices can participate in the service. The no form of this command removes the SDP binding from the service. The SDP configuration is not affected; only the binding of the SDP to a service. Once removed, no packets are forwarded to the far-end router.
Default	No <i>sdp-id</i> is bound to a service.
Special Cases	VPLS — Several SDPs can be bound to a VPLS. Each SDP must be destined to a different router. If two <i>sdp-id</i> bindings terminate on the same 7750 SR, an error occurs and the second SDP is binding is rejected.
Parameters	<i>sdp-id</i> — The SDP identifier. Values 1 — 17407 <i>vc-id</i> — The virtual circuit identifier. This value is used to validate the VC ID portion of each mesh SDP binding defined in the service. The default value of this object is equal to the service ID. Values 1 — 4294967295 vc-type — This command overrides the default VC type signaled for the spoke or mesh binding to the far end of the SDP. The VC type is a 15 bit-quantity containing a value which represents the type of VC. The actual signaling of the VC type depends on the signaling parameter defined for the SDP. If signaling is disabled, the vc-type command can still be used to define the dot1q value expected by the far-end provider equipment. A change of the bindings VC type causes the binding to signal the new VC type to the far end when signaling is enabled. VC types are derived according to IETF <i>draft-martini-l2circuit-trans-mpls</i>. • The VC type value for Ethernet is 0x0005.

- The VC type value for an Ethernet VLAN is 0x0004.

ether — Defines the VC type as Ethernet. The **ether** and **vlan** keywords are mutually exclusive. When the VC type is not defined then the default is Ethernet for spoke SDP bindings. Defining Ethernet is the same as executing **no vc-type** and restores the default VC type for the spoke SDP binding. (hex 5)

vlan — Defines the VC type as VLAN. The **ether** and **vlan** keywords are mutually exclusive. When the VC type is not defined then the default is Ethernet for spoke SDP bindings.

spoke-sdp

Syntax	spoke-sdp <i>sdp-id[:vc-id]</i> [vc-type { ether vlan }] [split-horizon-group <i>group-name</i>] endpoint [no-endpoint] no spoke-sdp <i>sdp-id[:vc-id]</i>
Context	config>service>vpls
Description	This command binds a service to an existing Service Distribution Point (SDP). A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received. The SDP has an operational state which determines the operational state of the SDP within the service. For example, if the SDP is administratively or operationally down, the SDP for the service will be down. The SDP must already be defined in the config>service>sdp context in order to associate an SDP with a VPLS service. If the sdp sdp-id is not already configured, an error message is generated. If the <i>sdp-id</i> does exist, a binding between that <i>sdp-id</i> and the service is created. SDPs must be explicitly associated and bound to a service. If an SDP is not bound to a service, no far-end devices can participate in the service. The no form of this command removes the SDP binding from the service. The SDP configuration is not affected; only the binding of the SDP to a service. Once removed, no packets are forwarded to the far-end router.
Default	No <i>sdp-id</i> is bound to a service.
Special Cases	VPLS — Several SDPs can be bound to a VPLS service. Each SDP must use unique <i>vc-ids</i> . An error message is generated if two SDP bindings with identical <i>vc-ids</i> terminate on the same router. Split horizon groups can only be created in the scope of a VPLS service.
Parameters	<i>sdp-id</i> — The SDP identifier. Values 1 — 17407 <i>vc-id</i> — The virtual circuit identifier. Values 1 — 4294967295 vc-type — This command overrides the default VC type signaled for the spoke or mesh binding to the far end of the SDP. The VC type is a 15 bit-quantity containing a value which represents the type of VC. The actual signaling of the VC type depends on the signaling parameter defined for the SDP. If signaling is disabled, the vc-type command can still be used to define the dot1q value

expected by the far-end provider equipment. A change of the bindings VC type causes the binding to signal the new VC type to the far end when signaling is enabled. VC types are derived according to IETF *draft-martini-l2circuit-trans-mpls*.

- The VC type value for Ethernet is 0x0005.
- The VC type value for an Ethernet VLAN is 0x0004.

Values ether, vlan

ether — Defines the VC type as Ethernet. The **ethernet** and **vlan** keywords are mutually exclusive. When the VC type is not defined then the default is Ethernet for spoke SDP bindings. Defining Ethernet is the same as executing **no vc-type** and restores the default VC type for the spoke SDP binding. (hex 5)

vlan — Defines the VC type as VLAN. The **ethernet** and **vlan** keywords are mutually exclusive. When the VC type is not defined then the default is Ethernet for spoke SDP bindings. The VLAN VC-type requires at least one dot1Q tag within each encapsulated Ethernet packet transmitted to the far end.

split-horizon-group *group-name* — Specifies the name of the split horizon group to which the SDP belongs.

endpoint — Specifies the service endpoint to which this SDP bind is attached. The service ID of the SDP binding must match the service ID of the service endpoint.

no endpoint — removes the association of a spoke SDP with an explicit endpoint name.

control-word

Syntax	[no] control word
Context	config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp
Description	This command enables the use of the control word on pseudowire packets in VPLS and enables the use of the control word individually on each mesh SDP or spoke SDP. By default, the control word is disabled. When the control word is enabled, all VPLS packets, including the BPDU frames, are encapsulated with the control word when sent over the pseudowire. The T-LDP control plane behavior is the same as in the implementation of control word for VLL services. The configuration for the two directions of the Ethernet pseudowire should match. The no form of the command reverts the mesh SDP or spoke SDP to the default behavior of not using the control word.
Default	no control word

egress

Syntax	egress
Context	config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp
Description	This command configures the egress SDP context.

ingress

Syntax	ingress
Context	config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp
Description	This command configures the ingress SDP context.

mfib-allowed-mda-destinations

Syntax	mfib-allowed-mda-destinations
Context	config>service>vpls>mesh-sdp>egress config>service>vpls>spoke-sdp>egress
Description	This command enables the context to configure MFIB-allowed MDA destinations. The allowed-mda-destinations node and the corresponding mda command are used on spoke and mesh SDP bindings to provide a list of MDA destinations in the chassis that are allowed as destinations for multicast streams represented by [*;g] and [s,g] multicast flooding records on the VPLS service. The MDA list only applies to IP multicast forwarding when IGMP snooping is enabled on the VPLS service. The MDA list has no effect on normal VPLS flooding such as broadcast, L2 multicast, unknown destinations or non-snooped IP multicast. At the IGMP snooping level, a spoke or mesh SDP binding is included in the flooding domain for an IP multicast stream when it has either been defined as a multicast router port, received a IGMP query through the binding or has been associated with the multicast stream through an IGMP request by a host over the binding. Due to the dynamic nature of the way that a spoke or mesh SDP binding is associated with one or more egress network IP interfaces, the system treats the binding as appearing on all network ports. This causes all possible network destinations in the switch fabric to be included in the multicast streams flooding domain. The MDA destination list provides a simple mechanism that narrows the IP multicast switch fabric destinations for the spoke or mesh SDP binding. If no MDAs are defined within the allowed-mda-destinations node, the system operates normally and will forward IP multicast flooded packets associated with the spoke or mesh SDP binding to all switch fabric taps containing network IP interfaces. The MDA inclusion list should include all MDAs that the SDP binding may attempt to forward through. A simple way to ensure that an MDA that is not included in the list is not being used by the binding is to define the SDP the binding is associated with as MPLS and use an RSVP-TE LSP with a strict egress hop. The MDA associated with the IP interface defined as the strict egress hop should be present in the inclusion list. If the inclusion list does not currently contain the MDA that the binding is forwarding through, the multicast packets will not reach the destination represented by the binding. By default, the MDA inclusion list is empty. If an MDA is removed from the list, the MDA is automatically removed from the flooding domain of any snooped IP multicast streams associated with a destination on the MDA unless the MDA was the last MDA on the inclusion list. Once the inclusion list is empty, all MDAs are eligible for snooped IP multicast flooding for streams associated with the SDP binding.

mda

Syntax	[no] mda mda-id
Context	config>service>vpls>mesh-sdp>egress>mfib-allowed-mda-destinations config>service>vpls>spoke-sdp>egress>mfib-allowed-mda-destinations
Description	This command specifies an MFIB-allowed MDA destination for an SDP binding configured in the system.
Parameters	<i>mda-id</i> — Specifies an MFIB-allowed MDA destination.
Values	slot/mda slot: 1 — 10 mda: 1 — 2

vc-label

Syntax	[no] vc-label vc-label
Context	config>service>vpls>mesh-sdp>egress config>service>vpls>spoke-sdp>egress
Description	This command configures the egress VC label.
Parameters	<i>vc-label</i> — A VC egress value that indicates a specific connection.
Values	16 — 1048575

vc-label

Syntax	[no] vc-label vc-label
Context	config>service>vpls>mesh-sdp>ingress config>service>vpls>spoke-sdp>ingress
Description	This command configures the ingress VC label.
Parameters	<i>vc-label</i> — A VC ingress value that indicates a specific connection.
Values	2048 — 18431

static-mac

Syntax	[no] static-mac ieee-mac-address
Context	config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp
Description	This command creates a remote static MAC entry in the Virtual Private LAN Service (VPLS) forwarding database (FDB) associated with the Service Distribution Point (SDP).

In a VPLS service, MAC addresses are associated with a Service Access Point (SAP) or with a Service Distribution Point (SDP). MACs associated with a SAP are classified as local MACs, and MACs associated with an SDP are remote MACs.

Remote static MAC entries create a permanent MAC address to SDP association in the forwarding database for the VPLS instance so that MAC address will not be learned on the edge device.

Note that static MAC definitions on one edge device are not propagated to other edge devices participating in the VPLS instance, that is, each edge device has an independent forwarding database for the VPLS.

Only one static MAC entry (local or remote) can be defined per MAC address per VPLS instance.

The **no** form of this command deletes the static MAC entry with the specified MAC address associated with the SDP from the VPLS forwarding database.

Default	none
Parameters	<i>ieee-mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i> , <i>bb</i> , <i>cc</i> , <i>dd</i> , <i>ee</i> and <i>ff</i> are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

vlan-vc-tag

Syntax	vlan-vc-tag <i>0..4094</i> no vlan-vc-tag [<i>0..4094</i>]
Context	config>service>vpls>spoke-sdp config>service>vpls>mesh-sdp
Description	This command specifies an explicit Dot1q value used when encapsulating to the SDP far end. When signaling is enabled between the near and far end, the configured Dot1q tag can be overridden by a received TLV specifying the Dot1q value expected by the far end. This signaled value must be stored as the remote signaled Dot1q value for the binding. The provisioned local Dot1q tag must be stored as the administrative Dot1q value for the binding. When the Dot1q tag is not defined, the default value of zero is stored as the administrative dot1q value. Setting the value to zero is equivalent to not specifying the value. The no form of this command disables the command.
Default	no vlan-vc-tag
Parameters	<i>0..4094</i> — Specifies a valid VLAN identifier to bind an 802.1Q VLAN tag ID.

SAP Subscriber Management Commands

cpu-protection

Syntax	cpu-protection <i>policy-id</i> [mac-monitoring] no cpu-protection
Context	config>service>vpls>sap
Description	This command assigns an existing CPU protection policy to the associated service SAP. The CPU protection policies are configured in the config>sys>security>cpu-protection>policy <i>cpu-protection-policy-id</i> context. If no CPU protection policy is assigned to a service SAP, then a the default policy is used to limit the overall-rate. The default policy is policy number 1 and can be viewed in the show>system>security>cpu-protection>policy 1 command output.
Parameters	<i>policy-id</i> — Specifies an existing CPU protection policy. Values 1 — 255 mac-monitoring — When specified, the per MAC rate limiting should be performed, using the per-source-rate from the associated cpu-protection policy.

default-msap-policy

Syntax	default-msap-policy <i>policy-name</i> no default-msap-policy
Context	config>service>vpls>sap
Description	This command specifies an existing managed SAP policy. Managed SAPs allow the use of policies and a SAP template for the creation of a SAP. Managed SAP policies are created in the config>subscr-mgmt context. This command is only applicable to SAPs created as a capture-sap.
Default	none
Parameters	<i>msap-policy-name</i> — Specifies an existing managed SAP policy name up to 32 characters in length.

sub-sla-mgmt

Syntax	[no] sub-sla-mgmt
Context	config>service>vpls>sap
Description	This command enables the context to configure subscriber management parameters for this SAP.
Default	no sub-sla-mgmt

def-inter-dest-id

Syntax	def-inter-dest-id { string <i>string</i> use-top-q } no def-inter-dest-id
Context	config>service>vpls>sap>sub-sla-mgmt
Description	This command specifies a default destination string for all subscribers associated with the SAP. The command also accepts the use-top-q flag that automatically derives the string based on the top most delineating Dot1Q tag from the SAP's encapsulation. The no form of the command removes the default subscriber identification string from the configuration. no def-sub-id
Default	no def-inter-dest-id
Parameters	use-top-q — Derives the string based on the top most delineating Dot1Q tag from the SAP's encapsulation. string <i>string</i> — Specifies the subscriber identification applicable for a subscriber host.

def-sla-profile

Syntax	def-sla-profile <i>default-sla-profile-name</i> no def-sla-profile
Context	config>service>vpls>sap>sub-sla-mgmt
Description	This command specifies a default SLA profile for this SAP. The SLA profile must be defined prior to associating the profile with a SAP in the config>subscriber-mgmt>sla-profile context. An SLA profile is a named group of QoS parameters used to define per service QoS for all subscriber hosts common to the same subscriber within a provider service offering. A single SLA profile may define the QoS parameters for multiple subscriber hosts. SLA profiles are maintained in two locations, the subscriber identification policy and the subscriber profile templates. After a subscriber host is associated with an SLA profile name, either the subscriber identification policy used to identify the subscriber or the subscriber profile associated with the subscriber host must contain an SLA profile with that name. If both the subscriber identification policy and the subscriber profile contain the SLA profile name, the SLA profile in the subscriber profile is used. The no form of the command removes the default SLA profile from the SAP configuration.
Default	no def-sla-profile
Parameters	<i>default-sla-profile-name</i> — Specifies a default SLA profile for this SAP. The SLA profile must be defined prior to associating the profile with a SAP in the config>subscriber-mgmt>sla-profile context.

def-sub-profile

Syntax	def-sub-profile <i>default-subscriber-profile-name</i>
Context	config>service>vpls>sap>sub-sla-mgmt
Description	This command specifies a default subscriber profile for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the config>subscriber-mgmt>sub-profile context. A subscriber profile defines the aggregate QoS for all hosts within a subscriber context. This is done through the definition of the egress and ingress scheduler policies that govern the aggregate SLA for subscriber using the subscriber profile. Subscriber profiles also allow for specific SLA profile definitions when the default definitions from the subscriber identification policy must be overridden. The no form of the command removes the default SLA profile from the SAP configuration.
Parameters	<i>default-sub-profile</i> — Specifies a default subscriber profile for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the config>subscriber-mgmt>sub-profile context.

mac-da-hashing

Syntax	[no] mac-da-hashing
Context	config>service>vpls>sap>sub-sla-mgmt
Description	This command specifies whether subscriber traffic egressing a LAG SAP has its egress LAG link selected by a function of the MAC destination address instead of the subscriber ID. This command is only meaningful if subscriber management is enabled and can be configured for this VPLS service.

multi-sub-sap

Syntax	multi-sub-sap [<i>subscriber-limit</i>] no multi-sub-sap
Context	config>service>vpls>sap>sub-sla-mgmt
Description	This command configures the maximum number of subscribers for this SAP. The no form of this command returns the default value.
Parameters	<i>number-of-sub</i> — Specifies the maximum number of subscribers for this SAP.
Values	2 — 8000

non-sub-traffic

Syntax	non-sub-traffic sub-profile <i>sub-profile-name</i> sla-profile <i>sla-profile-name</i> [subscriber <i>sub-ident-string</i>] no non-sub-traffic
Context	config>service>vpls>sap>sub-sla-mgmt>single-sub
Description	This command configures non-subscriber traffic profiles. The no form of the command removes the profiles and disables the feature.
Parameters	sub-profile <i>sub-profile-name</i> — Specifies an existing subscriber profile name to be associated with the static subscriber host. The subscriber profile is configured in the config>subscr-mgmt>sub-profile context. sla-profile <i>sla-profile-name</i> — Specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the config>subscr-mgmt>sla-profile context. subscriber <i>sub-ident-string</i> — Specifies an existing subscriber identification profile to be associated with the static subscriber host. The subscriber identification profile is configured in the config>subscr-mgmt>sub-ident-policy context. The subscriber information is used by the SAP arp-reply-agent to determine the proper handling of received ARP requests from subscribers. For SAPs with arp-reply-agent enabled with the optional <i>sub-ident</i> parameter, the static subscriber host's sub-ident-string is used to determine whether an ARP request received on the SAP is sourced from a host belonging to the same subscriber as the destination host. When both the destination and source hosts from the ARP request are known on the SAP and the subscriber identifications do not match, the ARP request may be forwarded to the rest of the service destinations. If the static subscriber host's <i>sub-ident</i> string is not defined, the host is not considered to belong to the same subscriber as another host on the SAP. If source or destination host is unknown, the hosts are not considered to belong to the same subscriber. ARP messages from unknown hosts are subject to anti-spoof filtering rules applied at the SAP. If <i>sub-ident</i> is not enabled on the SAP arp-reply-agent, subscriber identification matching is not performed on ARP requests received on the SAP. ARP requests are never forwarded back to the same SAP or within the receiving SAP's Split Horizon Group.

profiled-traffic-only

Syntax	[no] profiled-traffic-only
Context	config>service>vpls>sap>sub-sla-mgmt>single-sub
Description	This command enables profiled traffic only for this SAP. The no form of the command disables the command.

single-sub-parameters

Syntax	single-sub-parameters
Context	config>service>vpls>sap>sub-sla-mgmt
Description	This command enables the context to configure single subscriber parameters for this SAP.

sub-ident-policy

Syntax	sub-ident-policy <i>sub-ident-policy-name</i>
Context	config>service>vpls>sap>sub-sla-mgmt
Description	This command associates a subscriber identification policy to this SAP. The subscriber identification policy must be defined prior to associating the profile with a SAP in the config>subscriber-mgmt>sub-ident-policy context. Subscribers are managed by the system through the use of subscriber identification strings. A subscriber identification string uniquely identifies a subscriber. For static hosts, the subscriber identification string is explicitly defined with each static subscriber host. For dynamic hosts, the subscriber identification string must be derived from the DHCP ACK message sent to the subscriber host. The default value for the string is the content of Option 82 CIRCUIT-ID and REMOTE-ID fields interpreted as an octet string. As an option, the DHCP ACK message may be processed by a subscriber identification policy which has the capability to parse the message into an alternative ASCII or octet string value. When multiple hosts on the same port are associated with the same subscriber identification string they are considered to be host members of the same subscriber. The no form of the command removes the default subscriber identification policy from the SAP configuration.
Default	no sub-ident-policy
Parameters	<i>sub-ident-policy-name</i> — Specifies a subscriber identification policy for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the config>subscriber-mgmt>sub-ident-policy context.

VPLS Multicast Commands

fast-leave

Syntax	[no] fast-leave
Context	<pre>config>service>vpls>sap>igmp-snooping config>service>vpls>sap>mld-snooping config>service>vpls>spoke-sdp>igmp-snooping config>service>vpls>mesh-sdp>igmp-snooping config>service>vpls>spoke-sdp>mld-snooping config>service>vpls>mesh-sdp>mld-snooping</pre>
Description	This command enables fast leave. When IGMP fast leave processing is enabled, the 7750 SR will immediately remove a SAP or SDP from the multicast group when it detects an IGMP “leave” on that SAP or SDP. Fast leave processing allows the switch to remove a SAP or SDP that sends a 'leave' from the forwarding table without first sending out group-specific queries to the SAP or SDP, and thus speeds up the process of changing channels ('zapping'). Fast leave should only be enabled when there is a single receiver present on the SAP or SDP. When fast leave is enabled, the configured last-member-query-interval value is ignored.
Default	no fast-leave

from-vpls

Syntax	from-vpls <i>vpls-id</i> no from-vpls
Context	<pre>config>service>vpls>sap>igmp-snooping>mvr config>service>vpls>sap>mld-snooping>mvr</pre>
Description	This command configures the VPLS from which multicast traffic is copied upon receipt of an IGMP join request. IGMP snooping must be enabled on the MVR VPLS.
Default	no from-vpls
Parameters	<i>vpls-id</i> — Specifies the MVR VPLS from which multicast channels should be copied into this SAP. Values <i>service-id:</i> 1 — 2147483648

group

Syntax	[no] group <i>grp-address</i>
Context	config>service>vpls>sap>igmp-snooping>static

```
config>service>vpls>spoke-sdp>snooping>static
config>service>vpls>mesh-sdp>snooping>static
```

Description	This command adds a static multicast group either as a (*, g) or as one or more (s,g) records. When a static IGMP group is added, multicast data for that (*,g) or (s,g) is forwarded to the specific SAP or SDP without receiving any membership report from a host.
Default	none
Parameters	<i>grp-address</i> — Specifies an IGMP multicast group address that receives data on an interface. The IP address must be unique for each static group.

group-policy

Syntax	group-policy <i>policy-name</i> no group-policy
Context	config>service>vpls>sap>igmp-snooping>mvr config>service>vpls>mld-snooping>mvr
Description	This command identifies filter policy of multicast groups to be applied to this VPLS entity. The sources of the multicast traffic must be a member of the VPLS. The no form of the command removes the policy association from the VPLS configuration.
Default	No group policy is specified.
Parameters	<i>policy-name</i> — The group policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Routing policies are configured in the config>router>policy-options context. The router policy must be defined before it can be imported. For details on IGMP policies, please see section “Enabling IGMP group membership report filtering” in the 7750 SR OS Router Configuration Guide.

fault-propagation-bmac

Syntax	fault-propagation-bmac [<i>mac-name</i> <i>ieee-address</i>] [create] no fault-propagation-bmac [<i>mac-name</i> <i>ieee-address</i>]
Context	config>service>vpls>mesh-sdp config>service>vpls>sap config>service>vpls>spoke-sdp
Description	This command configures associated BMAC addresses for fault propagation on a B-VPLS SAP or SDP binding. The statement can appear up to four times in the configuration to support four remote BMAC addresses in the same remote B-VPLS. The configured VPLS must be a B-VPLS. The no form of the command removes the specified MAC name or MAC address from the list of Fault Propagation BMAC addresses associated with the SAP (or SDP).
Parameters	<i>mac-name</i> — Specifies a (predefined) MAC name to associate with the SAP or SDP, indirectly specifying a Fault Propagation BMAC address. Up to 32 characters in length.

ieee-address — Specifies a MAC address to associate with the SAP or SDP, directly specifying a Fault Propagation BMAC address. The value should be input in either a xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx format.

force-vlan-vc-forwarding

Syntax	[no] force-vlan-vc-forwarding
Context	config>service>epipe>spoke-sdp config>service>vpls>mesh-sdp config>service>vpls>spoke-sdp
Description	This command forces vc-vlan-type forwarding in the data path for spoke/mesh SDPs which have either vc-type. This comand is not allowed on vlan-vc-type SDPs. The no form of this command sets default behavior.
Default	disabled

hash-label

Syntax	[no] hash-label
Context	config>service>vpls>spoke-sdp config>service>vpls>mesh-sdp
Description	This command enables the use of the hash label on a VLL, VPLS, or VPRN service bound to LDP or RSVP SDP as well as to a VPRN service using the autobind mode with the with the ldp, rsvp-te, or mpls options. This feature is not supported on a service bound to a GRE SDP or for a VPRN service using the autobind mode with the gre option.. When this feature is enabled, the ingress data path is modified such that the result of the hash on the packet header is communicated to the egress data path for use as the value of the label field of the hash label. The egress data path appends the hash label at the bottom of the stack (BoS) and sets the S-bit to 1 to indicate that. In order to allow for applications whereby the egress LER infers the presence of the Hash Label implicitly from the value of the label, the Most Significant Bit (MSB) of the result of the hash is set before copying into the Hash Label. This means that the value of the hash label will always be in the range [524,288 - 1,048,575] and will not overlap with the signaled/static LSP and signaled/static service label ranges. This also guarantees that the hash label will not match a value in the reserved label range. The (unmodified) result of the hash continues to be used for the purpose of ECMP and LAG spraying of packets locally on the ingress LER. Note however that for VLL services, the result of the hash is overwritten and the ECMP and LAG spraying will be based on service-id when ingress SAP shared queuing is not enabled. However, the hash label will still reflect the result of the hash such that an LSR can use it to perform fine grained load balancing of VLL PW packets. Packets that are generated in CPM and forwarded labeled within the context of a service (for example, OAM packets) must also include a Hash Label at the BoS and set the S-bit accordingly.

The TTL of the Hash Label is set to a value of 1.

The **no** form of this command disables the use of the hash label.

Default no hash-label

igmp-snooping

Syntax	igmp-snooping
Context	config>service>vpls config>service>vpls>sap config>service>vpls>spoke-sdp config>service>vpls>mesh-sdp
Description	This command enables the Internet Group Management Protocol (IGMP) snooping context.
Default	none

igmp-host-tracking

Syntax	igmp-host-tracking
Context	config>service>vpls config>service>vpls>sap
Description	This command enables the context to configure IGMP host tracking parameters.

expiry-time

Syntax	expiry-time <i>expiry-time</i> no expiry-time
Context	config>service>vpls>igmp-trk config>service>vpls>sap>igmp-trk
Description	This command configures the time that the system continues to track inactive hosts. The no form of the command removes the values from the configuration.
Default	no expiry-time
Parameters	<i>expiry-time</i> — Specifies the time, in seconds, that this system continues to track an inactive host. Values 1 — 65535

import

Syntax	import <i>policy-name</i> no import
Context	config>service>vpls>sap>igmp-trk
Description	This command associates an import policy to filter IGMP packets. The no form of the command removes the values from the configuration.
Default	no import
Parameters	<i>policy-name</i> — Specifies the import policy name.

max-num-groups

Syntax	max-num-groups <i>max-num-groups</i> no max-num-groups
Context	config>service>vpls>sap>igmp-trk
Description	This command configures the maximum number of multicast groups allowed to be tracked. The no form of the command removes the values from the configuration.
Default	no max-num-groups
Parameters	<i>max-num-groups</i> — Specifies the maximum number of multicast groups allowed to be tracked. Values 1 — 196607

max-num-sources

Syntax	max-num-sources <i>max-num-sources</i> no max-num-sources
Context	config>service>vpls>sap>igmp-trk
Description	This command configures the maximum number of multicast sources allowed to be tracked per group. The no form of the command removes the value from the configuration.
Parameters	<i>max-num-sources</i> — Specifies the maximum number of multicast sources allowed to be tracked per group. Values 1 — 1000

import

Syntax	import <i>policy-name</i> no import
Context	config>service>vpls>sap>igmp-snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>mesh-sdp>snooping config>service>vpls>sap>mld-snooping config>service>vpls>spoke-sdp>mld-snooping config>service>vpls>mesh-sdp>mld-snooping
Description	This command specifies the import routing policy to be used for IGMP packets to be used on this SAP or SDP. Only a single policy can be imported on a single SAP at any time. The no form of the command removes the policy association from the SAP or SDP.
Default	no import — No import policy is specified.
Parameters	<i>policy-name</i> — The import policy name. Values can be string up to 32 characters long of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. These policies are configured in the config>router>policy-options context The router policy must be defined before it can be imported.

last-member-query-interval

Syntax	last-member-query-interval <i>tenths-of-seconds</i> no last-member-query-interval
Context	config>service>vpls>sap>igmp-snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>mesh-sdp>snooping config>service>vpls>sap>mld-snooping config>service>vpls>spoke-sdp>mld-snooping config>service>vpls>mesh-sdp>mld-snooping
Description	This command configures the maximum response time used in group-specific queries sent in response to ‘leave’ messages, and is also the amount of time between 2 consecutive group-specific queries. This value may be tuned to modify the leave latency of the network. A reduced value results in reduced time to detect the loss of the last member of a group. The configured last-member-query-interval is ignored when fast-leave is enabled on the SAP or SDP.
Default	10
Parameters	<i>seconds</i> — Specifies the frequency, in tenths of seconds, at which query messages are sent. Values 1 — 50

mcac

Syntax	mcac
Context	config>service>vpls>mesh-sdp>snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>sap>igmp-snooping
Description	This command configures multicast CAC policy and constraints for this interface.
Default	none

policy

Syntax	policy <i>policy-name</i> no policy
Context	config>service>vpls>mesh-sdp>snooping>mcac config>service>vpls>spoke-sdp>snooping>mcac config>service>vpls>sap>igmp-snooping>mcac
Description	This command configures the multicast CAC policy name.
Parameters	<i>policy-name</i> — The multicast CAC policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

unconstrained-bw

Syntax	unconstrained-bw <i>bandwidth</i> mandatory-bw <i>mandatory-bw</i> no unconstrained-bw
Context	config>service>vpls>mesh-sdp>snooping>mcac config>service>vpls>spoke-sdp>snooping>mcac config>service>vpls>sap>igmp-snooping>mcac
Description	This command configures the bandwidth for the interface's multicast CAC policy traffic. When disabled (no unconstrained-bw) there will be no checking of bandwidth constraints on the interface level. When enabled and a policy is defined, enforcement is performed. The allocated bandwidth for optional channels should not exceed the unconstrained-bw minus the mandatory-bw and the mandatory channels have to stay below the specified value for the mandatory-bw . After this interface check, the bundle checks are performed.
Parameters	<i>bandwidth</i> — The bandwidth assigned for interface's MCAC policy traffic, in kilo-bits per second (kbps). Values 0 — 2147483647 mandatory-bw <i>mandatory-bw</i> — Specifies the bandwidth pre-reserved for all the mandatory channels on a given interface in kilo-bits per second (kbps).

If the *bandwidth* value is 0, no mandatory channels are allowed. If the value of *bandwidth* is '-1', then all mandatory and optional channels are allowed.

If the value of *mandatory-bw* is equal to the value of *bandwidth*, then all the unconstrained bandwidth on a given interface is allocated to mandatory channels configured through multicast CAC policy on that interface and no optional groups (channels) are allowed.

The value of *mandatory-bw* should always be less than or equal to that of *bandwidth*. An attempt to set the value of *mandatory-bw* greater than that of *bandwidth*, will result in inconsistent value error.

Values 0 — 2147483647

mc-constraints

Syntax	mc-constraints
Context	config>service>vpls>sap>igmp-snooping>mcac
Description	This command enables the context to configure multicast CAC constraints.
Default	none

level

Syntax	level <i>level-id</i> bw <i>bandwidth</i> no level <i>level-id</i>
Context	config>service>vpls>sap>igmp-snooping>mcac>mc-constraints
Description	This command configures levels and their associated bandwidth for multicast cac policy on this interface.
Parameters	<i>level-id</i> — Specifies has an entry for each multicast CAC policy constraint level configured on this system. Values 1 — 8 <i>bandwidth</i> — Specifies the bandwidth in kilobits per second (kbps) for the level. Values 1 — 2147483647

number-down

Syntax	number-down <i>number-lag-port-down</i> no number-down
Context	config>service>vpls>sap>igmp-snooping>mcac>mc-constraints
Description	This command configure the number of ports down along with level for multicast cac policy on this interface.

Default not enabled

max-num-groups

Syntax	max-num-groups <i>count</i> no max-num-groups
Context	config>service>vpls>sap>igmp-snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>mesh-sdp>snooping config>service>vpls>sap>mld-snooping config>service>vpls>spoke-sdp>mld-snooping config>service>vpls>mesh-sdp>mld-snooping
Description	This command defines the maximum number of multicast groups that can be joined on this SAP or SDP. If the node receives an IGMP join message that would exceed the configured number of groups, the request is ignored.
Default	no max-num-groups
Parameters	<i>count</i> — Specifies the maximum number of groups that can be joined on this SAP or SDP. Values 1 — 1000

max-num-sources

Syntax	max-num-sources <i>max-num-sources</i> no max-num-sources
Context	config>service>vpls>sap>igmp-snooping
Description	This command configures the maximum number of multicast sources allowed per group.
Parameters	<i>max-num-sources</i> — Specifies the maximum number of multicast sources allowed per group. Values 1 — 1000

mrouter-port

Syntax	[no] mrouter-port
Context	config>service>vpls>sap>igmp-snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>mesh-sdp>snooping
Description	This command specifies whether a multicast router is attached behind this SAP or SDP. Configuring a SAP as an mrouter-port will have a double effect. Firstly, all multicast traffic received on another SAP or SDP will be copied to this SAP or SDP. Secondly, IGMP reports generated by the system as a result of someone joining or leaving a multicast group, will be sent to this SAP or SDP.

If two multicast routers exist in the network, one of them will become the active querier. While the other multicast router (non-querier) stops sending IGMP queries, it should still receive reports to keep its multicast trees up to date. To support this, the mrouter-port should be enabled on all SAPs or SDPs connecting to a multicast router.

Note that the IGMP version to be used for the reports (v1, v2 or v3) can only be determined after an initial query has been received. Until such time no reports are sent on the SAP or spoke SDP, even if mrouter-port is enabled.

This parameter can only be enabled on a SAP or spoke SDP, not on a mesh SDP.

If the **send-queries** command is enabled on this SAP or spoke SDP, the mrouter-port parameter can not be set.

Default no mrouter-port

mvr

Syntax mvr

Context config>service>vpls>igmp-snooping
config>service>vpls>mld-snooping
config>service>vpls>sap>igmp-snooping

Description This command enables the context to configure Multicast VPLS Registration (MVR) parameters.

query-interval

Syntax query-interval *seconds*
no query-interval

Context config>service>vpls>igmp-snooping
config>service>vpls>sap>igmp-snooping
config>service>vpls>spoke-sdp>snooping
config>service>vpls>mesh-sdp>snooping
config>service>vpls>mld-snooping
config>service>vpls>sap>mld-snooping
config>service>vpls>spoke-sdp>mld-snooping
config>service>vpls>mesh-sdp>mld-snooping

Description This command configures the IGMP query interval. If the **send-queries** command is enabled, this parameter specifies the interval between two consecutive general queries sent by the system on this SAP or SDP. The configured query-interval must be greater than the configured query-response-interval. If send-queries is not enabled on this SAP or SDP, the configured query-interval value is ignored.

Default 125

Parameters *seconds* — The time interval, in seconds, that the router transmits general host-query messages.

Values 2 — 1024

query-response-interval

Syntax	query-response-interval <i>seconds</i>
Context	config>service>vpls>sap>igmp-snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>mesh-sdp>snooping config>service>vpls>sap>mld-snooping config>service>vpls>spoke-sdp>mld-snooping config>service>vpls>mesh-sdp>mld-snooping
Description	This command configures the IGMP query response interval. If the send-queries command is enabled, this parameter specifies the maximum response time advertised in IGMPv2/v3 queries. The configured query-response-interval must be smaller than the configured query-interval. If send-queries is not enabled on this SAP or SDP, the configured query-response-interval value is ignored.
Default	10
Parameters	<i>seconds</i> — Specifies the length of time to wait to receive a response to the host-query message from the host. Values 1 — 1023

query-src-ip

Syntax	query-src-ip <i>ipv6-address</i> no query-src-ip
Context	config>service>vpls>mld-snooping
Description	This command configures the IP source address used in MLD queries.

report-src-ip

Syntax	report-src-ip <i>address</i> no report-src-ip
Context	config>service>vpls>igmp-snooping
Description	This parameter specifies the source IP address used when generating IGMP reports. According the IGMPv3 standard, a zero source address is allowed in sending IGMP reports. However, for interoperability with some multicast routers, the source IP address of IGMP group reports can be configured using this command.
Default	0.0.0.0
Parameters	<i>ip-address</i> — The source IP source address in transmitted IGMP reports.

robust-count

Syntax	robust-count <i>robust-count</i> no robust-count
Context	config>service>vpls>igmp-snooping config>service>vpls>sap>igmp-snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>mesh-sdp>snooping config>service>vpls>sap>mld-snooping config>service>vpls>spoke-sdp>mld-snooping config>service>vpls>mesh-sdp>mld-snooping
Description	If the send-queries command is enabled, this parameter allows tuning for the expected packet loss on a SAP or SDP. The robust-count variable allows tuning for the expected packet loss on a subnet and is comparable to a retry count. If this SAP or SDP is expected to be 'lossy', this parameter may be increased. IGMP snooping on this SAP or SDP is robust to (robust-count-1) packet losses. If send-queries is not enabled, this parameter will be ignored.
Default	2
Parameters	<i>robust-count</i> — Specifies the robust count for the SAP or SDP.
Values	config>service>vpls>sap>igmp-snooping: 2 — 7 config>service>vpls>igmp-snooping: 1 — 255

mrp

Syntax	mrp
Context	config>service>vpls config>service>vpls>mesh-sdp config>service>vpls>sap config>service>vpls>spoke-sdp
Description	This command configures Multiple Registration Protocol (MRP) parameters.

attribute-table-size

Syntax	[no] attribute-table-size <i>value</i>
Context	config>service>vpls>mrp
Description	This command controls the number of attributes accepted on a per BVPLS basis. When the limit is reached, no new attributes will be registered. If a new lower limit (smaller than the current number of attributes) from a local or dynamic IVPLS is being provisioned, a CLI warning will be issued stating that the system is currently beyond the new limit. The value will be accepted, but any creation of new attributes will be blocked under the attribute count drops below the new limit; the software will then start enforcing the new limit.

Default	maximum number of attributes
Parameters	<i>value</i> — Specifies the number of attributes accepted on a per BVPLS basis.
Values	SR-7/SR-12: 1 — 2047 SR-1 1 — 1023

attribute-table-high-wmark

Syntax	[no] attribute-table-high-wmark <i>high-water-mark</i>
Context	config>service>vpls>mrp
Description	This command specifies the percentage filling level of the MMRP attribute table where logs and traps are sent.
Default	95%
Parameters	<i>high-water-mark</i> — 1%-100%

attribute-table-low-wmark

Syntax	[no] attribute-table-low-wmark <i>low-water-mark</i>
Context	config>service>vpls>mrp
Description	This command specifies the MMRP attribute table low watermark as a percentage. When the percentage filling level of the MMRP attribute table drops below the configured value, the corresponding trap is cleared and/or a log entry is added.
Default	90%
Parameters	<i>low-water-mark</i> — 1%-100%

flood-time

Syntax	flood-time <i>flood-time</i> no flood-time
Context	config>service>vpls>mrp
Description	This command configures the amount of time, in seconds, after a status change in the VPLS service during which traffic is flooded. Once that time expires, traffic will be delivered according to the MMRP registrations that exist in the VPLS.
Default	3 seconds
Parameters	<i>flood-time</i> — Specifies the MRP flood time, in seconds.
Values	3 — 600

join-time

Syntax	[no] join-time <i>value</i>
Context	config>service>vpls>sap>mrp config>service>vpls>spoke-sdp>mrp config>service>vpls>mesh-sdp>mrp
Description	This command controls the interval between transmit opportunities that are applied to the Applicant state machine. An instance of this Join Period Timer is required on a per-Port, per-MRP Participant basis. For additional information, refer to IEEE 802.1ak-2007 section 10.7.4.1.
Default	2
Parameters	<i>value</i> — [1-10] tenths of a second

leave-time

Syntax	[no] leave-time <i>value</i>
Context	config>service>vpls>sap>mrp config>service>vpls>spoke-sdp>mrp config>service>vpls>mesh-sdp>mrp
Description	This command controls the period of time that the Registrar state machine will wait in the leave state before transitioning to the MT state when it is removed. An instance of the timer is required for each state machine that is in the leave state. The Leave Period Timer is set to the value leave-time when it is started. A registration is normally in “in” state where there is an MFIB entry and traffic is being forwarded. When a “leave all” is performed (periodically around every 10-15 seconds per SAP/SDP binding - see leave-all-time-below), a node sends a message to its peer indicating a leave all is occurring and puts all of its registrations in leave state. The peer refreshes its registrations based on the leave all PDU it receives and sends a PDU back to the originating node with the state of all its declarations. Refer to IEEE 802.1ak-2007 section 10.7.4.2.
Default	30
Parameters	<i>value</i> — [30-60] tenths of a second

leave-all-time

Syntax	[no] leave-all-time <i>value</i>
Context	config>service>vpls>sap>mrp config>service>vpls>spoke-sdp>mrp config>service>vpls>mesh-sdp>mrp

Description	This command controls the frequency with which the LeaveAll state machine generates LeaveAll PDUs. The timer is required on a per-Port, per-MRP Participant basis. The Leave All Period Timer is set to a random value, T, in the range $\text{LeaveAllTime} < T < 1.5 * \text{leave-all-time}$ when it is started. Refer to IEEE 802.1ak-2007 section 10.7.4.3.
Default	100
Parameters	<i>value</i> — [60-300] tenths of a second

mrp-policy

Syntax	[no] mrp-policy <i>policy-name</i>
Context	config>service>vpls>sap>mrp config>service>vpls>spoke-sd>mrp config>service>vpls>mesh-sdp>mrp
Description	This command instructs MMRP to use the mrp-policy specified in the command to control which Group BMAC attributes will be declared and registered on the egress SAP/Mesh-SDP/Spoke-SDP. The Group BMACs will be derived from the ISIDs using the procedure used in the PBB solution. The Group MAC = standard OUI with the last 24 bits being the ISID value. If the policy-name refers to a non-existing mrp-policy the command should return error. Changes to a mrp-policy are allowed and applied to the SAP/SDPs under which the policy is referenced.
Default	no mrp-policy is defined
Parameters	<i>policy-name</i> — Specifies the redirect policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

periodic-time

Syntax	[no] periodic-time <i>value</i>
Context	config>service>vpls>sap>mrp config>service>vpls>spoke-sdp>mrp config>service>vpls>mesh-sdp>mrp
Description	This command controls the frequency the PeriodicTransmission state machine generates periodic events if the Periodic Transmission Timer is enabled. The timer is required on a per-Port basis. The Periodic Transmitting Timer is set to one second when it is started.
Default	10
Parameters	<i>value</i> — [10-100] tenths of a second

periodic-timer

Syntax	[no] periodic-timer
Context	config>service>vpls>sap>mrp config>service>vpls>spoke-sdp>mrp config>service>vpls>mesh-sdp>mrp
Description	This command enables or disables the Periodic Transmission Timer.
Default	disabled

multicast-info-policy

Syntax	multicast-info-policy <i>policy-name</i> no multicast-info-policy
Context	config>service>vpls
Description	This command specifies the multicast policy name configured on this service.

per-service-hashing

Syntax	[no] per-service-hashing
Context	config>service>vpls
Description	This command enables on a per service basis, consistent per-service hashing for Ethernet services over LAG, over Ethernet tunnel (eth-tunnel) using loadsharing protection-type or over CCAG. Specifically, it enables the new hashing procedures for Epipe, VPLS, regular or PBB services. The following algorithm describes the hash-key used for hashing when the new option is enabled: • If the packet is PBB encapsulated (contains an I-TAG ethertype) at the ingress side, use the ISID value from the I-TAG • If the packet is not PBB encapsulated at the ingress side – For regular (non-PBB) VPLS and EPIPE services, use the related service ID – If the packet is originated from an ingress IVPLS or PBB Epipe SAP •If there is an ISID configured use the related ISID value •If there is no ISID yet configured use the related service ID – For BVPLS transit traffic use the related flood list id •Transit traffic is the traffic going between BVPLS endpoints •An example of non-PBB transit traffic in BVPLS is the OAM traffic • The above rules apply regardless of traffic type – Unicast, BUM flooded without MMRP or with MMRP, IGMP snooped The no form of this command implies the use of existing hashing options.

Default no per-service-hashing

pim-snooping

Syntax [no] **pim-snooping**

Context config>service>vpls>spoke-sdp
config>service>vpls>sap

Context This command enables PIM snooping for the VPLS service. When enabled, it is enabled for all SAPs except default SAPs. A default SAP is a SAP that has a wildcard VLAN ID, such as sap 1/1/1:*.
The **no** form of the command removes the PIM snooping configuration.

max-num-groups

Syntax **max-num-groups** *num-groups*
no max-num-groups

Context config>service>vpls>pim-snooping
config>service>vpls>spoke-sdp>pim-snooping
config>service>vpls>sap>pim-snooping

Description This command configures the maximum groups for PIM snooping.

Parameters *num-groups* — Specifies the maximum groups for PIM snooping.

Values 1 — 16000

The max number of MFIBs is 1000 for a 7750 router in chassis mode A.

The max number of MFIBs is 4000 for a 7750 router in chassis mode B and C.

hold-time

Syntax **hold-time** *seconds*
no hold-time

Context config>service>vpls>pim-snooping

Description This command configures the duration that allows the PIM-snooping switch to snoop all the PIM states in the VPLS. During this duration, multicast traffic is flooded in the VPLS. At the end of this duration, multicast traffic is forwarded using the snooped states.

When PIM snooping is enabled in VPLS, there is a period of time when the PIM snooping switch may not have built complete snooping state. The switch cannot build states until the routers connected to the VPLS refresh their PIM messages.

This parameter is applicable only if PIM snooping is enabled.

Parameters *seconds* — Specifies the PIM snooping hold time, in seconds

Values	0 — 300
Default	90

mode

Syntax	mode <i>mode</i>
Context	config>service>vpls>pim-snooping
Description	This command sets the PIM snooping mode to proxy or plain snooping.
Parameters	<i>mode</i> — Specifies PIM snooping mode.
	Values snooping, proxy
	Default proxy

propagate-mac-flush

Syntax	[no] propagate-mac-flush
Context	config>service>vpls
Description	This command specifies whether MAC flush messages received from the given LDP are propagated to all spoke and mesh SDPs within the context of this VPLS service. The propagation will follow the split-horizon principle and any data-path blocking in order to avoid the looping of these messages.
Default	no propagate-mac-flush

send-queries

Syntax	[no] send-queries
Context	config>service>vpls>sap>igmp-snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>mesh-sdp>snooping config>service>vpls>sap>mld-snooping config>service>vpls>spoke-sdp>mld-snooping config>service>vpls>mesh-sdp>mld-snooping
Description	This command specifies whether to send IGMP general query messages on the SAP or SDP. When send-queries is configured, all type of queries generate ourselves are of the configured version. If a report of a version higher than the configured version is received, the report will get dropped and a new wrong version counter will get incremented. If send-queries is not configured, the version command has no effect. The version used will be the version of the querier. This implies that, for example, when we have a v2 querier, we will never send out a v3 group or group-source specific query when a host wants to leave a certain group.

Default no send-queries

source

Syntax **[no] source** *ip-address*

Context config>service>vpls>sap>igmp-snooping>static>group
config>service>vpls>spoke-sdp>snooping>static>group
config>service>vpls>mesh-sdp>snooping>static>group

Description This command adds a static (s,g) entry to allow multicast traffic for the corresponding multicast group from that specific source. For the same multicast group, more than one source can be specified. Static (s,g) entries can not be entered when a starg is already created. The **no** form of the command removes the source from the configuration.

Default none

Parameters *ip-address* — Specifies the IPv4 unicast address.

starg

Syntax **[no] starg**

Context config>service>vpls>sap>igmp-snooping>static>group
config>service>vpls>spoke-sdp>snooping>static>group
config>service>vpls>mesh-sdp>snooping>static>group

Description This command adds a static (*,g) entry to allow multicast traffic for the corresponding multicast group from any source. This command can only be enabled if no existing source addresses for this group are specified. The **no** form of the command removes the starg entry from the configuration.

Default no starg

static

Syntax **static**

Context config>service>vpls>sap>igmp-snooping
config>service>vpls>spoke-sdp>snooping
config>service>vpls>mesh-sdp>snooping
config>service>vpls>sap>mld-snooping
config>service>vpls>spoke-sdp>mld-snooping
config>service>vpls>mesh-sdp>mld-snooping

Description This command enables access to the context to configure static group addresses. Static group addresses can be configured on a SAP or SDP. When present either as a (*, g) or a (s,g) entry,

multicast packets matching the configuration will be forwarded even if no join message was registered for the specific group.

Default none

version

Syntax	version <i>version</i> no version
Description	<pre>config>service>vpls>sap>igmp-snooping config>service>vpls>mesh-sdp>snooping config>service>vpls>spoke-sdp>snooping config>service>vpls>sap>mld-snooping config>service>vpls>spoke-sdp>mld-snooping config>service>vpls>mesh-sdp>mld-snooping</pre>
Description	This command specifies the version of IGMP which is running on this SAP or SDP. This object can be used to configure a router capable of running either value. For IGMP to function correctly, all routers on a LAN must be configured to run the same version of IGMP on that LAN. When the send-query command is configured, all type of queries generate ourselves are of the configured version. If a report of a version higher than the configured version is received, the report gets dropped and a new “wrong version” counter is incremented. If the send-query command is not configured, the version command has no effect. The version used on that SAP or SDP will be the version of the querier. This implies that, for example, when there is a v2 querier, a v3 group or group-source specific query when a host wants to leave a certain group will never be sent.
Parameters	<i>version</i> — Specify the IGMP version. Values 1, 2, 3

to-sap

Syntax	to-sap <i>sap-id</i> no to-sap
Context	config>service>vpls>sap>igmp-snooping>mvr
Description	In some situations, the multicast traffic should not be copied from the MVR VPLS to the SAP on which the IGMP message was received (standard MVR behaviour) but to another SAP. This command configures the SAP to which the multicast data needs to be copied.
Default	no to-sap
Parameters	<i>sap-id</i> — Specifies the SAP to which multicast channels should be copied. See Common CLI Command Descriptions on page 1933 for command syntax.

VPLS DHCP and Anti-Spoofing Commands

anti-spoof

Syntax	anti-spoof { ip mac ip-mac } no anti-spoof
Context	config>service>vpls>sap
Description	This command enables anti-spoof filtering and optionally changes the anti-spoof matching type for the SAP. The type of anti-spoof filtering defines what information in the incoming packet is used to generate the criteria to lookup an entry in the anti-spoof filter table. The type parameter (ip, mac, ip-mac) defines the anti-spoof filter type enforced by the SAP when anti-spoof filtering is enabled. The no form of the command disables anti-spoof filtering on the SAP.
Default	no anti-spoof
Parameters	ip — Configures SAP anti-spoof filtering to use only the source IP address in its lookup. If a static host exists on the SAP without an IP address specified, the anti-spoof ip command will fail. mac — Configures SAP anti-spoof filtering to use only the source MAC address in its lookup. If a static host exists on the SAP without a specified MAC address, the anti-spoof mac command will fail. ip-mac — Configures SAP anti-spoof filtering to use both the source IP address and the source MAC address in its lookup. If a static host exists on the SAP without both the IP address and MAC address specified, the anti-spoof ip-mac command will fail.

app-profile

Syntax	app-profile <i>app-profile-name</i> no app-profile
Context	config>service>vpls>sap
Description	This command configures the application profile name.
Parameters	<i>app-profile-name</i> — Specifies an existing application profile name configured in the config>app-assure>group>policy context.

arp-host

Syntax	arp-host
Context	config>service>vpls>sap

Description This command enables the context to configure ARP host parameters.

host-limit

Syntax **host-limit** *max-num-hosts*
no host-limit

Context config>service>vpls>sap>arp-host

Description This command configures the maximum number of ARP hosts.
 The **no** form of the command returns the value to the default.

Default 1

Parameters *max-num-hosts* — specifies the maximum number of ARP hosts allowed on this SAP.

Values 1 — 32767

min-auth-interval

Syntax **min-auth-interval** *min-auth-interval*
no min-auth-interval

Context config>service>vpls>sap>arp-host

Description This command configures the minimum authentication interval.
 The **no** form of the command returns the value to the default.

Default 15

Parameters *min-auth-interval* — Specifies the minimum authentic interval, in minutes.

Values 1 — 6000

arp-reply-agent

Syntax **arp-reply-agent** [sub-ident]
no arp-reply-agent

Context config>service>vpls>sap

Description This command enables a special ARP response mechanism in the system for ARP requests destined to static or dynamic hosts associated with the SAP. The system responds to each ARP request using the hosts MAC address as the both the source MAC address in the Ethernet header and the target hardware address in the ARP header.

ARP replies and requests received on a SAP with **arp-reply-agent** enabled will be evaluated by the system against the anti-spoof filter entries associated with the ingress SAP (if the SAP has anti-spoof filtering enabled). ARPs from unknown hosts on the SAP will be discarded when anti-spoof filtering is enabled.

The ARP reply agent only responds if the ARP request enters an interface (SAP, spoke SDP or mesh-SDP) associated with the VPLS instance of the SAP.

A received ARP request that is not in the ARP reply agent table is flooded to all forwarding interfaces of the VPLS capable of broadcast except the ingress interface while honoring split-horizon constraints.

Static hosts can be defined on the SAP using the **host** command. Dynamic hosts are enabled on the system by enabling the **lease-populate** command in the SAP's **dhcp** context. In the event that both a static host and a dynamic host share the same IP and MAC address, the VPLS ARP reply agent will retain the host information until both the static and dynamic information are removed. In the event that both a static and dynamic host share the same IP address, but different MAC addresses, the VPLS ARP reply agent is populated with the static host information.

The **arp-reply-agent** command will fail if an existing static host on the SAP does not have both MAC and IP addresses specified. Once the ARP reply agent is enabled, creating a static host on the SAP without both an IP address and MAC address will fail.

The ARP-reply-agent may only be enabled on SAPs supporting Ethernet encapsulation.

The **no** form of the command disables ARP-reply-agent functions for static and dynamic hosts on the SAP.

Default	not enabled
Parameters	sub-ident — Configures the arp-reply-agent to discard ARP requests received on the SAP that are targeted for a known host on the same SAP with the same subscriber identification. Hosts are identified by their subscriber information. For DHCP subscriber hosts, the subscriber hosts, the subscriber information is configured using the optional subscriber parameter string. When arp-reply-agent is enabled with sub-ident: • If the subscriber information for the destination host exactly matches the subscriber information for the originating host and the destination host is known on the same SAP as the source, the ARP request is silently discarded. • If the subscriber information for the destination host or originating host is unknown or undefined, the source and destination hosts are not considered to be the same subscriber. The ARP request is forwarded outside the SAP's Split Horizon Group. • When sub-ident is not configured, the arp-reply-agent does not attempt to identify the subscriber information for the destination or originating host and will not discard an ARP request based on subscriber information.

force-l2pt-boundary

Syntax	[no] force-l2pt-boundary
Context	config>service>vpls>sap
Description	Enabling force-l2pt-boundary will force that all SAPs managed by the given m-vpls instance on the corresponding port will have to have l2pt-termination enabled. This command is applicable only to SAPs created under m-vpls and this regardless the flavor of STP currently being active. It is not applicable to spoke-sdps.

The execution of this command will fail as soon as at least one of the currently managed SAPs (all SAPs falling within the specified managed-vlan-range) does not have l2pt-termination enabled, and this regardless its admin/operational status.

If force-l2pt-boundary is enabled on a given m-vpls SAP, all newly created SAPs falling into the specified managed-vlan-range will have l2pt-termination enabled per default.

Extending or adding new range into a managed-vlan-range declaration will fail as soon as there is at least one SAPs falling into the specified vlan-range does not have l2pt-termination enabled.

Disabling l2pt-termination on currently managed SAPs will fail as soon as the force-l2pt-boundary is enabled under corresponding m-vpls SAP.

frame-relay

Syntax	frame-relay
Context	config>service>vpls>sap
Description	This command enables the context to configure frame-relay parameters.

frf-12

Syntax	[no] frf-12
Context	config>service>vpls>sap>fr
Description	This command enables FRF12 headers. This must be set to disabled for this entry to be added to an MLFR bundle. The no form of the command disables FRF12 headers.

ete-fragment-threshold

Syntax	ete-fragment-threshold <i>threshold</i> no ete-fragment-threshold
Context	config>service>vpls>sap>fr>frf-12
Description	This command configures the FRF.12 fragmentation threshold. The no form of the command removes the value.
Default	128
Parameters	<i>threshold</i> — Specifies the maximum length of a fragment to be transmitted. Values 128 — 512

interleave

Syntax	interleave no interleave
Context	config>service>vpls>sap>frame-relay>frf.12
Description	This command enables interleaving of high priority frames and low-priority frame fragments within a FR SAP using FRF.12 end-to-end fragmentation. When this option is enabled, only frames of the FR SAP non expedited forwarding class queues are subject to fragmentation. The frames of the FR SAP expedited queues are interleaved, with no fragmentation header, among the fragmented frames. In effect, this provides a behavior like in MLPPP Link Fragment Interleaving (LFI). When this option is disabled, frames of all the FR SAP forwarding class queues are subject to fragmentation. The fragmentation header is however not included when the frame size is smaller than the user configured fragmentation size. In this mode, the SAP transmits all fragments of a frame before sending the next full or fragmented frame. The receive direction of the FR SAP supports both modes of operation concurrently, with and without fragment interleaving. The no form of this command restores the default mode of operation.
Default	no interleave

scheduling-class

Syntax	scheduling-class <i>class-id</i> no scheduling-class
Context	config>service>vpls>sap>frame-relay
Description	This command specifies the scheduling class to use for this SAP. This object is only applicable for a SAP whose bundle type is set to MLFR.
Parameters	<i>class-id</i> — Specifies the scheduling class.
Values	0 — 3

host-connectivity-verify

Syntax	host-connectivity-verify source-ip <i>ip-address</i> [source-mac <i>ieee-address</i>] [interval <i>interval</i>] [action { remove alarm }]
Context	config>service>vpls config>service>vpls>sap
Description	This command enables subscriber host connectivity verification on a given SAP within a VPLS service. This tool will periodically scan all known hosts (from dhcp-state) and perform a UC

ARP request. The subscriber host connectivity verification will maintain state (connected vs. not-connected) for all hosts.

Default no host-connectivity-verify

Parameters **source-ip** *ip-address* — Specify an unused IP address in the same network for generation of subscriber host connectivity verification packets.

source-mac *ieee-address* — Specifies the source MAC address to be used for generation of subscriber host connectivity verification packets.

interval *interval* — The interval, in minutes, which specifies the time interval in which all known sources should be verified. The actual rate is then dependent on number of known hosts and interval.

Values 1 — 6000

Note that a zero value can be used by the SNMP agent to disable host-connectivity-verify.

action {**remove** | **alarm**} — Defines the action taken on a subscriber host connectivity verification failure for a given host. The **remove** keyword raises an alarm and removes dhcp-state and releases all allocated resources (queues, table entries, etc.). DHCP release will be signaled to corresponding DHCP server. Static host will be never removed. The **alarm** keyword raises an alarm indicating that the host is disconnected.

Egress Multicast Group Commands

egress-multicast-group

Syntax	egress-multicast-group <i>egress-multicast-group-name</i> no egress-multicast-group <i>group-name</i>
Context	config>service
Description	This command creates an egress multicast group (EMG) context. An EMG is created as an object used to group VPLS SAPs that are allowed to participate in efficient multicast replication (EMR). EMR is a method to increase the performance of egress multipoint forwarding by sacrificing some destination-based features. Eliminating the requirement to perform unique features for each destination allows the egress forwarding plane to chain together multiple destinations into a batch replication process. In order to perform this batch replication function, similar characteristics are required on each SAP within the EMG.

Only SAPs defined on Ethernet access ports are allowed into an egress-multicast-group.

In order to understand the purpose of an egress-multicast-group, an understanding of the system's use of flooding lists is required. A flooding list is maintained at the egress forwarding plane to define a set of destinations to which a packet must be replicated. Multipoint services make use of flooding lists to enable forwarding a single packet to many destinations. Examples of multipoint services that use flooding lists are VPLS, IGMP snooping and IP multicast routing. Currently, the egress forwarding plane will only use efficient multicast replication for VPLS and IGMP snooping flooding lists.

In VPLS services, a unique flooding list is created for each VPLS context. The flooding list is used when a packet has a broadcast, multicast or unknown destination MAC address. From a system perspective, proper VPLS handling requires that a broadcast, multicast or unknown destined packet be sent to all destinations that are in the forwarding state. The ingress forwarding plane ensures the packet gets to all egress forwarding planes that include a destination in the VPLS context. It is the egress forwarding plane's job to replicate the packet to the subset of the destinations that are reached through its interfaces and each of these destinations are included in the VPLS context's flooding list.

For IGMP snooping, a unique flooding list is created for each IP multicast (s,g) record. This (s,g) record is associated with an ingress VPLS context and may be associated with VPLS destinations in the source VPLS instance or other VPLS instances (in the case of MVR). Again, the ingress forwarding plane ensures that an ingress IP multicast packet matching the (s,g) record gets to all egress forwarding planes that have a VPLS destination associated with the (s,g) record. The egress forwarding plane uses the flooding list owned by the (s,g) record to replicate the packet to all VPLS destinations in the flooding list. The IGMP Snooping function identifies which VPLS destinations should be associated with the (s,g) record.

With normal multicast replication, the egress forwarding plane examines which features are enabled for each destination. This includes ACL filtering, mirroring, encapsulation and queuing. The resources used to perform this per destination multicast processing are very expensive to the egress forwarding plane when high replication bandwidth is required. If destinations with similar egress functions can be grouped together, the egress forwarding plane can process them in a more efficient manner and maximize replication bandwidth.

The egress-multicast-group object is designed to allow the identification of SAPs with similar egress characteristics. When a SAP is successfully provisioned into an egress-multicast-group, the system is ensured that it may be batched together with other SAPs in the same group at the egress forwarding plane for efficient multicast replication. A SAP that does not meet the common requirements is not allowed into the egress-multicast-group.

At the forwarding plane level, a VPLS flooding list is categorized into chainable and non-chainable destinations. Currently, the only chainable destinations are SAPs within an egress-multicast-group. The chainable destinations are further separated by egress-multicast-group association. Chains are then created following the rules below:

- A replication batch chain may only contain SAPs from the same egress-multicast-group
- A replication batch chain length may not exceed the dest-chain-limit of the egress-multicast-group to which the SAPs are members

Further subcategories are created for an IGMP (s,g) flooding list. A Layer 2 (s,g) record is created in a specific VPLS instance (the instance the (s,g) flow ingresses). SAPs within that VPLS context that join the (s,g) record are considered native SAPs within the flooding list. SAPs that join the (s,g) flooding list through the multicast VPLS registration process (MVR) from another VPLS context using the **from-vpls** command are considered alien SAPs. The distinction between native and alien in the list is maintained to allow the forwarding plane to enforce or suspend split-horizon-group (SHG) squelching. When the source of the (s,g) matching packet is in the same SHG as a native SAP, the packet must not be replicated to that SAP. For a SAP in another VPLS context, the source SHG of the packet has no meaning and the forwarding plane must disregard SHG matching between the native source of the packet and the alien destination. Because the SHG squelch decision is done for the whole chain based on the first SAP in the chain, all SAPs in the chain must be all native or all alien SAPs. Chains for IGMP (s,g) flooding lists are created using the following rules:

1. A replication batch chain may only contain SAPs from the same egress-multicast-group.
2. A replication batch chain may only contain all alien or all native SAPs.
3. A replication batch chain length may not exceed the dest-chain-limit of the egress-multicast-group to which the SAPs are members

When a packet associated with a flooding list is received by the egress forwarding plane, it processes the packet by evaluating each destination on the list sequentially in a replication context. If the current entry being processed in the list is a non-chained destination, the forwarding plane processes the packet for that destination and then moves on to process other packets currently in the forwarding plane before returning to process the next destination in the list. If the current entry being processed is a chained destination, the forwarding plane remains in the replication context until it has forwarded to each entry in that chain. Once the replication context finishes with the last entry in the chain, it moves on to process other packets waiting for egress processing before returning to the replication context. Processing continues in this manner until the packet has been forwarded to all destinations in the list.

Batch chain processing of a chain of SAPs improves replication efficiency by bypassing the functions that perform egress mirroring decisions on SAPs within the chain and making a single ACL filtering decision for the whole chain. Each destination in the chain may have a unique egress QoS policy and per destination queuing is still performed for each destination in the chain. Also, while each SAP in the chain must be on access ports with the same encap-type, if the encap-type is dot1q, each SAP may have a unique dot1q tag.

One caveat to each SAP having a unique egress QoS policy in the chain is that only the Dot1P marking decisions for the first SAP in the list is enforced. If the first SAP's QoS policy forwarding class action states that the packet should not be remarked, none of the replicated packets in the chain will have the dot1P bits remarked. If the first SAP's QoS policy forwarding class action states that the

packet should be remarked with a specific dot1P value, all the replicated packets for the remaining SAPs in the chain will have the same dot1P marking.

While the system supports 32 egress multicast groups, a single group would usually suffice. An instance where multiple groups would be needed is when all the SAPs requiring efficient multicast replication cannot share the same common requirements. In this case, an egress multicast group would be created for each set of common requirements. An egress multicast group may contain SAPs from many different VPLS instances. It should be understood that an egress multicast group is not equivalent to an egress forwarding plane flooding list. An egress multicast group only identifies which SAPs may participate in efficient multicast replication. As stated above, entries in a flooding list are populated due to VPLS destination creation or IGMP snooping events.

The **no** form of the command removes a specific egress multicast group. Deleting an egress multicast group will only succeed when the group has no SAP members. To remove SAP members, use the **no multicast-group group-name** command under each SAP's egress context.

Note: Efficient multicast replication will only be performed on IOMs that support chassis mode b. If an IOM does not support mode b operation, egress-multicast-group membership is ignored on that IOM's egress forwarding planes. The chassis need not be placed into mode b for efficient multicast replication to be performed on the capable IOMs.

Parameters	<i>group-name</i> — Multiple egress multicast groups may be created on the system. Each must have a unique name. The egress-multicast-group-name is an ASCII string up to 16 characters in length and follows all the naming rules as other named policies in the system. The group's name is used throughout the system to uniquely identify the Egress Multicast Group and is used to provision a SAP into the group. Default None, each egress multicast group must be explicitly configured. Values Up to 32 egress multicast groups may be created on the system.

description

Syntax	description <i>description-string</i> no description
Context	config>service>egress-multicast-group
Description	This command defines an ASCII string associated with egress-multicast-group-name. The no form of the command removes an existing description string from egress-multicast-group.
Default	none
Parameters	<i>description-string</i> — The description command accepts a description-string parameter. The description-string parameter is an ASCII string of up to 80 characters in length. Only printable 127 bit ASCII characters are allowed. If the string contains spaces, the string must be specified with beginning and ending quotes. Values An ASCII string up to 80 characters in length.

dest-chain-limit

Syntax	dest-chain-limit <i>destinations per pass</i> no dest-chain-limit
Context	config>service>egress-multicast-group
Description	This command defines the maximum length of an egress forwarding plane efficient multicast replication chain for an egress-multicast-group. Varying the maximum length of chains created for an egress multicast group has the effect of efficient multicast batched chain replication on other packets flowing through the egress forwarding plane. While replicating for the SAPs within a replication chain, other packets are waiting for the forwarding plane to finish. As the chain length increases, forwarding latency for the other waiting packets may increase. When the chain length decreases, a loss of efficiency in the replication process will be observed. The no form of the command restores the default value.
Default	16
Parameters	<i>destinations per pass</i> — This parameter must be specified when executing the dest-chain-limit command. When executed, the command will use the number-of-destinations parameter to reorganize all efficient multicast SAP chains that contain members from the egress-multicast-group. The <i>destinations per pass</i> parameter can be modified at any time. Be aware that when changing the maximum chain length, the system will rebuild the chains according to the new limit. When this happens, it is possible that packets will not be replicated to a destination while it is being reorganized in the flooding list's chains. Only the chains associated with the egress-multicast-group context the command is executed in will be affected by changing the parameter. It is expected that the optimal replication chain length will be between 10 and 16. Since so many variables affect efficient multicast (i.e. ingress packet rate, number of chains, size of replicated packets), only proper testing in the environment that replication will be performed will identify the best dest-chain-limit value for each Egress Multicast Group. Setting the <i>destinations per pass</i> parameter to a value of 0 has the effect of removing from all egress forwarding planes all chains with members from the egress-multicast-group. Replication to each destination SAP from the group is performed using the normal method (non-efficient replication). The value 0 is not considered a normal value for dest-chain-limit and is provided for debugging purposes only. Setting the value to 0 is persistent between reboots of the system. Setting the <i>destinations per pass</i> parameter to a value of 1 has the effect of placing each egress-multicast-group member SAP into a chain with a single SAP. The value 1 is not considered a normal value for the dest-chain-limit and is provided for debugging purposes only. Setting the value to 1 is persistent between reboots of the system.
Values	1 — 30

sap-common-requirements

Syntax	sap-common-requirements
Context	config>service>egress-multicast-group

Description This command configures the common SAP parameter requirements. The SAP common requirements are used to evaluate each SAP for group membership. If a SAP does not meet the specified requirements, the SAP is not allowed into the egress-multicast-group. Once a SAP is a member of the group, attempting to change the parameters on the SAP will fail.

egress-filter

Syntax **egress-filter** [**ip** *ip-filter-id*]
egress-filter [**ipv6** *ipv6-filter-id*]
egress-filter [**mac** *mac-filter-id*]
no egress-filter [**ip** *ip-filter-id*] [**ipv6** *ipv6-filter-id*] [**mac** *mac-filter-id*]

Context config>service>egress-multicast-group>sap-common-requirements

Description This command identifies the type of filter and actual filter ID that must be provisioned on the SAP prior to the SAP being made a member of the egress-multicast-group. If the SAP does not have the specified filter applied, the SAP cannot be provisioned into the group. It is important that the egress filter applied to each SAP within the egress-multicast-group be the same since the batch replication process on an efficient multicast replication chain will apply the first SAP's ACL decision to all other SAPs on the chain. Once the SAP is made a member of the egress-multicast-group, the SAP's egress filter cannot be changed on the SAP.

Changing the **egress-filter** parameters within the **sap-common-requirements** node automatically changes the egress filter applied to each member SAP. If the filter cannot be changed on the SAP due to resource constraints, the modification will fail.

The specified egress-filter does not contain an entry that is defined as an egress mirror-source. Once the filter is associated with the egress-multicast-group, attempting to define one of its entries as an egress mirror source will fail.

The **no** form of the command removes the egress-filter removes the egress filter from each member SAP. The **no egress-filter** command specifies that an egress filter (IP, IPv6 or MAC) is not applied to a new member SAP within the egress-multicast-group.

Default **no filter**. The egress filter ID must be defined with the associated **ip** or **mac** keyword. If an egress-filter is not specified or the no egress-filter command is executed in the sap-common-requirements node, a new member SAP does not have an egress IP or MAC filter defined.

Parameters **ip** *ip-filter-id* — Specifies IP filter policy. The filter ID must already exist within the created IP filters.

Values 1 — 65535

ipv6 *ipv6-filter-id* — Specifies the IPv6 filter policy. The filter ID must already exist within the created IPv6 filters.

Values 1 — 65535

mac *mac-filter-id* — Specifies the MAC filter policy. The specified filter ID must already exist within the created MAC filters. The filter policy must already exist within the created MAC filters.

Values 1 — 65535

encap-type

Syntax	encap-type {dot1q null} no encap-type
Context	config>service>egress-multicast-group>sap-common-requirements
Description	This command specifies the encapsulation type that must exist on the SAP's access port to allow the SAP membership within the egress-multicast-group. The config>port>ethernet>access>encap-type command is used to define the encapsulation type for the Ethernet port. The allowed encapsulation type values are dot1q and null. If the SAP does not exist on a port with the specified encap-type, it will not be allowed into the egress-multicast-group. If at least one SAP is currently a member of the efficient-multicast-group, the encap-type cannot be changed within the sap-common-requirements node. If the efficient-multicast-group does not contain any member SAPs, the encap-type may be changed at any time. There is no interaction between an efficient-multicast-group and the corresponding access ports associated with its members since all SAPs must be deleted from a port before its encap-type can be changed. When the SAPs are deleted from the port, they are also automatically deleted from the efficient-multicast-group. The no form of the command returns the egress-multicast-group required encapsulation type for SAPs to dot1q. If the current encap-type is set to null, the command cannot be executed when SAPs exist within the egress-multicast-group.
Default	dot1q — For an egress-multicast-group. null — If member SAPs are on a null encapsulated access port.
Parameters	null — The null keyword is mutually exclusive with the dot1q keyword. When the encap-type within the sap-common-requirements is specified to be null, the encapsulation type for the access ports associated with all SAPs within the egress-multicast-group must be set to null. dot1q — The dot1q keyword is mutually exclusive with the null keyword. When the encap-type within the sap-common-requirements is specified to be dot1q, the encapsulation type for the access ports associated with all SAPs within the egress-multicast-group must be set to dot1q.

qinq-etype

Syntax	qinq-etype [0x0600..0xffff] no qinq-etype
Context	config>service>egress-multicast-group>sap-common-requirements
Description	This command specifies the EtherType used for QinQ encapsulation.
Default	no qinq-etype
	<i>ethertype</i> — Defines the dot1q EtherType that must be associated with a SAP's access port when the encap-type is set to dot1q. Any valid EtherType may be specified.
Values	[0x0600 — 0xffff]: [1536 — 65535] in decimal or hex

qinq-fixed-tag-value

Syntax	qinq-fixed-tag-value <i>tag-value</i> no qinq-fixed-tag-value
Context	config>service>egress-multicast-group>sap-common-requirements
Description	This command configures the fixed tag value used for QinQ encapsulation.
Default	no qinq-fixed-tag-value
Parameters	<i>tag-value</i> — Specifies the provisioned common value of the fixed 802.1Q tag of all the QinQ SAP's in this egress multicast group. The value 0 is used to indicate that the actual value of the fixed tag will be defined implicitly by the corresponding tag of the first SAP added to this egress multicast group.
Values	0, 1 — 4094

dot1q-etype

Syntax	dot1q-etype [0x0600..0xffff] no dot1q-etype
Context	config>service>egress-multicast-group>sap-common-requirements
Description	This command specifies the dot1q EtherType that must exist on the SAP's access port to allow the SAP membership within the egress-multicast-group. The config>port>ethernet>access>dot1q-etype command is used to define the EtherType used when encapsulating a packet with a dot1q tag on the Ethernet port. Any valid EtherType is allowed on the port. If the current encap-type for the egress-multicast-group is set to null, the dot1q-etype EtherType is ignored when evaluating SAP membership in the group. If the encap-type is set to dot1q (the default), a member SAP's access port must be configured with the same dot1q-etype EtherType as the egress-multicast-group. If at least one SAP is currently a member of the efficient-multicast-group, the dot1q-etype value cannot be changed within the sap-common-requirements node. If the efficient-multicast-group does not contain any member SAPs, the dot1q-etype value may be changed at any time. If an access port currently has SAPs associated with it that are defined within an egress-multicast-group and the port is currently set to encap-type dot1q, the dot1q-etype value defined on the port cannot be changed. The no form of the command returns the egress-multicast-group dot1q EtherType to the default value of 0x8100. If the current encap-type is set to a value other than 0x8100, the command cannot be executed when SAPs exist within the egress-multicast-group.
Default	The default dot1q-etype is 0x8100 for an egress-multicast-group.
Parameters	<i>ethertype</i> — Defines the dot1q EtherType that must be associated with a SAP's access port when the encap-type is set to dot1q. Any valid EtherType may be specified.
Values	0x0600 — 0xffff 1536 — 65535 in decimal or hex
Default	0x8100

Provider Edge Discovery Policy Commands

pe-discovery-policy

Syntax	[no] pe-discovery-policy <i>name</i>
Context	config>service
Description	This command configures a provider edge discovery policy and parameters. The no form of the command removes the policy from the configuration.
Parameters	<i>name</i> — Specifies the RADIUS PE discovery policy name, up to 32 characters in length.

password

Syntax	password <i>password</i> no password
Context	config>service>pe-discovery-policy
Description	This command configures the PE discovery password that is used when contacting the RADIUS server for VPLS auto-discovery. The no form of the command removes the password from the configuration.
Default	no password
Parameters	<i>password</i> — Specifies the password, up to 32 characters in length, used when contacting the RADIUS server for VPLS auto-discovery.

polling-interval

Syntax	polling-interval <i>minutes</i> no polling-interval
Context	config>service>pe-discovery-policy
Description	This command configures the PE discovery polling interval.
Default	5
Parameters	<i>minutes</i> — Specifies the polling interval, in minutes, for RADIUS PE discovery. Values 1 — 30

server

Syntax	server <i>server-index</i> address <i>ip-address</i> secret <i>key</i> [hash hash2] [port <i>port-num</i>] no server <i>server-index</i>
Context	config>service>pe-discovery-policy
Description	This command adds a RADIUS server.
Parameters	<i>server-index</i> — The index for the RADIUS server. The index determines the sequence in which the servers are queried for authentication requests. Servers are queried in order from lowest to highest index. Values 1 — 5 address <i>ip-address</i> — The IP address of the RADIUS server. Two RADIUS servers cannot have the same IP address. An error message is generated if the server address is a duplicate. secret <i>key</i> — The secret key to access the RADIUS server. This secret key must match the password on the RADIUS server. Values Up to 20 characters in length. hash — Specifies the key is entered in an encrypted form. If the hash parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the hash parameter specified. hash2 — Specifies the key is entered in a more complex encrypted form. If the hash2 parameter is not used, the less encrypted hash form is assumed. <i>port</i> — Specifies the UDP port number on which to contact the RADIUS server for authentication. Values 1 — 65535

timeout

Syntax	timeout <i>seconds</i> no timeout
Context	config>service>pe-discovery-policy
Description	This command specifies the number of seconds to wait before timing out a RADIUS server. The no form of the command reverts to the default value.
Default	3 seconds
Parameters	<i>seconds</i> — The number of seconds to wait for a response from a RADIUS server, expressed as a decimal integer. Values 1 — 90

radius-discovery

Syntax	[no] radius-discovery
Context	config>service>vpls
Description	This command enables the RADIUS provider edge discovery for this VPLS service.
Default	none

pe-discovery-policy

Syntax	pe-discovery-policy <i>name</i> no pe-discovery-policy
Context	config>service>vpls>radius-discovery
Description	This command specifies the existing RADIUS PE discovery policy name. The policy must have been configured in the config>service context.
Parameters	<i>name</i> — Specifies the RADIUS PE discovery policy name, up to 32 characters in length.

user-name-format

Syntax	user-name-format { vpn-id <i>vpn-id</i> router-distinguisher <i>rd</i> } no pe-discovery-policy
Context	config>service>vpls>radius-discovery
Description	This command specifies whether the RADIUS user name is a VPN ID or router-distinguisher.
Parameters	vpn-id <i>vpn-id</i> — Indicates the VPN ID of the associated VPLS service. router-distinguisher <i>rd</i> — Sets the identifier attached to routes that distinguishes the VPN it belongs to.

BGP Auto-Discovery Commands

bgp

Syntax	bgp
Context	config>service>vpls
Description	This command enables the context to configure the BGP related parameters for both BGP AD and BGP VPLS.

bgp-vpls

Syntax	bgp-vpls
Context	config>service>vpls
Description	This command enables the context to configure the BGP-VPLS parameters and addressing.

max-ve-id

Syntax	max-ve-id <i>value</i> no max-ve-id
Context	config>service>vpls>bgp-vpls
Description	This command configures the allowed range for the VE-id value: locally configured and received in a NLRI. Configuration of a VE-id higher than the value specified in this command is not allowed. Also upon reception of a higher VE-id in an NLRI imported in this VPLS instance (RT = configured import RT) the following action must be taken: • a trap must be generated informing the operator of the mismatch. • NLRI must be dropped • no service labels are to be installed for this VE-id • no new NLRI must be generated if a new offset is required for VE-id.

The **no** form of this command sets the max-ve-id to un-configured. The BGP VPLS status should be administratively down for “no max-ve-id” to be used.

The max-ve-id value can be changed without shutting down bgp-vpls if the newly provisioned value does not conflict with the already configured local VE-ID. If the value of the local-VE-ID is higher than the new max-ve-id value the command is rejected. The operator needs to decrease first the VE-ID before running the command.

The actions taken for other max-ve-id values are described below:

- max-ve-id value higher than all VE-IDs (local and received) is allowed and there are no effects.

- max-ve-id higher than the local VE-ID but smaller than the remote VE-IDs:
 - Provisioning is allowed
 - A warning message will be generated stating that “Higher VE-ID values were received in the BGP VPLS context. Related PWs will be removed.”
 - The PWs associated with the higher VE-IDs will be removed locally.
 - Note that this is a situation that should be corrected by the operator as the PW may be down just at the local PE, consuming unnecessarily core bandwidth. The higher VE-IDs should be removed or lowered.

If the max-ve-id has increased a BGP route refresh is sent to the VPLS community to get the routes which might have been rejected earlier due to max-ve-id check. Default no max-ve-id – max-ve-id is not configured. A max-ve-id value needs to be provisioned for BGP VPLS to be in “no shutdown” state.

Default	no max-ve-id
Parameters	<i>value</i> — Specifies the allowed range of [1-value] for the VE-id. The configured value must be bigger than the existing VE-ids.
Values	1-65535

ve-name

Syntax	ve-name <i>name</i> no ve-name
Context	config>service>vpls>bgp-vpls
Description	This command creates or edits a ve-name. Just one ve-name can be created per BGP VPLS instance. The no form of the command removes the configured ve-name from the bgp vpls node. It can be used only when the BGP VPLS status is shutdown. Command “no shutdown” cannot be used if there is no ve-name configured.
Default	no ve-name
Parameters	<i>name</i> — A character string identifying the VPLS Edge instance.
Values	32 ASCII chars max

ve-id

Syntax	ve-id <i>ve-id-value</i> no ve-id
Context	config>service>vpls>bgp-vpls>ve-name
Description	This command configures a ve-id. Just one ve-id can be configured per BGP VPLS instance. The VE-ID can be changed without shutting down the VPLS Instance. When the VE-ID changes, BGP is withdrawing its own previously advertised routes and sending a route-refresh to all the peers which

would result in reception of all the remote routes again. The old PWs are removed and new ones are instantiated for the new VE-ID value.

The **no** form of the command removes the configured ve-id. It can be used just when the BGP VPLS status is shutdown. Command “no shutdown” cannot be used if there is no ve-id configured.

Default	no ve-id
Parameters	<i>value</i> — A two bytes identifier that represents the local instance in a VPLS and is advertised through the BGP NLRI. Must be lower or equal with the max-ve-id.
Values	1-65535

shutdown

Syntax	[no] shutdown
Context	config>service>vpls>bgp-vpls
Description	This command administratively enables/disables the local BGP VPLS instance. On de-activation an MP-UNREACH-NLRI must be sent for the local NLRI. The no form of the command enables the BGP VPLS addressing and the related BGP advertisement. The associated BGP VPLS MP-REACH-NLRI will be advertised in an update message and the corresponding received NLRIs must be considered to instantiate the data plane. RT, RD usage: same like in the BGP AD solution, if the values are not configured here, the value of the VPLS-id from under the bgp-ad node is used. If VPLS-id value is not configured either the MH site cannot be activated – i.e. no shutdown returns an error. Same applies if a PW-template is not specified under the bgp node.
Default	shutdown

bgp-ad

Syntax	[no] bgp-ad
Context	config>service>vpls
Description	This command configures BGP auto-discovery.

pw-template-bind

Syntax	pw-template-bind <i>policy-id</i> [split-horizon-group <i>group-name</i>] [import-rt { <i>ext-community</i> , ...}(up to 5 max)] no pw-template-bind <i>policy-id</i>
Context	config>service>vpls>bgp-ad config>service>vpls>bgp

Description This command binds the advertisements received with the route target (RT) that matches the configured list (either the generic or the specified import) to a specific pw-template. If the RT list is not present the pw-template is used for all of them.

The pw-template-binding applies to both BGP-AD and BGP-VPLS if these features are enabled in the VPLS.

For BGP VPLS the following additional rules govern the use of PW-template:

- On transmission the settings for the L2-Info extended community in the BGP Update are derived from the PW-template attributes. If multiple pw-templates (with or without import-rt) are specified for the same VPLS instance the first pw-template entry will be used.
- On reception the values of the parameters in the L2-Info extended community of the BGP Update are compared with the settings from the corresponding pw-template. The following steps are used to determine the local pw-template:
 - The RT values are matched to determine the pw-template.
 - If multiple pw-templates matches are found from the previous steps, the first configured pw-template entry will be considered.
 - If the values used for Layer 2 MTU or C Flag do not match the PW setup fails.

The tools perform commands can be used to control the application of changes in pw-template for both BGP-AD and BGP-VPLS.

The **no** form of the command removes the values from the configuration.

Default none

Parameters *policy-id* — Specifies an existing policy ID.

Values 1 — 2147483647

split-horizon-group *group-name* — The specified group-name overrides the split horizon group template settings.

import-rt *ext-comm* — Specify communities allowed to be accepted from remote PE neighbors. An extended BGP community in the **type:x:y** format. The value **x** can be an integer or IP address. The **type** can be the target or origin. **x** and **y** are 16-bit integers.

Values target:{*ip-address:comm-val* [*as-number:ext-comm-val*]}
ip-address: a.b.c.d
comm-val: 0 — 65535
as-number: 1 — 65535
ext-comm-val: 0 — 4294967295

route-target

Syntax **route-target** {*ext-community*}[{**export** *ext-community*}[**import** *ext-community*]}
no route-target

Context config>service>vpls>bgp-ad
 config>service>vpls>bgp

Description	This command configures the route target (RT) component that will be signaled in the related MP-BGP attribute to be used for BGP auto-discovery, BGP VPLS and BGP Multi-Homing if these features are configured in this VPLS service. If this command is not used, the RT is built automatically using the VPLS ID. The ext-comm can have the same two formats as the VPLS ID, a two-octet AS-specific extended community, IPv4 specific extended community. The following rules apply: • if BGP AD VPLS-id is configured & no RT is configured under BGP node - RT = VPLS-ID • if BGP AD VPLS-id is not configured then an RT value must be configured under BGP node (this is the case when only BGP VPLS is configured) • if BGP AD VPLS-id is configured and an RT value is also configured under BGP node, the configured RT value prevails
Parameters	export <i>ext-community</i> — Specify communities allowed to be sent to remote PE neighbors. import <i>ext-community</i> — Specify communities allowed to be accepted from remote PE neighbors.

vpls-id

Syntax	vpls-id <i>vpls-id</i>															
Context	config>service>vpls>bgp-ad															
Description	This command configures the VPLS ID component that will be signaled in one of the extended community attributes (<i>ext-comm</i>). Values and format (6 bytes, other 2 bytes of type-subtype will be automatically generated)															
Parameters	<i>vpls-id</i> — Specifies a globally unique VPLS ID for BGP auto-discovery in this VPLS service. <table><tr><td>Values</td><td>vpls-id :</td><td><ip-addr:comm-val> <as-number:ext-comm-val></td></tr><tr><td></td><td>ip-addr</td><td>a.b.c.d</td></tr><tr><td></td><td>comm-val</td><td>0 — 65535</td></tr><tr><td></td><td>as-number</td><td>1..65535</td></tr><tr><td></td><td>ext-comm-val</td><td>0..4294967295</td></tr></table>	Values	vpls-id :	<ip-addr:comm-val> <as-number:ext-comm-val>		ip-addr	a.b.c.d		comm-val	0 — 65535		as-number	1..65535		ext-comm-val	0..4294967295
Values	vpls-id :	<ip-addr:comm-val> <as-number:ext-comm-val>														
	ip-addr	a.b.c.d														
	comm-val	0 — 65535														
	as-number	1..65535														
	ext-comm-val	0..4294967295														

vsi-export

Syntax	vsi-export <i>policy-name</i> [<i>policy-name</i> ...(up to 5 max)] no vsi-export
Context	config>service>vpls>bgp-ad config>service>vpls>bgp
Description	This command specifies the name of the VSI export policies to be used for BGP auto-discovery, BGP VPLS and BGP Multi-Homing if these features are configured in this VPLS service. If multiple policy names are configured, the policies are evaluated in the order they are specified. The first policy that matches is applied.

The policy name list is handled by the SNMP agent as a single entity.

vsi-id

Syntax	vsi-id
Context	config>service>vpls>bgp-ad
Description	This command enables the context to configure the Virtual Switch Instance Identifier (VSI-ID).

prefix

Syntax	prefix <i>low-order-vsi-id</i> no prefix
Context	config>service>vpls>bgp-ad>vsi-id
Description	This command specifies the low-order 4 bytes used to compose the Virtual Switch Instance Identifier (VSI-ID) to use for NLRI in BGP auto-discovery in this VPLS service. If no value is set, the system IP address will be used.
Default	no prefix
Parameters	<i>low-order-vsi-id</i> — Specifies a unique VSI ID.
Values	0— 4294967295

route-distinguisher

Syntax	route-distinguisher [<i>ip-addr:comm-val</i> <i>as-number:ext-comm-val</i>] no route-distinguisher
Context	config>service>vpls>bgp-ad>vsi-id config>service>vpls>bgp
Description	This command configures the Route Distinguisher (RD) component that will be signaled in the MP-BGP NLRI for L2VPN AFI. This value will be used for BGP-AD, BGP VPLS and BGP Multi-Homing NLRI if these features are configured. If this command is not configured, the RD is automatically built using the BGP-AD VPLS ID. The following rules apply: • if BGP AD VPLS-id is configured & no RD is configured under BGP node - RD = VPLS-ID • if BGP AD VPLS-id is not configured then an RD value must be configured under BGP node (this is the case when only BGP VPLS is configured) • if BGP AD VPLS-id is configured and an RD value is also configured under BGP node, the configured RD value prevails Values and format (6 bytes, other 2 bytes of type will be automatically generated)

Parameters *ip-addr:comm-val* — Specifies the IP address.

Values	ip-addr	a.b.c.d
	comm-val	0 — 65535

as-number:ext-comm-val — Specifies the AS number and the

Values	as-number	1 — 65535
	ext-comm-val	0 — 4294967295

vsi-import

Syntax **vsi-import** *policy-name* [*policy-name*...(up to 5 max)]
no vsi-import

Context config>service>vpls>bgp-ad>vsi-id
 config>service>vpls>bgp

Description This command specifies the name of the VSI import policies to be used for BGP auto-discovery, BGP VPLS and BGP Multi-Homing if these features are configured in this VPLS service. If multiple policy names are configured, the policies are evaluated in the order they are specified. The first policy that matches is applied.

The policy name list is handled by the SNMP agent as a single entity.

IEEE 802.1ah Provider Backbone Bridging

In This Chapter

This chapter provides information about Provider Backbone Bridging (PBB), process overview, and implementation notes.

Topics in this chapter include:

- [IEEE 802.1ah Provider Backbone Bridging \(PBB\) Overview on page 768](#)
- [PBB Features on page 769](#)
 - [Integrated PBB-VPLS Solution on page 769](#)
 - [PBB Technology on page 771](#)
 - [PBB Mapping to Existing VPLS Configurations on page 772](#)
 - [SAP and SDP Support on page 774](#)
 - [PBB Packet Walkthrough on page 776](#)
 - [IEEE 802.1ak MMRP for Service Aggregation and Zero Touch Provisioning on page 778](#)
 - [MMRP Support Over B-VPLS SAPs and SDPs on page 780](#)
 - [PBB and BGP-AD on page 785](#)
 - [PBB ELINE Service on page 785](#)
 - [PBB Using G.8031 Protected Ethernet-Tunnels on page 786](#)
 - [MAC Flush on page 793](#)
 - [Access Multi-Homing for Native PBB \(B-VPLS over SAP Infrastructure\) on page 798](#)
 - [PBB and IGMP Snooping on page 807](#)
 - [PBB QoS on page 808](#)
 - [PBB OAM on page 814](#)
- [Configuration Examples on page 816](#)

IEEE 802.1ah Provider Backbone Bridging (PBB) Overview

IEEE 802.1ah draft standard (IEEE802.1ah), also known as Provider Backbone Bridges (PBB), defines an architecture and bridge protocols for interconnection of multiple Provider Bridge Networks (PBNs - IEEE802.1ad QinQ networks). PBB is defined in IEEE as a connectionless technology based on multipoint VLAN tunnels. IEEE 802.1ah employs Provider MSTP as the core control plane for loop avoidance and load balancing. As a result, the coverage of the solution is limited by STP scale in the core of large service provider networks.

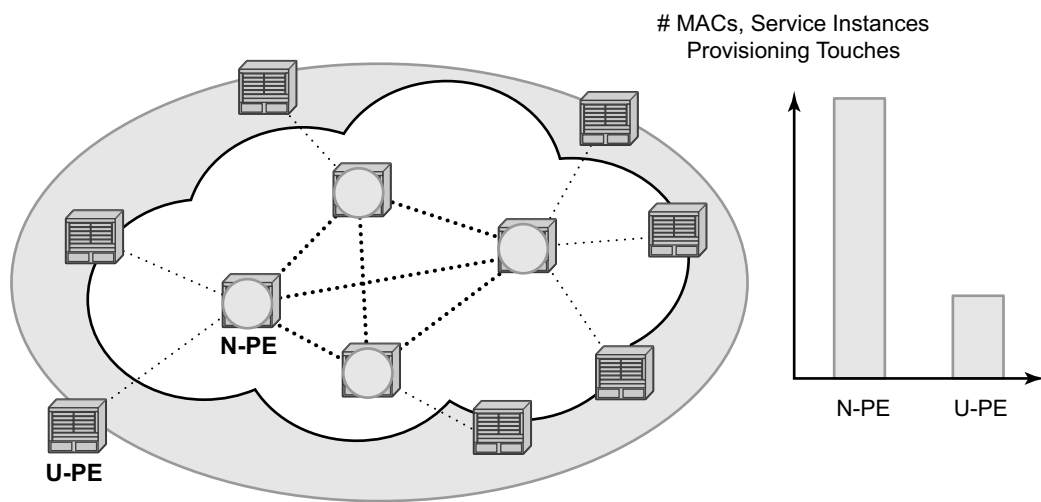
Virtual Private LAN Service (VPLS), RFC 4762, *Virtual Private LAN Service (VPLS) Using Label Distribution Protocol (LDP) Signaling*, provides a solution for extending Ethernet LAN services using MPLS tunneling capabilities through a routed, traffic-engineered MPLS backbone without running (M)STP across the backbone. As a result, VPLS has been deployed on a large scale in service provider networks.

Alcatel-Lucent's implementation fully supports a native PBB deployment and an integrated PBB-VPLS model where desirable PBB features such as MAC hiding, service aggregation and the service provider fit of the initial VPLS model are combined to provide the best of both worlds.

PBB Features

Integrated PBB-VPLS Solution

HVPLS introduced a service-aware device in a central core location in order to provide efficient replication and controlled interaction at domain boundaries. The core network facing provider edge (N-PE) devices have knowledge of all VPLS services and customer MAC addresses for local and related remote regions resulting in potential scalability issues as depicted in [Figure 99](#).

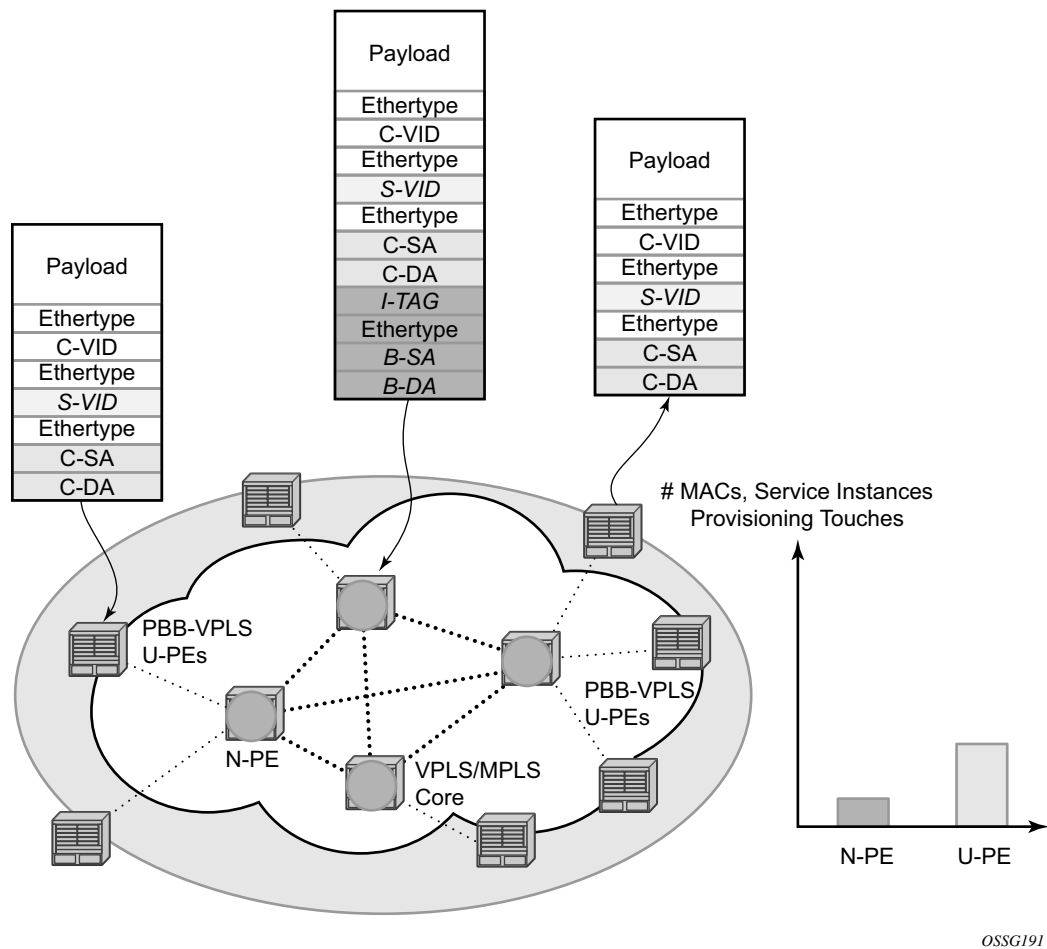


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Figure 99: Large HVPLS Deployment

In a large VPLS deployment, it is important to improve the stability of the overall solution and to speed up service delivery. These goals are achieved by reducing the load on the N-PEs and respectively minimizing the number of provisioning touches on the N-PEs.

The integrated PBB-VPLS model introduces an additional PBB hierarchy in the VPLS network to address these goals as depicted in [Figure 100](#).



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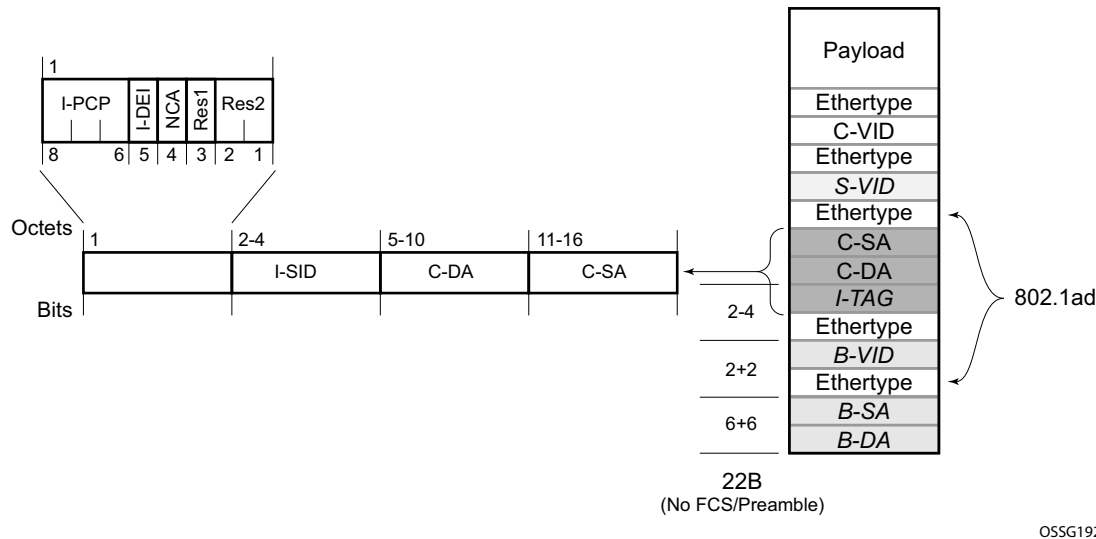
Figure 100: Large PBB-VPLS Deployment

PBB encapsulation is added at the user facing PE (U-PE) to hide the customer MAC addressing and topology from the N-PE devices. The core N-PEs need to only handle backbone MAC addressing and do not need to have visibility of each customer VPN. As a result, the integrated PBB-VPLS solution decreases the load in the N-PEs and improves the overall stability of the backbone.

Alcatel-Lucent's PBB-VPLS solution also provides automatic discovery of the customer VPNs through the implementation of IEEE 802.1ak MMRP minimizing the number of provisioning touches required at the N-PEs.

PBB Technology

IEEE 802.1ah specification encapsulates the customer or QinQ payload in a provider header as shown in [Figure 101](#).



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Figure 101: IEEE 802.1ah Frame Format

PBB adds a regular Ethernet header where the B-DA and B-SA are the backbone destination and respectively, source MACs of the edge U-PEs. The backbone MACs (B-MACs) are used by the core N-PE devices to switch the frame through the backbone.

A special group MAC is used for the backbone destination MAC (B-DA) when handling an unknown unicast, multicast or broadcast frame. This backbone group MAC is derived from the I-service instance identifier (ISID) using the rule: a standard group OUI (01-1E-83) followed by the 24 bit ISID coded in the last three bytes of the MAC address.

The BVID (backbone VLAN ID) field is a regular DOT1Q tag and controls the size of the backbone broadcast domain. When the PBB frame is sent over a VPLS pseudo-wire (pseudowire), this field may be omitted depending on the type of pseudowire used.

The following ITAG (standard Ether-type value of 0x88E7) has the role of identifying the customer VPN to which the frame is addressed through the 24 bit ISID. Support for service QoS is provided through the priority (3 bit I-PCP) and the DEI (1 bit) fields.

PBB Mapping to Existing VPLS Configurations

The IEEE model for PBB is organized around a B-component handling the provider backbone layer and an I-component concerned with the mapping of the customer/provider bridge (QinQ) domain (MACs, VLANs) to the provider backbone (B-MACs, B-VLANs): for example, the I-component contains the boundary between the customer and backbone MAC domains.

Alcatel-Lucent's implementation is extending the IEEE model for PBB to allow support for MPLS pseudowires using a chain of two VPLS context linked together as depicted in [Figure 102](#).

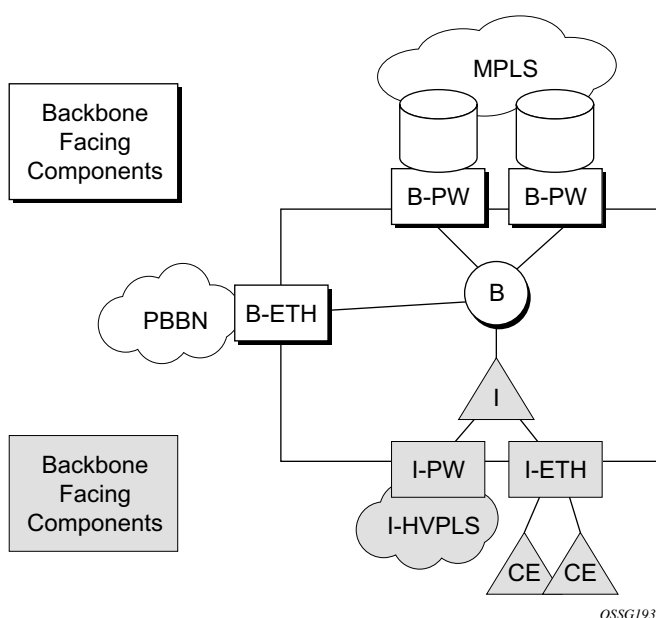


Figure 102: PBB Mapping to VPLS Constructs

A VPLS context is used to provide the backbone switching component. The white circle marked B, referred to as backbone-VPLS (B-VPLS), operates on backbone MAC addresses providing a core multipoint infrastructure that may be used for one or multiple customer VPNs. Alcatel-Lucent's B-VPLS implementation allows the use of both native PBB and MPLS infrastructures.

Another VPLS context (I-VPLS) can be used to provide the multipoint I-component functionality emulating the ELAN service (refer to the triangle marked "I" in [Figure 102](#)). Similar to B-VPLS, I-VPLS inherits from the regular VPLS the pseudowire (SDP bindings) and native Ethernet (SAPs) handoffs accommodating this way different types of access: for example, direct customer link, QinQ or HVPLS.

In order to support PBB ELINE (point-to-point service), the use of an Epipe as I-component is allowed. All Ethernet SAPs supported by a regular Epipe are also supported in the PBB Epipe.

SAP and SDP Support

PBB B-VPLS

- SAPs
 - Ethernet DOT1Q is supported — This is applicable to most PBB use cases, for example, one backbone VLAN ID used for native Ethernet tunneling.
 - Ethernet null is supported — This is supported for a direct connection between PBB PEs, for example, no BVID is required.
 - Default SAP types are blocked in the CLI for the B-VPLS SAP.
 - The following rules apply to the SAP processing of PBB frames:
 - For “transit frames” (not destined to a local BMAC), there is no need to process the ITAG component of the PBB Frames. Regular Ethernet SAP processing is applied to the backbone header (BMACs and BVID).
 - If a local I-VPLS instance is associated with the B-VPLS, “local frames” originated/terminated on local I-VPLS(s) are PBB encapsulated/de-encapsulated using the **pbb-etype** provisioned under the related port or SDP component.
 - SDPs
 - For MPLS, both mesh and spoke-SDPs with split horizon groups are supported.
 - Similar to regular pseudowire, the outgoing PBB frame on an SDP (for example, B-pseudowire) contains a BVID qtag only if the pseudowire type is Ethernet VLAN. If the pseudowire type is ‘Ethernet’, the BVID qtag is stripped before the frame goes out.
-

PBB I-VPLS

- Port Level
 - All existing Ethernet encapsulation types are supported (for example, null, dot1q, qinq).
- SAPs
 - The I-VPLS SAPs can co-exist on the same port with SAPs for other business services, for example, VLL, VPLS SAPs.
 - All existing Ethernet encapsulation are supported: null, dot1q, qinq.
- SDPs
 - GRE and MPLS SDP are spoke-sdp only. Mesh SDPs can just be emulated by using the same split horizon group everywhere.

Existing SAP processing rules still apply for the I-VPLS case; the SAP encapsulation definition on Ethernet ingress ports defines which VLAN tags are used to determine the service that the packet belongs to:

- Null encap defined on ingress — Any VLAN tags are ignored and the packet goes to a default service for the SAP;
- Dot1q encap defined on ingress — only first VLAN tag is considered;
- Qinq encap defined on ingress — both VLAN tags are considered; wildcard support for the inner VLAN tag
- For dot1q/qinq encapsulations, traffic encapsulated with VLAN tags for which there is no definition is discarded.
- Note that any VLAN tag used for service selection on the I-SAP is stripped before the PBB encapsulation is added. Appropriate VLAN tags are added at the remote PBB PE when sending the packet out on the egress SAP.

PBB Packet Walkthrough

This section describes the walkthrough for a packet that traverses the B-VPLS and I-VPLS instances using the example of a unicast frame between two customer stations as depicted in the following network diagram [Figure 103](#).

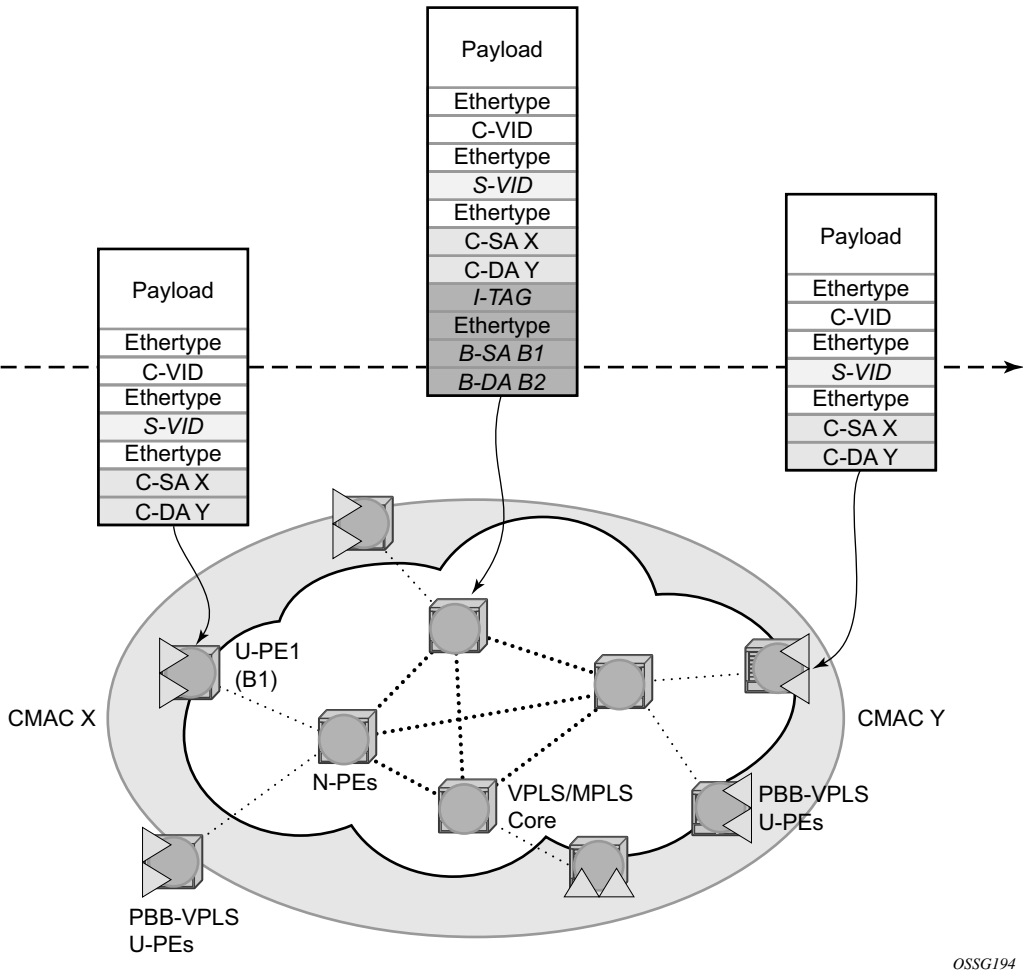


Figure 103: PBB Packet Walkthrough

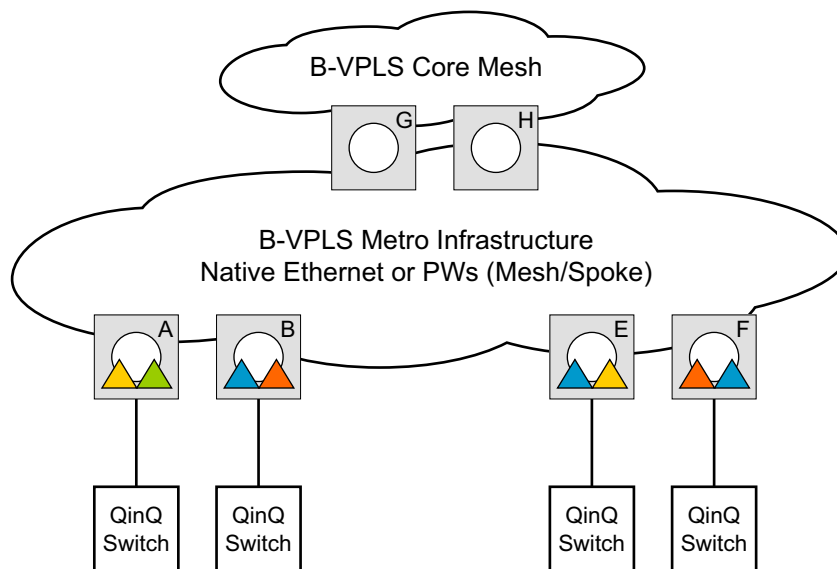
The station with CMAC (customer MAC) X wants to send a unicast frame to CMAC Y through the PBB-VPLS network. A customer frame arriving at PBB-VPLS U-PE1 is encapsulated with the PBB header. The local I-VPLS FIB on U-PE1 is consulted to determine the destination BMAC of

the egress U-PE for CMAC Y. In our example, B2 is assumed to be known as the B-DA for Y. If CMAC Y is not present in the U-PE1 forwarding database, the PBB packet is sent in the B-VPLS using the standard group MAC address for the ISID associated with the customer VPN. If the uplink to the N-PE is a spoke pseudowire, the related PWE3 encapsulation is added in front of the B-DA.

Next, only the Backbone Header in green is used to switch the frame through the green B-VPLS/VPLS instances in the N-PEs. At the receiving U-PE2, the CMAC X is learned as being behind BMAC B1; then the PBB encapsulation is removed and the lookup for CMAC Y is performed. In the case where a pseudowire is used between N-PE and U-PE2, the pseudowire encapsulation is removed first.

IEEE 802.1ak MMRP for Service Aggregation and Zero Touch Provisioning

IEEE 802.1ah supports an M:1 model where multiple customer services, represented by ISIDs, are transported through a common infrastructure (B-component). Alcatel-Lucent's PBB implementation supports the M:1 model allowing for a service architecture where multiple customer services (I-VPLS or Epipe) can be transported through a common B-VPLS infrastructure as depicted in [Figure 104](#).



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Figure 104: Customer Services Transported in 1 B-VPLS (M:1 Model)

The B-VPLS infrastructure represented by the white circles is used to transport multiple customer services represented by the triangles of different colors. This service architecture minimizes the number of provisioning touches and reduces the load in the core PEs: for example, G and H use less VPLS instances and pseudowire.

In a real life deployment, different customer VPNs do not share the same community of interest – for example, VPN instances may be located on different PBB PEs. The M:1 model depicted in [Figure 105](#) requires a per VPN flood containment mechanism so that VPN traffic is distributed just to the B-VPLS locations that have customer VPN sites: for example, flooded traffic originated in the blue I-VPLS should be distributed just to the PBB PEs where blue I-VPLS instances are present – PBB PE B, E and F.

Per customer VPN distribution trees need to be created dynamically throughout the BVPLS as new customer I-VPLS instances are added in the PBB PEs.

Alcatel-Lucent's PBB implementation employs the IEEE 802.1ak Multiple MAC Registration Protocol (MMRP) to dynamically build per I-VPLS distribution trees inside a certain B-VPLS infrastructure.

IEEE 802.1ak Multiple Registration Protocol (MRP) – specifies changes to IEEE Std 802.1Q that provide a replacement for the GARP, GMRP and GVRP protocols. MMRP application of IEEE 802.1ak specifies the procedures that allow the registration/de-registration of MAC addresses over an Ethernet switched infrastructure.

In the PBB case, as I-VPLS instances are enabled in a certain PE, a group B-MAC address is by default instantiated using the standard based PBB Group OUI and the ISID value associated with the I-VPLS.

When a new I-VPLS instance is configured in a PE, the IEEE 802.1ak MMRP application is automatically invoked to advertise the presence of the related group B-MAC on all active B-VPLS SAPs and SDP bindings.

When at least two I-VPLS instances with the same ISID value are present in a B-VPLS, an optimal distribution tree is built by MMRP in the related B-VPLS infrastructure as depicted in [Figure 105](#).

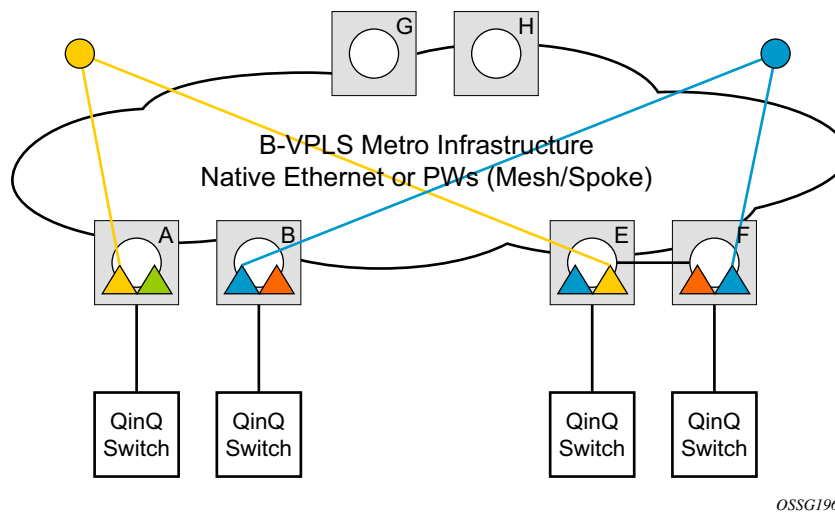


Figure 105: Flood Containment Requirement in M:1 Model

MMRP Support Over B-VPLS SAPs and SDPs

MMRP is supported in B-VPLS instances over all the supported BVPLS SAPs and SDPs, including the primary and standby pseudowire scheme implemented for VPLS resiliency.

When a B-VPLS with MMRP enabled receives a packet destined to a specific group BMAC, it checks its own MFIB entries and if the group BMAC does not exist, it floods it everywhere. This should never happen as this kind of packet will be generated at the I-VPLS/PBB PE when a registration was received for a local I-VPLS group BMAC.

I-VPLS Changes and Related MMRP Behavior

This section describes the MMRP behavior for different changes in IVPLS.

1. When an ISID is set for a certain I-VPLS and a link to a related B-VPLS is activated (for example, through the **config>service>vpls>backbone-vpls vpls id:isid** command), the group BMAC address is declared on all B-VPLS virtual ports (SAPs or SDPs).
2. When the ISID is changed from one value to a new one, the old group BMAC address is undeclared on all ports and the new group BMAC address is declared on all ports in the B-VPLS.
3. When the I-VPLS is disassociated with the B-VPLS, the old group BMAC is no longer advertised as a local attribute in the B-VPLS if no other peer B-VPLS PEs have it declared.
4. When an I-VPLS goes operationally down (either all SAPs/SDPs are down) or the I-VPLS is shutdown, the associated group BMAC is undeclared on all ports in the B-VPLS.
5. When the I-VPLS is deleted, the group BMAC should already be un-declared on all ports in the B-VPLS because the I-VPLS has to be shutdown in order to delete it.

Limiting the Number of MMRP Entries on a Per B-VPLS Basis

The MMRP exchanges create one entry per attribute (group BMAC) in the B-VPLS where MMRP protocol is running. When the first registration is received for an attribute, an MFIB entry is created for it.

Alcatel-Lucent's implementation allows the user to control the number of MMRP attributes (group BMACs) created on a per B-VPLS basis. Control over the number of related MFIB entries in the B-VPLS FIB is inherited from previous releases through the use of the **config>service>vpls>mfib-table-size table-size** command. This ensures that no B-VPLS will take up all the resources from the total pool.

Optimization for Improved Convergence Time

Assuming that MMRP is used in a certain B-VPLS, under failure conditions the time it takes for the B-VPLS forwarding to resume may depend on the data plane and control plane convergence plus the time it takes for MMRP exchanges to settle down the flooding trees on a per ISID basis.

In order to minimize the convergence time, Alcatel-Lucent's PBB implementation offers the selection of a mode where B-VPLS forwarding reverts for a short time to flooding so that MMRP has enough time to converge. This mode can be selected through configuration using the **configure>service>vpl> bvpls>mrp>flood-time** *value* command where *value* represents the amount of time in seconds that flooding will be enabled. Refer to the [PBB Command Reference on page 825](#) for command syntax and usage.

If this behavior is selected, the forwarding plane reverts to B-VPLS flooding for a configurable time period, for example, for a few seconds, then it reverts back to the MFIB entries installed by MMRP.

The following B-VPLS events initiate the switch from per I-VPLS (MMRP) MFIB entries to "B-VPLS flooding":

- Reception or local triggering of a TCN
- B-SAP failure
- Failure of a B-SDP binding
- Pseudowire activation in a primary/standby HVPLS resiliency solution
- SF/CPM switchover due to STP reconvergence

Controlling MRP Scope using MRP Policies

MMRP advertises the Group BMACs associated with ISIDs throughout the whole BVPLS context regardless of whether a specific IVPLS is present in one or all the related PEs or BEBs. When evaluating the overall scalability the resource consumption in both the control and data plane must be considered:

- Control plane - MMRP processing and number of attributes advertised
- Data plane – one tree is instantiated per ISID or Group BMAC attribute

In a multi-domain environment, for example multiple MANs interconnected through a WAN, the BVPLS and implicitly MMRP advertisement may span across domains. The MMRP attributes will be flooded throughout the BVPLS context indiscriminately, regardless of the distribution of IVPLS sites.

The solution described in this section limits the scope of MMRP control plane advertisements to a specific network domain using MRP Policy. ISID-based filters are also provided as a safety measure for BVPLS data plane.

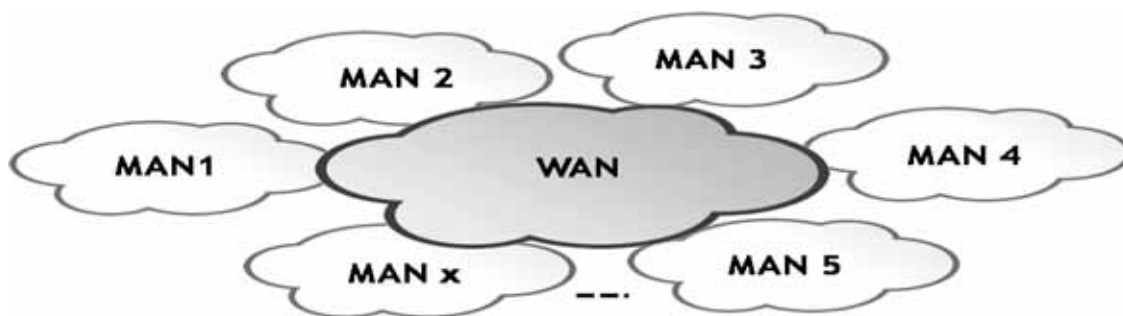


Figure 106: Inter-domain topology

Figure 106 depicts the case of an Inter-domain deployment where multiple metro domains (MANs) are interconnected through a wide area network (WAN). A BVPLS is configured across these domains running PBB M:1 model to provide infrastructure for multiple IVPLS services. MMRP is enabled in the BVPLS to build per IVPLS flooding trees. In order to limit the load in the core PE or PBB BCBs, the local IVPLS instances must use MMRP and data plane resources only in the MAN regions where they have sites. A solution to the above requirements is depicted in Figure 107. The case of native PBB metro domains inter-connected via a MPLS core is used in this example. Other technology combinations are possible.

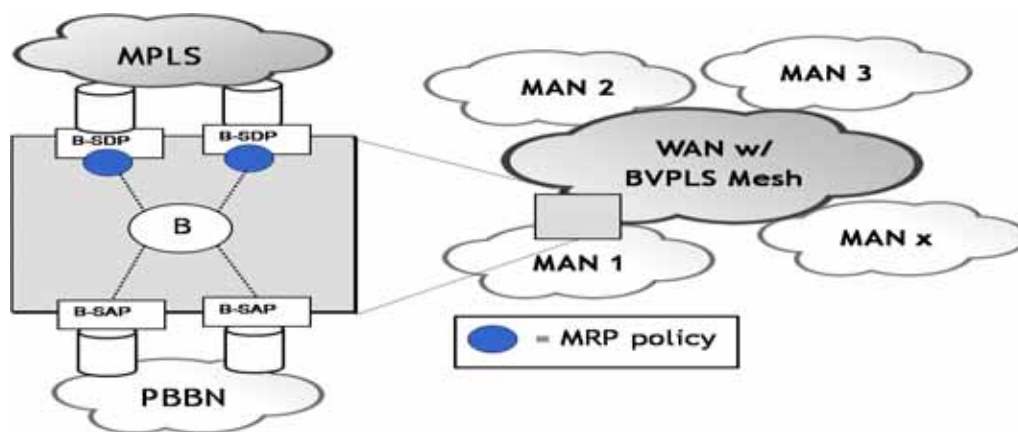


Figure 107: Limiting the scope of MMRP advertisements

An MRP policy can be applied to the edge of MAN1 domain to restrict the MMRP advertisements for local ISIDs outside local domain. Or the MRP policy can specify the inter-domain ISIDs allowed to be advertised outside MAN1. The configuration of MRP policy is similar with the configuration of a filter. It can be specified as a template or exclusively for a specific endpoint under service mrp object. An ISID or a range of ISID(s) can be used to specify one or multiple match criteria that will be used to generate the list of Group MACs to be used as filters to control which MMRP attributes can be advertised. An example of a simple mrp-policy that allows the advertisement of Group BMACs associated with ISID range 100-150 is given below:

```
*A:ALA-7>config>service>mrp# info
-----
      mrp-policy "test" create
      default-action block
      entry 1 create
      match
      isid 100 to 150
      exit
    action allow
      exit
    exit
-----
```

A special action end-station is available under mrp-policy entry object to allow the emulation on a specific SAP/PW of an MMRP end-station. This is usually required when the operator does not want to activate MRP in the WAN domain for interoperability reasons or if it prefers to manually specify which ISID will be interconnected over the WAN. In this case the MRP transmission will be shutdown on that SAP/PW and the configured ISIDs will be used the same way as an IVPLS connection into the BVPLS, emulating a static entry in the related BVPLS MFIB. Also if MRP is active in the BVPLS context, MMRP will declare the related GBMAC(s) continuously over all the other BVPLS SAP/PW(s) until the mrp-policy end-station action is removed from the mrp-policy assigned to that BVPLS context.

The MMRP usage of the mrp-policy will ensure automatically that traffic using Group BMAC will not be flooded between domains. There could be though small transitory periods when traffic originated from PBB BEB with unicast BMAC destination may be flooded in the BVPLS context as unknown unicast in the BVPLS context for both IVPLS and PBB Epipe. To restrict distribution of this traffic for local PBB services a new ISID match criteria is added to existing mac-filters. The mac-filter configured with ISID match criterias can be applied to the same interconnect endpoint(s), BVPLS SAP or PW, as the mrp-policy to restrict the egress transmission any type of frames that contain a local ISID. An example of this new configuration option is described below:

```
-----
A;ALA-7>config>filter# info
-----
mac-filter 90 create
description "filter-wan-man"
type isid
scope template
entry 1 create
description "drop-local-isids"
match
-----
```

```
isid from 100 to 1000
exit
action drop
exit
-----
```

These filters will be applied as required on a per B-SAP or B-PW basis just in the egress direction. The ISID match criteria is exclusive with any other criteria under mac-filter. A new mac-filter type attribute is defined to control the use of ISID match criteria and must be set to isid to allow the use of isid match criteria. The ISID tag is identified using the PBB ethertype provisioned under config>port>ethernet>pbb-etype.

PBB and BGP-AD

BGP auto-discovery is supported only in the BVPLS to automatically instantiate the BVPLS pseudowires and SDPs as described in [BGP Auto-Discovery for LDP VPLS on page 482](#).

PBB ELINE Service

ELINE service is defined in PBB (IEEE 802.1ah) as a point-to-point service over the B-component infrastructure. Alcatel-Lucent's implementation offers support for PBB ELINE through the mapping of multiple Epipe services to a Backbone VPLS infrastructure.

The use of Epipe scales the ELINE services as no MAC switching, learning or replication is required in order to deliver the point-to-point service.

All packets ingressing the customer SAP are PBB encapsulated and unicasted through the B-VPLS "tunnel" using the backbone destination MAC of the remote PBB PE.

All the packets ingressing the B-VPLS destined for the Epipe are PBB de-encapsulated and forwarded to the customer SAP.

PBB Using G.8031 Protected Ethernet-Tunnels

IEEE 802.1ah Provider Backbone Bridging (PBB) specification employs provider MSTP (PMSTP) to ensure loop avoidance in a resilient native Ethernet core. The usage of P-MSTP means failover times depend largely on the size and the connectivity model used in the network. The use of MPLS tunnels provides a way to scale the core while offering fast failover times using MPLS FRR. There are still service provider environments where Ethernet services are deployed using native Ethernet backbones. A solution based on native Ethernet backbone is required to achieve the same fast failover times as in the MPLS FRR case.

The Alcatel-Lucent PBB implementation offers the capability to use core Ethernet tunnels compliant with ITU-T G.8031 specification to achieve 50 ms resiliency for backbone failures. This is required to comply with the stringent SLAs provided by service providers in the current competitive environment. The implementation also allows a LAG-emulating Ethernet Tunnel providing a complimentary native Ethernet ELAN capability. The LAG-emulating Ethernet tunnels and G.8031 protected Ethernet tunnels operate independently.

The next section describes an applicability example where an Ethernet service provider using native PBB offers a carrier of carrier backhaul service for mobile operators.

Solution Overview

A simplified topology example for a PBB network offering a carrier of carrier service for wireless service providers is depicted in [Figure 108](#).

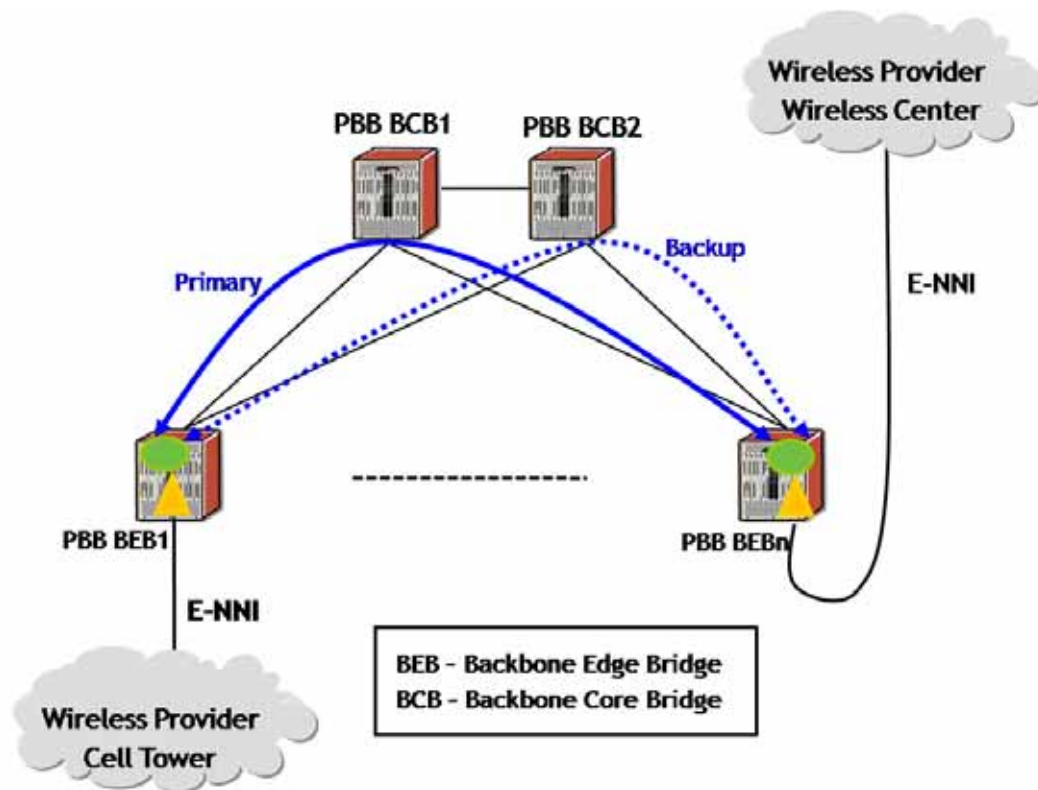


Figure 108: Mobile Backhaul Use Case

The wireless service provider in this example purchases an ELINE service between the ENNI on PBB edge nodes, BEB1 and BEBn. PBB services are employing a type of Ethernet tunneling (Eth-tunnels) between BEBs where primary and backup member paths controlled by G.8031 1:1 protection are used to ensure faster backbone convergence. Ethernet CCMs based on IEEE 802.1ag specification may be used to monitor the liveness for each individual member paths.

The Ethernet paths span a native Ethernet backbone where the BCBs are performing simple Ethernet switching between BEBs using an Epipe or a VPLS service.

Although the network diagram shows just the Epipe case, both PBB ELINE and ELAN services are supported.

Detailed Solution Description

This section discusses the details of the Ethernet tunneling for PBB. The main solution components are depicted in [Figure 109](#).

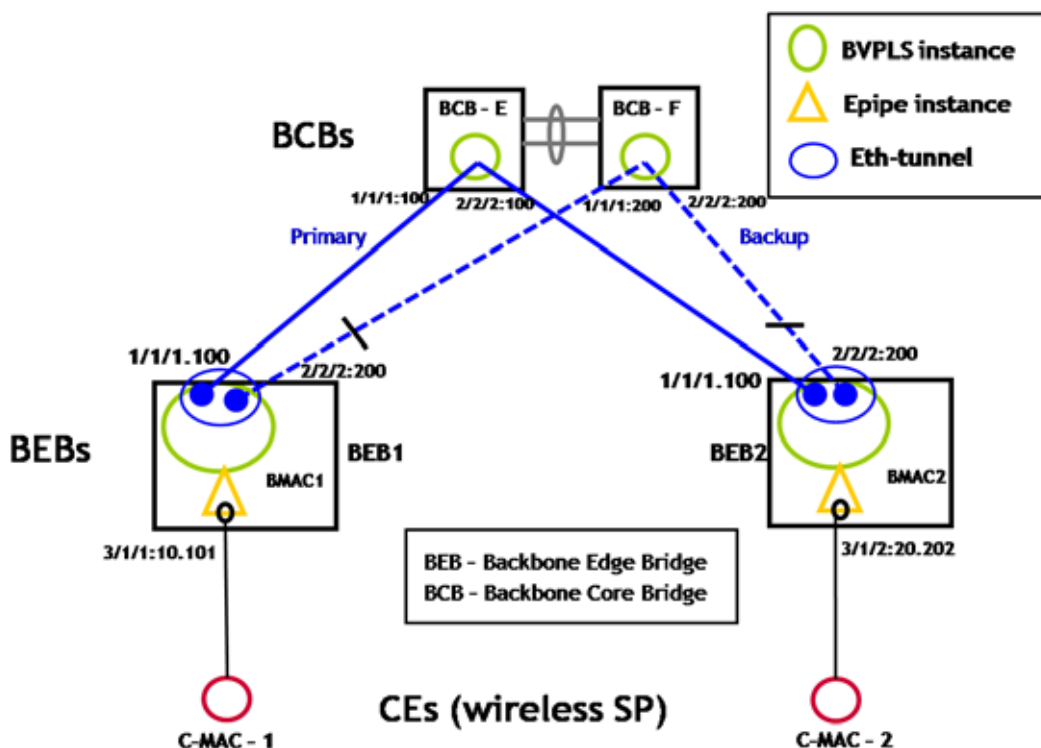


Figure 109: PBB-Epipe with B-VPLS over Ethernet Tunnel

The PBB ELINE service is represented in the BEBs as a combination of an Epipe mapped to a BVPLS instance. A eth-tunnel object is used to group two possible paths defined by specifying a member port and a control tag. In our example, the blue-circle representing the eth-tunnel is associating in a protection group the two paths instantiated as (port, control-tag/bvid): a primary one of port 1/1/1, control-tag 100 and respectively a secondary one of port 2/2/2, control tag 200.

The BCBs devices will stitch each BVID between different BEB-BCB links using either a VPLS or Epipe service. Epipe instances are recommended as the preferred option due to increased tunnel scalability.

Fast failure detection on the primary and backup paths is provided using IEEE 802.1ag CCMs that can be configured to transmit at 10 msec interval. Alternatively, the link layer fault detection mechanisms like LoS/RDI or 802.3ah can be employed.

Path failover is controlled by an Ethernet protection module, based on standard G.8031 Ethernet Protection Switching. The Alcatel-Lucent implementation of Ethernet protection switching supports only the 1:1 model which is common practice for packet based services since it makes better use of available bandwidth. The following additional functions are provided by the protection module:

- Synchronization between BEBs such that both send and receive on the same Ethernet path in stable state.
- Revertive / non-revertive choices.
- Compliant G.8031 control plane.

The secondary path requires a MEP to exchange the G.8031 APS PDUs. The following Ethernet CFM configuration in the **eth-tunnel>path>eth-cfm>mep** context can be used to enable the G.8031 protection without activating the Ethernet CCMs:

- Create the domain (MD) in CFM
- Create the association (MA) in CFM. NOTE: Do not put remote MEPs.
- Create the MEP
- Configure control-mep and no shutdown on the MEP
- The CCM transmission should stay disabled using the no ccm-enable command.

If a MEP is required for troubleshooting issues on the primary path, the configuration described above for the secondary path must be used to enable the use of Link Layer OAM on the primary path.

LAG loadsharing is offered to complement G.8031 protected Ethernet tunnels for situations where unprotected VLAN services are to be offered on some or all of the same native Ethernet links.

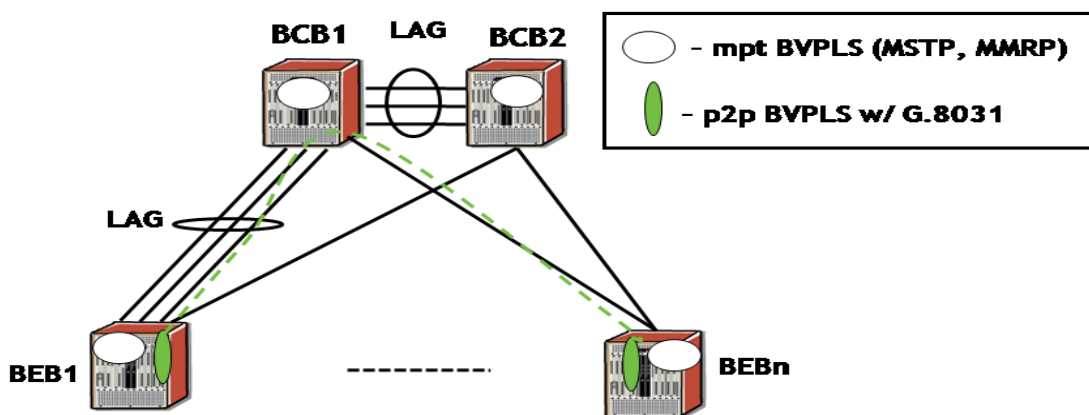


Figure 110: G.8031 p2p Tunnels and LAG-Like Loadsharing Co-Existence

In [Figure 110](#), the G.8031 Ethernet tunnels are used by the B-SAP(s) mapped to the green BVPLS entities supporting the ELINE services. A LAG-like loadsharing solution is provided for the Multipoint BVPLS (white circles) supporting the ELAN (IVPLS) services. The green G.8031 tunnels co-exist with LAG-emulating Ethernet tunnels (loadsharing mode) on both BEB-BCB and BCB-BCB physical links.

The G.8031-controlled Ethernet tunnels will select an active tunnel based on G.8031 APS operation, while emulated-LAG Ethernet tunnels will hash traffic within the configured links. Upon failure of one of the links the emulated-LAG tunnels will rehash traffic within the remaining links and fail the tunnel once the number of links breaches the minimum required (independent of G.8031-controlled Ethernet tunnels on the links shared emulated-LAG).

Detailed PBB Emulated LAG Solution Description

This section discusses the details of the emulated LAG Ethernet tunnels for PBB. The main solution components are depicted in [Figure 111](#) which overlays Ethernet Tunnels services on the network from [Figure 109](#).

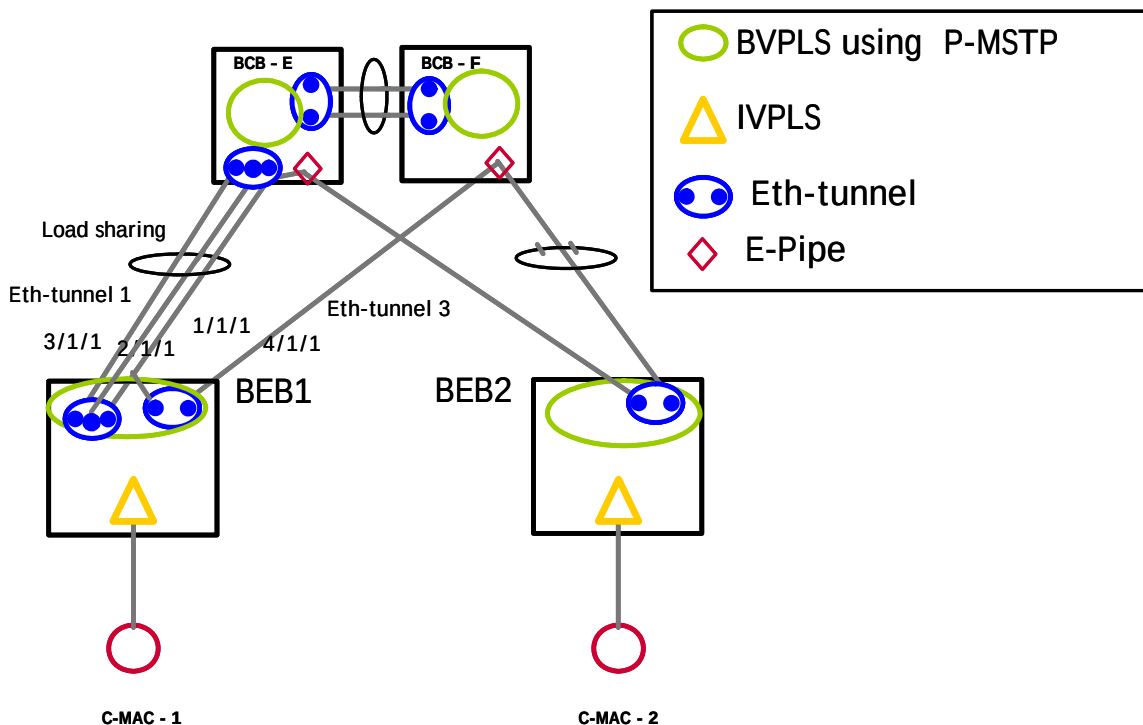


Figure 111: Ethernet Tunnel Overlay

For a PBB Ethernet VLAN to make efficient use of an emulated LAG solution, a Management-VPLS (m-VPLS) is configured enabling Provider Multi-Instance Spanning Tree Protocol (P-MSTP). The m-VPLS is assigned to two SAPs; the eth-tunnels connecting BEB1 to BCB-E and BCB-F respectively reserving a range of VLANs for P-MSTP.

The PBB P-MSTP service is represented in the BEBs as a combination of an Epipe mapped to a BVPLS instance as before but now the PBB service is able to use the Ethernet tunnels under the P-MSTP control and load share traffic on the emulated LAN. In our example, the blue-circle representing the BVPLS is assigned to the SAPs which define two paths each. All paths are specified as primary precedence to load share the traffic.

A Management VPLS (m-VPLS) is first configured with a VLAN-range and assigned to the SAPs containing the path to the BCBs. The load shared eth-tunnel objects are defined by specifying a member ports and a control tag of zero. Then individual B-VPLS services can be assigned to the member paths of the emulated LAGs and defining the path encapsulation. Then individual services such as the IVPLS service can be assigned to the B-VPLS.

At the BCBs the tunnels are terminated the next BVPLS instance controlled by P-MSTP on the BCBs to forward the traffic.

In the event of link failure, the emulated LAG group will automatically adjust the number of paths. A threshold can be set whereby the LAG group is declared down. All emulated LAG operations are independent of any 8031-1to1 operation.

Support Service and Solution Combinations

The following considerations apply when Ethernet tunnels are configured under a VPLS service:

- Only ports in access or hybrid mode can be configured as eth-tunnel path members. The member ports can be located on the same or different IOMs or MDAs.
- Dot1q and QinQ ports are supported as eth-tunnel path members.
- The same port cannot be used as member in both a LAG and an Ethernet-tunnel.
- A mix of regular and multiple eth-tunnel SAPs and PWs can be configured in the same BVPLS.
- Split horizon groups in BVPLS are supported on eth-tunnel SAPs. The use of split horizon groups allows the emulation of a VPLS model over the native Ethernet core, eliminating the need for P-MSTP.
- STP and MMRP are not supported in a BVPLS using eth-tunnel SAPs.
- Both PBB ELINE (Epipe) and ELAN (IVPLS) services can be transported over a BVPLS using Ethernet-tunnel SAPs.
- MC-LAG access multi-homing into PBB services is supported in combination with Ethernet tunnels:
 - MC-LAG SAPs can be configured in IVPLS or Epipe instances mapped to a BVPLS that uses eth-tunnel SAPs
 - Blackhole Avoidance using native PBB MAC flush/MAC move solution is also supported
- Support is also provided for BVPLS with P-MSTP and MMRP control plane running as ships-in-the-night on the same links with the Ethernet tunneling which is mapped by a SAP to a different BVPLS.
 - Epipes must be used in the BCBs to support scalable point-to-point tunneling between the eth-tunnel endpoints when management VPLS is used.
- The following solutions or features are not supported in the current implementation and are blocked:
 - Capture SAP
 - Subscriber management
 - BSX
 - Eth-tunnels usage as a logical port in the **config>redundancy>multi-chassis>peer>sync>port** context

For further information, see [G.8031 Protected Ethernet Tunnels on page 54](#).

MAC Flush

PBB Resiliency for B-VPLS Over Pseudowire Infrastructure

The following VPLS resiliency mechanisms are also supported in PBB VPLS:

- Native Ethernet resiliency supported in both I-VPLS and B-VPLS contexts
- Distributed LAG, MC-LAG, RSTP
- MSTP in a management VPLS monitoring (B- or I-) SAPs and pseudowire
- BVPLS service resiliency, loop avoidance solutions – Mesh, active/standby pseudowires and multi-chassis endpoint
- IVPLS service resiliency, loop avoidance solutions – Mesh, active/standby pseudowires (PE-rs only role)

To support these resiliency options, extensive support for blackhole avoidance mechanisms is required.

Porting existing VPLS LDP MAC Flush in PBB VPLS

Both the I-VPLS and B-VPLS components inherit the LDP MAC flush capabilities of a regular VPLS to fast age the related FIB entries for each domain: CMACs for I-VPLS and BMACs for B-VPLS. Both types of LDP MAC flush are supported for I-VPLS and B-VPLS domains:

- **flush-all-but-mine** - flush on positive event, for example:
 - Pseudowire activation — VPLS resiliency using active/standby pseudowire
 - Reception of a STP TCN
- **flush-all-from-me** - flush on negative event, for example:
 - SAP failure – link down or MC-LAG out-of-sync
 - Pseudowire or Endpoint failure

In addition, only for the B-VPLS domain, changing the backbone source MAC of a B-VPLS will trigger a LDP MAC flush-all-from-me to be sent in the related active topology. At the receiving PBB PE, a BMAC flush automatically triggers a flushing of the CMACs associated with the old source BMAC of the B-VPLS.

PBB Blackholing Issue

In the PBB VPLS solution, a B-VPLS may be used as infrastructure for one or more I-VPLS instances. B-VPLS control plane (LDP Signaling or P-MSTP) replaces I-VPLS control plane throughout the core. This is raising an additional challenge related to blackhole avoidance in the I-VPLS domain as described in this section. [Figure 112](#) describes the case of a QinQ switch (node 5) dual-homed through MC-LAG to two I-VPLS instances located on PBB PEs A1 and A2.

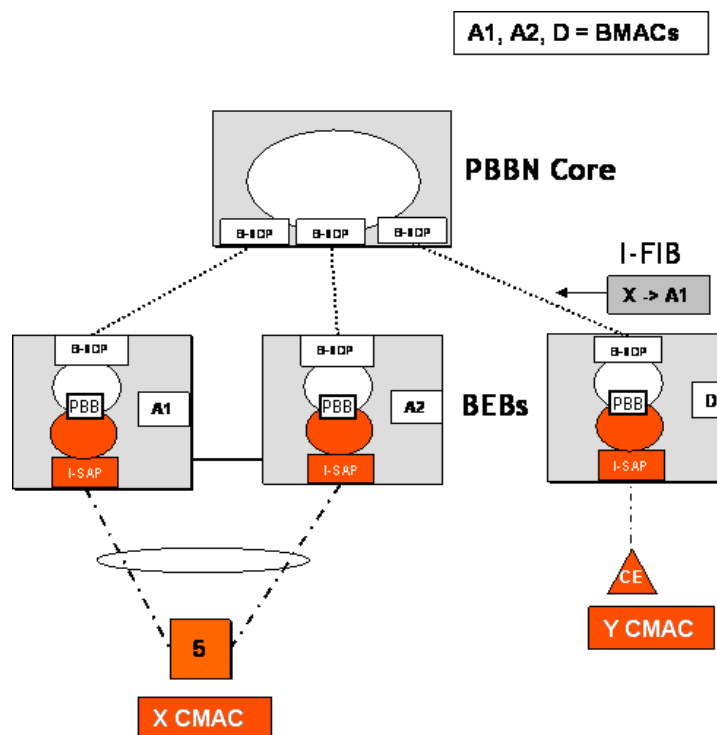


Figure 112: PBB Blackholing - MC LAG example

Assuming that the link between PE A1 and node 5 is active, the remote PEs participating in the orange VPN (for example, PE D) will learn the CMAC X associated with backbone MAC A1. Under failure of the link between node 5 and PE A1 and activation of link to PE A2, the remote PEs (for example, PE D) will black-hole the traffic destined for customer MAC X to BMAC A1 until the aging timer expires or a packet flows from X to Y through the PE A2. This may take a long time (default aging timer is 5 minutes) and may affect a large number of flows across multiple I-VPLSes.

A similar issue will occur in the case where node 5 is connected to A1 and A2 I-VPLS using active/standby pseudowires. For example, when node 5 changes the active pseudowire, the remote PBB PE will keep sending to the old PBB PE.

Another case is when the QinQ access network dual-homed to a PBB PE uses RSTP or MVPLS with MSTP to provide loop avoidance at the interconnection between the PBB PEs and the QinQ SWs. In the case where the access topology changes, a TCN event will be generated and propagated throughout the access network. Similarly, this change needs to be propagated to the remote PBB PEs to avoid blackholing.

A solution is required to propagate the I-VPLS events through the backbone infrastructure (B-VPLS) in order to flush the customer MAC to BMAC entries in the remote PBB. As there are no IVPLS control plane exchanges across the PBB backbone, extensions to B-VPLS control plane are required to propagate the I-VPLS MAC flush events across the B-VPLS.

LDP MAC Flush Solution for PBB Blackholing

In the case of an MPLS core, B-VPLS uses T-LDP signaling to set up the pseudowire forwarding. The following I-VPLS events must be propagated across the core B-VPLS using LDP MAC **flush-all-but-mine** or **flush-all-from-me** indications:

For **flush-all-but-mine** indication (“positive flush”):

- TCN event in one or more of the I-VPLS or in the related M-VPLS for the MSTP use case.
- Pseudowire/SDP binding activation with Active/Standby pseudowire (standby, active or down, up)
- Reception of an LDP MAC withdraw “flush-all-but-mine” in the related I-VPLS

For **flush-all-from-me** indication (“negative flush”)

- MC-LAG failure - does not require send-flush-on-failure to be enabled in I-VPLS
- Failure of a local SAP – requires send-flush-on-failure to be enabled in I-VPLS
- Failure of a local pseudowires/SDP binding – requires send-flush-on-failure to be enabled in I-VPLS
- Reception of an LDP MAC withdraw “flush-all-from-me” in the related I-VPLS

In order to propagate the MAC flush indications triggered by the above events, the PE that originates the LDP MAC withdraw message must be identified. In regular VPLS “mine”/“me” is represented by the pseudowire associated with the FEC and the T-LDP session on which the LDP MAC withdraw was received. In PBB, this is achieved using the B-VPLS over which the signaling was propagated and the BMAC address of the originator PE.

Alcatel-Lucent PBB-VPLS solution addresses this requirement by inserting in the BVPLS LDP MAC withdraw message a new PBB-TLV (type-length-value) element. The new PBB TLV contains the source BMAC identifying the originator (“mine”/“me”) of the flush indication and the ISID list identifying the I-VPLS instances affected by the flush indication.

There are a number of advantages to this approach. Firstly, the PBB-TLV presence indicates this is a PBB MAC Flush. As a result, all PEs containing only the B-VPLS instance will automatically propagate the LDP MAC withdraw in the B-VPLS context respecting the split-horizon and active link topology. There is no flushing of the B-VPLS FIBs throughout the core PEs. Subsequently, the receiving PBB VPLS PEs will use the BMAC and ISID list information to identify the specific I-VPLS FIBs and the CMAC entries pointing to the source BMAC included in the PBB TLV.

An example of processing steps involved in PBB MAC Flush is depicted in [Figure 113](#) for the case when a Topology Change Notification (TCN) is received on PBB PE 2 from a QinQ access in the I-VPLS domain.

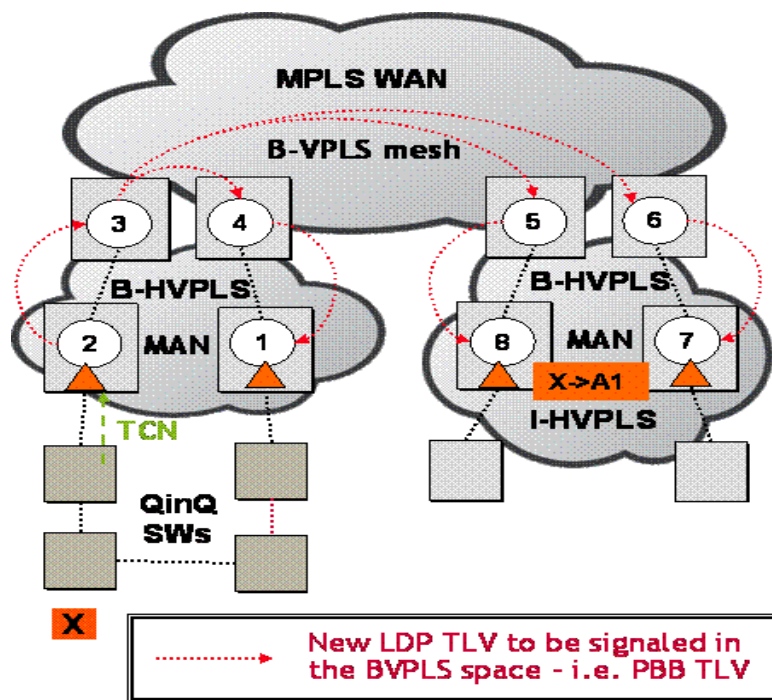


Figure 113: TCN Triggered PBB Flush-ALI-but-mine Procedure

The received TCN may be related to one or more I-VPLS domains. This will generate a MAC Flush in the local I-VPLS instance(s) and if configured, it will originate a PBB MAC **flush-all-but-mine** throughout the related B-VPLS context(s) represented by the white circles 1-8 in our example.

A PBB-TLV is added by PE2 to the regular LDP MAC **flush-all-but-mine**. BMAC2, the source BMAC associated with B-VPLS on PE2 is carried inside the PBB TLV to indicate who “mine” is. The ISID list identifying the I-VPLS affected by the TCN is also included if the number of affected I-VPLS is 100 or less. No ISID list is included in the PBB-TLV if more than 100 ISIDs are affected. If no ISID list is included, then the receiving PBB PE will flush all the local I-VPLS

instances associated with the B-VPLS context identified by the FEC TLV in the LDP MAC withdraw message. This is done to speed up delivery and processing of the message.

Recognizing the PBB MAC flush, the B-VPLS only PEs 3, 4, 5 and 6 refrain from flushing their B-VPLS FIB tables and propagate the MAC flush message regardless of their “propagate-mac-flush” setting.

When LDP MAC withdraw reaches the terminating PBB PEs 1 and 7, the PBB-TLV information is used to flush from the I-VPLS FIBs all CMAC entries except those associated with the originating BMAC BM2. If specific I-VPLS ISIDs are indicated in the PBB TLV, then the PBB PEs will flush only the CMAC entries from the specified I-VPLS except those mapped to the originating BMAC. Flush-all-but-mine indication is not propagated further in the I-VPLS context to avoid information loops.

The other events that trigger Flush-all-but-mine propagation in the B-VPLS (pseudowire/SDP binding activation, Reception of an LDP MAC Withdraw) are handled similarly. The generation of PBB MAC flush-all-but-mine in the B-VPLS must be activated explicitly on a per I-VPLS basis with the command **send-bvpls-flush all-but-mine**. The generation of PBB MAC flush-all-from-me in the B-VPLS must be activated explicitly on a per I-VPLS basis with the command **send-bvpls-flush all-from-me**.

Access Multi-Homing for Native PBB (B-VPLS over SAP Infrastructure)

Alcatel-Lucent PBB implementation allows the operator to use a native Ethernet infrastructure as the PBB core. Native Ethernet tunneling can be emulated using Ethernet SAPs to interconnect the related B-VPLS instances. This kind of solution might fit certain operational environments where Ethernet services was provided in the past using QinQ solution. The drawback is that no LDP signaling is available to provide support for Access Multi-homing for Epipe (pseudowire Active/Standby status) or I-VPLS services (LDP MAC Withdraw). An alternate solution is required.

A PBB network using Native Ethernet core is depicted in [Figure 114](#). MC-LAG is used to multi-home a number of edge switches running QinQ to PBB BEBs.

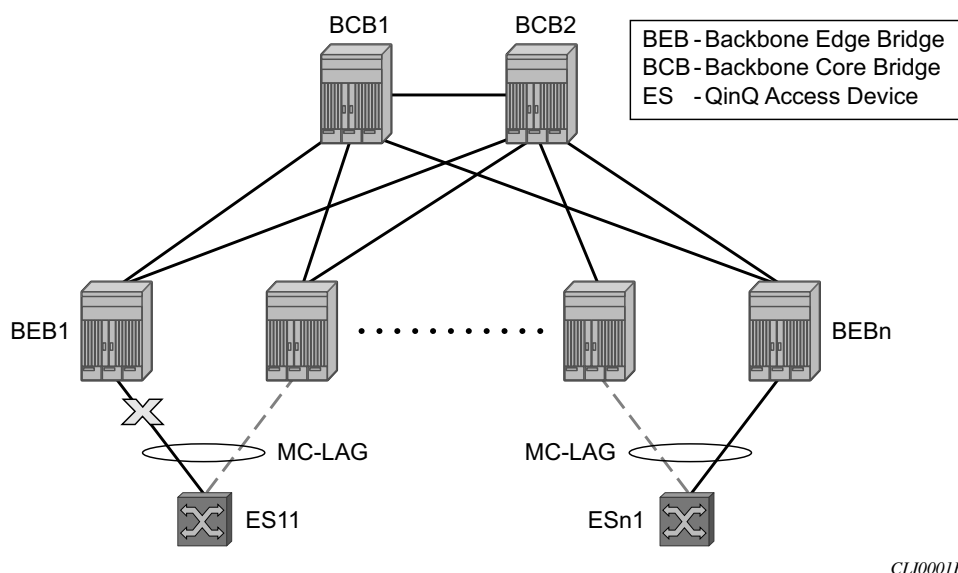


Figure 114: Access Dual-Homing into PBB BEBs - Topology View

The interrupted line from the MC-LAG represents the standby, inactive link; the solid line is the active link. The BEBs are dual-homed to two core switches BCB1 and BCB2 using native Ethernet SAPs on the B-VPLS side. Multi-point B-VPLS with MSTP for loop avoidance can be used as the PBB core tunneling. Alternatively point-to-point, G.8031 protected Ethernet tunnels can be also used to interconnect B-VPLS instances in the BEBs as described in the PBB over G.8031 protected Ethernet tunnels.

Alcatel-Lucent implementation provides a solution for both PBB ELINE (EPIPE) and ELAN (IVPLS) services that avoids PBB blackholing when the active ES11-BEB1 link fails. It also provides a consistent behavior for both service type and for different backbone types: for example, native Ethernet, MPLS, or a combination. Only MC-LAG is supported initially as the Access-Multi-homing mechanism.

Solution Description for I-VPLS Over Native PBB Core

The use case described in the previous section is addressed by enhancing the existing native PBB solution to provide for blackhole avoidance.

The topology depicted in [Figure 115](#) describes the details of the solution for the I-VPLS use case. Although the native PBB use case is used, the solution works the same for any other PBB infrastructure: for example, G.8031 Ethernet tunnels, pseudowire/MPLS, or a combination.

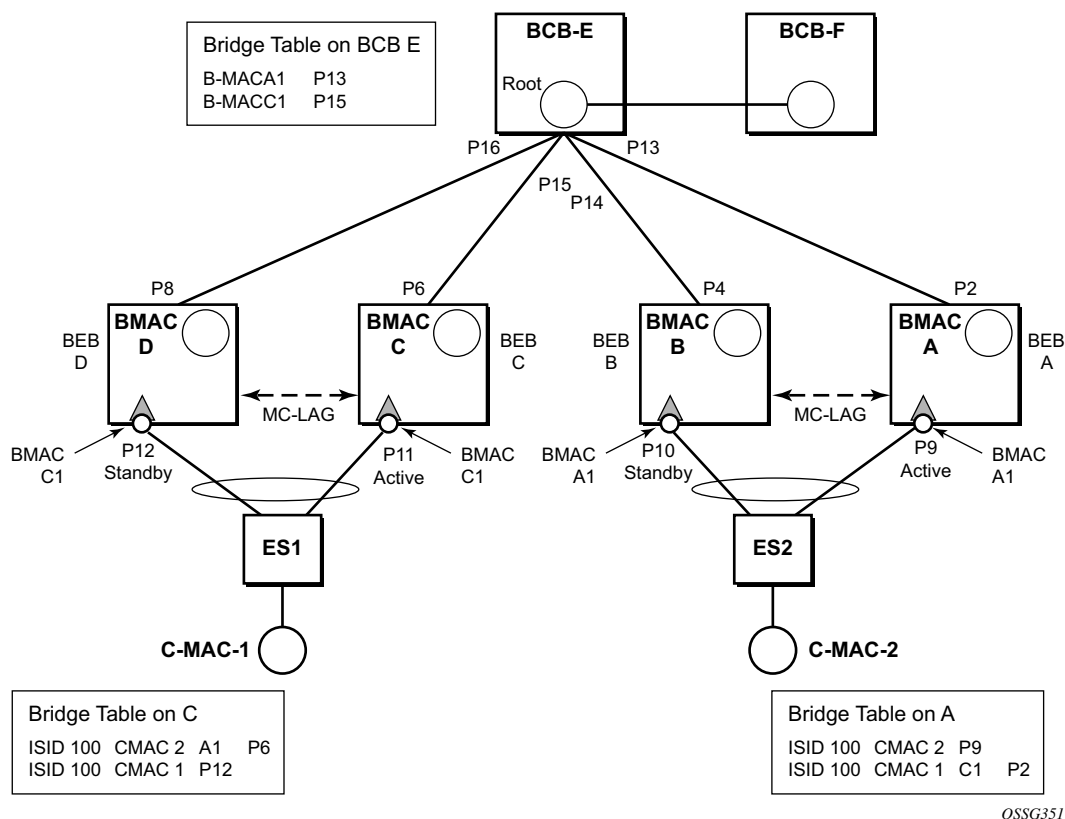


Figure 115: PBB Active Topology and Access Multi-Homing

ES1 and ES2 are dual-homed using MC-LAG into two BEB devices: ES1 to BEB C and BEB D, ES2 to BEB A and BEB B. MC-LAG P11 on BEB C and P9 on BEB A are active on each side.

In the service context, the yellow triangles are I-VPLS instances while the green circles are B-VPLS components with the related, per BVPLS source BMACs indicated next to each BVPLS instances. P-MSTP or RSTP may be used for loop avoidance in the multi-point BVPLS. For simplicity, only the active SAPs (BEB P2, P4, P6 and P8) are shown in the diagram.

In addition to the source BMAC associated with each BVPLS, there is an additional BMAC associated with each MC-LAG supporting multi-homed I-VPLS SAPs. The BEBs that are in a multi-homed MC-LAG configuration share a common B-MAC on the related MC-LAG interfaces. For example, a common BMAC C1 is associated in this example with ports P11 and P12 participating in the MC-LAG between BEB C and BEB D while BMAC A1 is associated with ports P9 and P10 in the MC-LAG between BEB A and BEB B. While BMAC C1 is associated through the I-VPLS SAPs with both BVPLS instances in BEB C and BEB D, it is actively used for forwarding to I-VPLS SAPs only on BEB C containing the active link P11.

MC-LAG protocol keeps track of which side (port or LAG) is active and which is standby for a given MC-LAG grouping and activates the standby in case the active one fails. The source BMAC C1 and A1 are used for PBB encapsulation as traffic arrives at the IVPLS SAPs on P11 and P9 respectively. MAC Learning in the BVPLS instances installs MAC FIB entries in BCB-E and BEB A as depicted in [Figure 115](#).

Active link (P11) or access node (BEB C) failures are activating through MC-LAG protocol the standby link (P12) participating in the MC-LAG on the pair MC-LAG device (BEB D).

[Figure 116](#) depicts the case of access link failure.

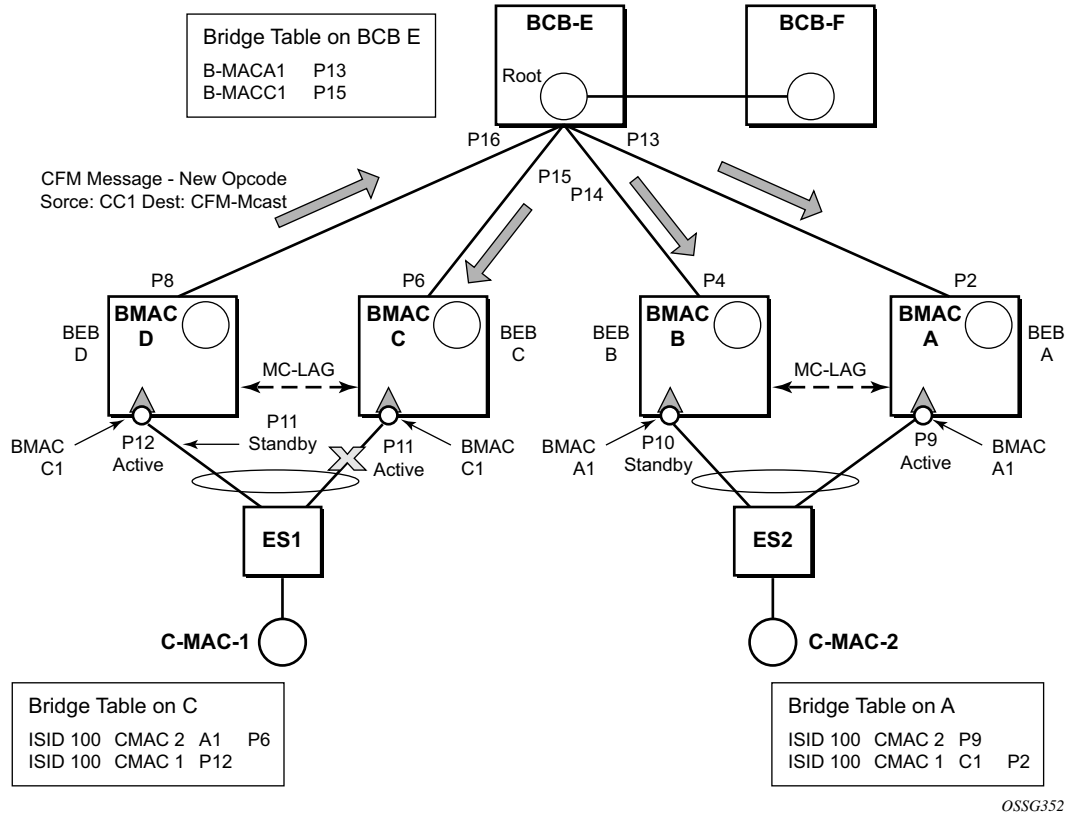


Figure 116: Access Multi-Homing - Link Failure

On failure of the active link P11 on BEB C the following processing steps apply:

- MC-LAG protocol activates the standby link P12 on the pair BEB D.
- BMAC C1 becomes active on BEB D and any traffic received on BEB C with destination BMAC C1 is forwarded on the corresponding I-VPLS SAPs on P12.
- BEB D determines the related B-VPLS instance(s) associated with all the I-VPLS SAP(s) mapped to P12, the newly activated MC-LAG link(s)/LAG component(s).
- Subsequently, BEB D floods in the related B-VPLS instance(s) an Ethernet CFM-like message using C1 as source BMAC. A vendor CFM opcode is used followed by an Alcatel-Lucent OUI.
- As a result, all the FIB entries in BCBs or BEBs along the path will be automatically updated to reflect the move of BMAC C1 to BEB D.
- Note that in this particular configuration the entries on BEB A do not need to be updated saving MAC Flush operation.

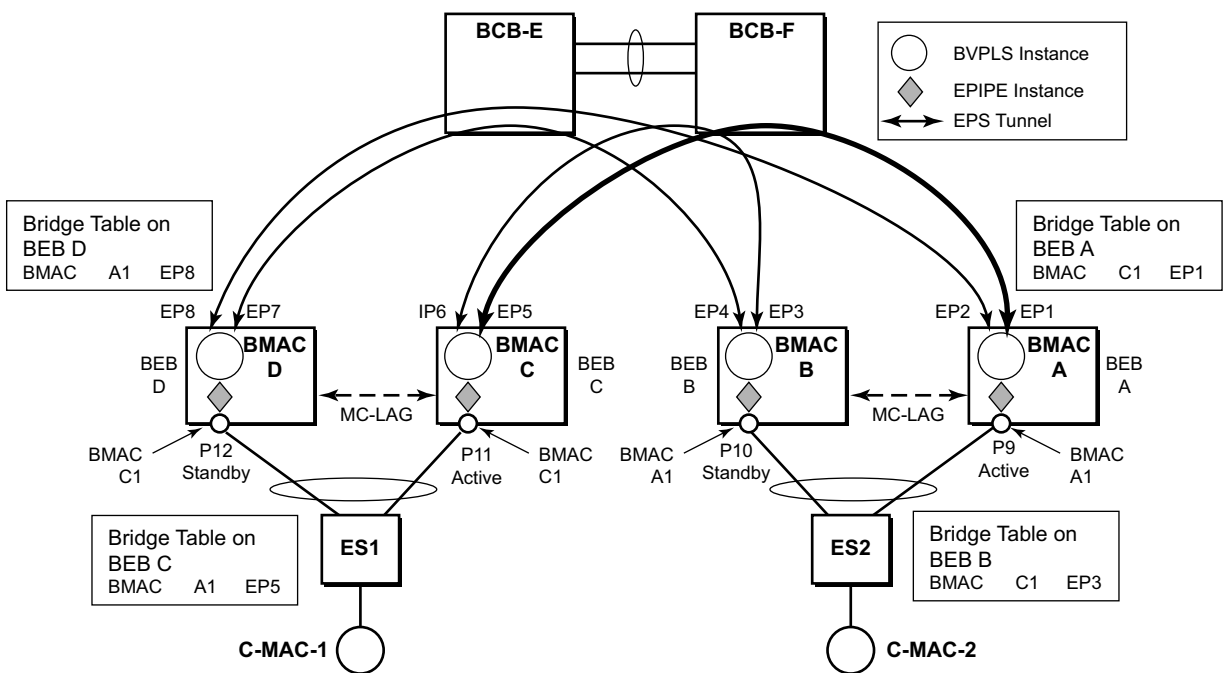
- In other topologies, it is possible that the BMAC C1 FIB entries in the B-VPLS instance on the remote BEBs (like BEB A) will need to move between B-SAPs. This will involve a move of all CMAC using as next hop BMAC C1 and the new egress IOM.

Identical procedure is used when the whole BEB C fails.

Solution Description for PBB EPIPE over G.8031 Ethernet Tunnels

This section discusses the Access Multi-Homing solution for PBB ELINE over an infrastructure of G.8031 Ethernet tunnels. Although a specific use case is used, the solution works the same for any other PBB infrastructure: for example, native PBB, pseudowire/MPLS, or a combination.

The physical topology described in section 5.1 is used in this example. The PBB ELINE service and the related BVPLS infrastructure are depicted in [Figure 117](#).



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Figure 117: Access Multi-Homing Solution for PBB EPIPE

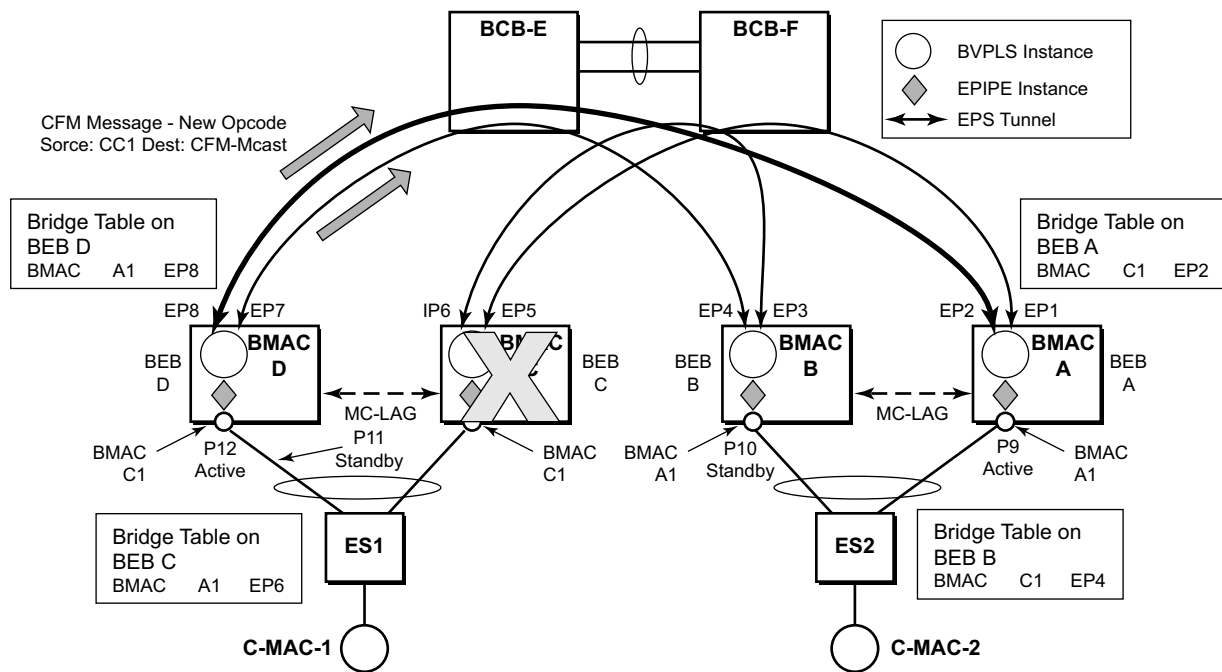
The ELINE instances are connected through the B-VPLS infrastructure. Each B-VPLS is interconnected to the BEBs in the remote pair using the G.8031, Ethernet Protection Switched (EPS) tunnels. Only the active Ethernet paths are shown in the network diagram to simplify the explanation. Split Horizon Groups may be used on EPS tunnels to avoid running MSTP/RSTP in the PBB core.

The same BMAC addressing scheme is used as in the ELAN case: a BMAC per B-VPLS and additional BMACs associated with each MC-LAG connected to an EPIPE SAP. The BMACs

associated with the active MC-LAG are actively used for forwarding into B-VPLS the traffic ingressing related EPIPE SAPs.

MC-LAG protocol keeps track of which side is active and which is standby for a given MC-LAG grouping and activates the standby link in a failure scenario. The source BMACs C1 and A1 are used for PBB encapsulation as traffic arrives at the EPIPE SAPs on P11 and P9, respectively. MAC Learning in the B-VPLS instances installs MAC FIB entries in BEB C and BEB A as depicted in Figure 117. The highlighted Ethernet tunnel (EPS) will be used to forward the traffic between BEB A and BEB C.

Active link (P11) or access node (BEB C) failures are activating through MC-LAG protocol, the standby link (P12) participating in the MC-LAG on the pair MC-LAG device (BEB D). The failure of BEB C is depicted in Figure 118. The same procedure applies for the link failure case.



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Figure 118: Access Dual-Homing for PBB ELINE - BEB Failure

The following process steps apply:

- BEB D will lose MC-LAG communication with its peer BEB C - no more keep-alives from BEB C or next-hop tracking may kick in.
- BEB D assumes BEB C is down and activates all shared MC-LAG links, including P12.

- BMAC C1 becomes active on BEB D and any traffic received on BEB C with destination BMAC C1 is forwarded on the corresponding EPIPE SAPs on P12.
- BEB D determines the related B-VPLS instance(s) associated with all the EPIPE SAP(s) mapped to P12, the newly activated MC-LAG link(s)/LAG component(s).
- Subsequently, BEB D floods in the related B-VPLS instance(s) the same Ethernet CFM message using C1 as source BMAC.
- As a result, the FIB entries in BEB A and BEB B will be automatically updated to reflect the move of BMAC C1 from EP1 to EP2 and from EP3 to EP4, respectively.
- Note that the same process is executed for all the MC-LAGs affected by BEB C failure so BEB failure will be the worst case scenario.

Dual-Homing into PBB Epipe - local switching use case

When the service SAPs were mapped to MC-LAGs belonging to the same pair of BEBs in earlier releases, an IVPLS had to be configured even if there were just two SAPs active at any point in time. Since then, the PBB EPIPE model has been enhanced to support configuring in the same EPIPE instance two SAPs and a BVPLS uplink as depicted in the diagram below.

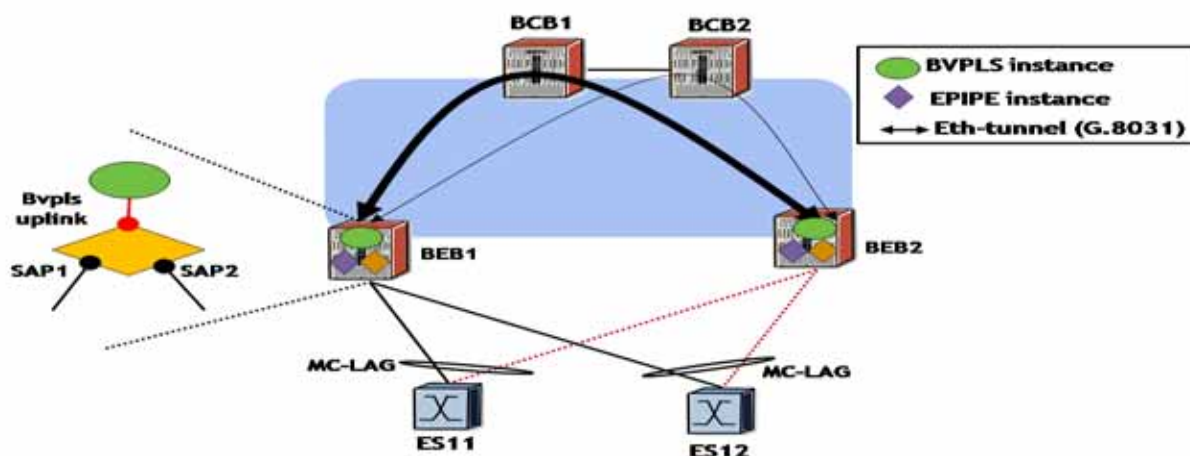


Figure 119: Solution for Access Dual-Homing with local switching for PBB ELINE/EPIPE

The PBB Epipe represented by the yellow diamond on BEB1 points through the BVPLS uplink to the BMAC associated with BEB2. The destination BMAC can be either the address associated with the green BVPLS on BEB2 or the BMAC of the SAP associated with the pair MC-LAG on BEB2 (preferred option).

The Epipe information model is expanded to accommodate the configuration of two SAPs (I-SAPs) and of a BVPLS uplink in the same time. For this configuration to work in an EPIPE environment, only two of them will be active in the forwarding plane at any point in time, specifically:

- SAP1 and SAP2 when both MC-LAG links are active on the local BEB1 (see [Figure 119](#))
- The Active SAP and the BVPLS uplink if one of the MC-LAG links is inactive on BEB1
 - PBB tunnel will be considered as a backup path only when the SAP is operationally down.
 - If the SAP is administratively down, then all traffic will be dropped.
- Although the CLI allows configuration of two SAPs and a BVPLS uplink in the same PBB Epipe, the BVPLS uplink is inactive as long as both SAPs are active.
 - Traffic received through PBB tunnel is dropped if BVPLS uplink is inactive.
- The same rules apply to BEB2.

PBB and IGMP Snooping

IGMP snooping feature provided for regular VPLS is supported similarly in the PBB IVPLS context to provide for efficient multicast replication in the customer domain. The difference from regular VPLS is the handling of IGMP messages arriving from the BVPLS side over a BVPLS SAP/SDP.

The first IGMP join message received over the local BVPLS will add all the BVPLS SAP/SDP components into the related multicast table associated with the IVPLS context. This is in line with the PBB model where the BVPLS infrastructure emulates a backbone LAN to which every IVPLS is connected by one virtual link.

When the querier is connected to a remote IVPLS instance, over the BVPLS infrastructure, its location is identified by the BVPLS SDP/SAP on which the query was received and also by the source BMAC address used in the PBB header for the query message, the BMAC associated with the BVPLS instance on the remote PBB PE.

PBB QoS

For PBB encapsulation, the configuration used for DE and dot1p in SAP and SDP policies applies to the related bits in both backbone dot1q (BTAG) and ITAG fields.

The following QoS processing rules apply for PBB B-VPLS SAPs and SDPs:

B-VPLS SAP ingress

- If dot1p, DE based classification is enabled, the BTAG fields will be used by default to evaluate the internal forwarding class (fc) and discard profile if there is a BTAG field. The 802.1ah ITAG will be used only if the BTAG is absent (null SAP).
- If either one of the dot1p or DE based classification is not explicitly enabled or the packets are untagged then the default fc and profile is assigned.

B-VPLS SAP egress

- If the sap-egress policy for the SAP contains an fc to dot1p/de mapping, this entry is used to set the dot1p and DE bits from the BTAG of the frame going out from the SAP. The same applies for the ITAG on frames originated locally from an I-VPLS. The mapping does not have any effect on the ITAG of frames transiting the B-VPLS.
- If no explicit mapping exists, the related dot1p DE bits are set to zero on both ITAG and BTAG if the frame is originated locally from an I-VPLS. If the frame is transiting the B-VPLS the ITAG stays unchanged, the BTAG is set according to the type of ingress SAP.
 - If the ingress SAP is tagged, the values of the dot1p, DE bits are preserved in the BTAG going out on the egress SAP.
 - If the ingress SAP is untagged, the dot1p, DE bits are set to zero in the BTAG going out on the egress SAP.

B-VPLS SDP (network) ingress policy

- QoS policies for dot1p and DE bits apply only for the outer VLAN ID: this is the VLAN ID associated with the link layer and not the PBB BTAG. As a result, the dot1p DE bits will be checked if an outer VLAN ID exists in the packets ingressing the SDP. If that VLAN ID is absent, nothing above the pseudowire SL will be checked - for example, no dot1p bits in the BTAG or ITAG will be checked. It is expected that the EXP bits will be used to transport QoS information across the MPLS backbone and into the PEs.

B-VPLS SDP (network) egress policy

- When building PBB packets originating from a local I-VPLS, the BTAG and ITAG values (dot1p, DE bits) will be set according to the network egress policy. The same applies for newly added BTAG (VLAN mode pseudowires) in a packet transiting the B-VPLS (SAP/

SDP to SDP). Note that if either dot1p or DE based classification is not explicitly enabled in the CLI, the values from the default fc to dot1p, DE mapping are assumed.

- Dot1p, DE bits for existing BTAGs will remain unchanged - for example, applicable to packets transiting the B-VPLS and going out on SDP.

Transparency of Customer QoS Indication through PBB Backbone

Similar to PW transport, operators want to allow their customers to preserve all eight (8) Ethernet COS markings (three dot1p bits) and the discard eligibility indication (DE bit) while transiting through a PBB backbone.

This means any customer COS marking on the packets inbound to the ingress SAP must be preserved when going out on the egress SAP at the remote PBB PE even if the customer VLAN tag is used for SAP identification at the ingress.

A solution to the above requirements is depicted in [Figure 120](#).

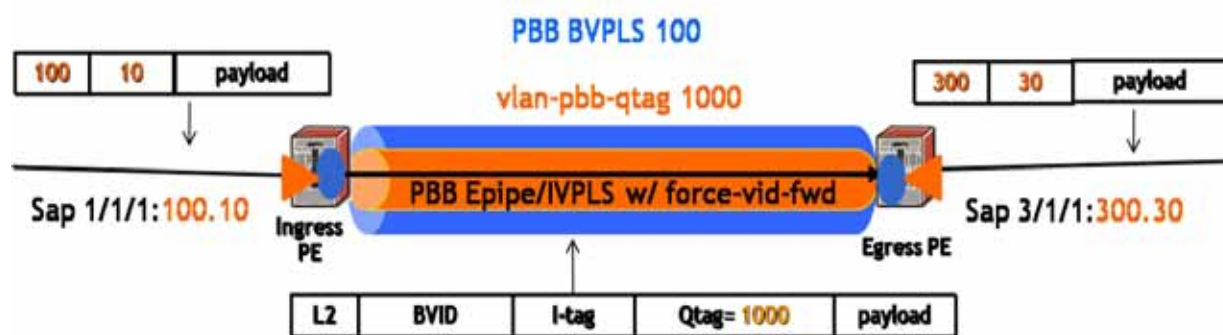


Figure 120: PCP, DE bits transparency in PBB

The PBB BVPLS is represented by the blue pipe in the middle with its associated COS represented through both the service (I-tag) and tunnel COS (BVID dot1p+DE or PW EXP bits).

The customer COS is contained in the orange dot1q VLAN tags managed in the customer domains. There may be one (CVID) or two (CVID, SVID) tags used to provide service classification at the SAP. IVPLS or PBB Epipe instances (orange triangles) are used to provide a Carrier-of-Carrier service.

As the VLAN tags are stripped at the ingress SAP and added back at the egress SAP, the PBB implementation must provide a way to maintain the customer QoS marking. This is done using a force-qtag-forwarding configuration on a per IVPLS/Epipe basis under the node specifying the uplink to the related BVPLS. When force-qtag-forwarding is enabled, a new VLAN tag is added

right after the CMAC addresses using the configured QTAG. The dot1p, DE bits from the specified outer/inner customer QTAG will be copied in the newly added tag.

Once the force-qtag-forwarding is enabled in one IVPLS/PBB Epipe instance, it will be enabled in all of the related instances.

At the remote PBB PE/BEB on the egress SAPs or SDPs, the first QTAG after the CMAC addresses will be removed and its dot1p, DE bits will be copied in the newly added customer QTAGs.

Configuration Examples

This section gives usage examples for the new commands under PBB Epipe or IVPLS instances.

PBB IVPLS usage:

```
configure service vpls 100 ivpls
    sap 1/1/1:101
    pbb
        backbone-vpls 10 isid 100
        force-qtag-forwarding
```

PBB Epipe Usage:

```
configure service epipe 200
    sap 1/1/1:201
    pbb
        tunnel 10 backbone-dest-mac ab-bc-cd-ef-01-01 isid 200
        force-qtag-forwarding
```

Details Solution Description

[Figure 120](#) depicts a specific use case. Keeping the same topology - an ingress PBB PE, a PBB core and an egress PBB PE - let us consider the generic use case where:

1. the packet arrives on the ingress PBB PE on an I-SAP or an I-SDP binding/PW and it is assigned to a PBB service instance (Epipe/IVPLS)
2. goes next through a PBB core (native Ethernet B-SAPs or PW/MPLS based B-SDP)
3. lastly, egresses at another PBB PE through a PBB service instance on either an I-SAP or I-SDP binding/PW.

Similar to the Ethernet-VLAN VC Type, the following packet processing steps apply for different scenarios.

- **Ingress PE, ingress I-SAP case** with force-qtag-forwarding enabled under PBB Epipe or IVPLS

The QTAG is inserted automatically right after CMAC addresses; an ethertype value of 8100 is used.

- **Case 1:** SAP type = null/dot1q default (1/1/1 or 1/1/1.*) so there is no service delimiting tag used and stripped on the ingress side.
 - VLAN and Dot1p+DE bits on the inserted QTAG are set to zero regardless of ingress QoS policy
- **Case 2:** SAP type = dot1q or qinq default (1/1/1.100 or 1/1/1.100.*) so there is a service delimiting tag used and stripped.
 - The service delimiting QTAG (dot1p + DE bits and VLAN) is copied as is in the inserted QTAG.
- **Case 3:** SAP type = qinq (1/1/1.100.10) so there are two service delimiting tags used and stripped.
 - The service delimiting QTAG (VLAN and dot1p + DE bits) is copied as is from the inner tag in the inserted QTAG.

- **Ingress PE, ingress I-SDP/PW case** with force-qtag-forwarding enabled under PBB Epipe or IVPLS

The QTAG is inserted automatically right after CMAC addresses; an ethertype value of 8100 is used.

- **Case 1:** SDP vc-type = Ethernet (force-vlan-vc-forwarding= not supported for I-PW) so there is no service delimiting tag stripped on the ingress side.
 - VLAN and Dot1p+DE bits on the inserted QTAG are set to zero regardless of ingress QoS policy
- **Case 2:** SDP vc-type = Ethernet VLAN so there is a service delimiting tag stripped.
 - VLAN and Dot1p + DE bits on the inserted QTAG are preserved from the service delimiting tag.

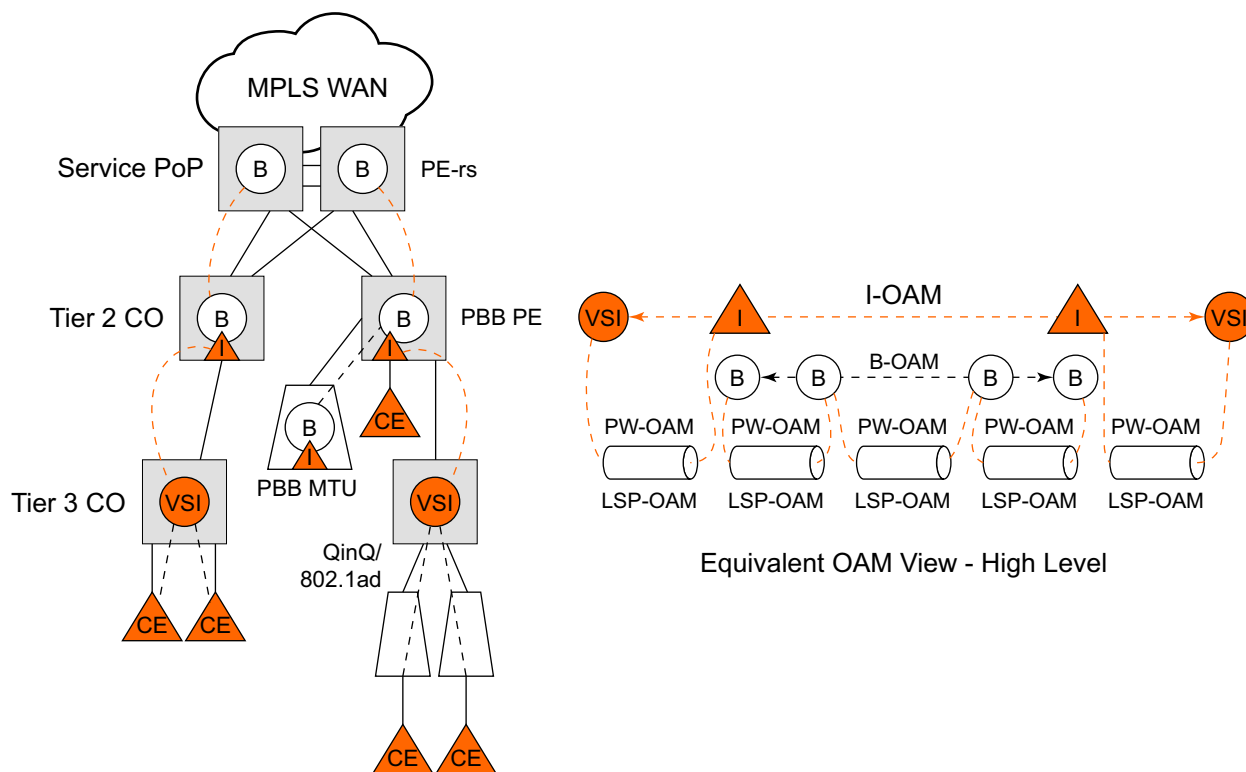
PBB packets are tunneled through the core the same way for native ETH/MPLS cases.

- **Egress PE, egress I-SAP case** with force-qtag-forwarding enabled under PBB Epipe or VPLS
 - The egress QoS policy (FC->dot1p+DE bits) is used to determine the QoS settings of the added QTAGs. If it required to preserve the ingress QoS, no egress policy should be added.
 - If QinQ SAP is used, at least qinq-mark-top-only option must be enabled to preserve the CTAG.
 - The “core QTAG” (core = received over the PBB core, 1st after CMAC addresses) is always removed after QoS information is extracted.
 - If no force-qtag-forwarding is used at egress PE, the inserted QTAG is maintained.
 - If egress SAP is on the ingress PE, then the dot1p+DE value is read directly from the procedures described in Ingress PE, ingress I-SAP and Ingress PE, ingress I-SDP/PW cases. The use cases below still apply.
 - **Case 1:** SAP type = null/dot1q default (2/2/2 or 2/2/2.*) so there is no service delimiting tag added on the egress side.
 - Dot1p+DE bits and the VLAN value contained in the QTAG are ignored.
 - **Case 2:** SAP type = dot1q/qinq default (3/1/1.300 or 3/1/1.300.*) so a service delimiting tag is added on egress
 - The FC->dot1p, DE bit entries in the SAP egress QoS policy are applied.
 - If there are no such entries, then the values of the dot1p+DE bits from the stripped QTAG are used.
 - **Case 3:** SAP type = qinq (3//1/1.300.30) so two service delimiting tags are added on egress
 - The FC->dot1p, DE bit entries in the SAP egress QoS policy are applied.
 - If the “qinq-mark-top-only” command under vpls>sap>egress is not enabled (default), the policy is applied to both service delimiting tags.
 - If the qinq-mark-top-only command is enabled, the policy is applied only to the outer service delimiting tag.
 - On the tags where the egress QoS policies do not apply the values of the dot1p+DE bits from the stripped QTAG are used.

- **Egress PE, egress I-SDP case** with force-qtag-forwarding enabled under PBB Epipe or IVPLS
 - **Case 1:** I-SDP vc-type = Ethernet VLAN so there is service delimiting tag added after PW encapsulation.
 - The dot1p+DE bits from the QTAG received over the PBB core side are copied to the QTAG added on the I-SDP.
 - The VLAN value in the QTAG might change to match the provisioned value for the I-SDP configuration.
 - **Case 2:** I-SDP vc-type = Ethernet (force-vlan-vc-forwarding=not supported for I-SDPs) so there is no service delimiting tag added on egress PW
 - The QTAG received over the PBB core is stripped and the QoS information is lost.

PBB OAM

Alcatel-Lucent's PBB implementation support both MPLS and native Ethernet tunneling. In the case of an MPLS, SDP bindings are used as the B-VPLS infrastructure while T-LDP is used for signaling. As a result, the existing VPLS, MPLS diagnostic tools are supported in both I-VPLS and B-VPLS domains as depicted in [Figure 121](#).



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Figure 121: PBB OAM View for MPLS Infrastructure

When an Ethernet switching backbone is used for aggregation between PBB PEs, a SAP is used as the B-VPLS uplink instead of an SDP. No T-LDP signalling is available.

The existing IEEE 802.1ag implemented for regular VPLS SAPs may be used to troubleshoot connectivity at I-VPLS and B-VPLS layers.

Mirroring

There are no restrictions for mirroring in I-VPLS or B-VPLS.

OAM Commands

All VPLS OAM commands may be used in both I-VPLS and B-VPLS instances.

I-VPLS

- The following OAM commands are meaningful only towards another I-VPLS service instance (spoke-SDP in I-VPLS):
 - LSP-ping, LSP-trace, SDP-ping, SDP-MTU
- The following I-VPLS OAM exchanges are transparently transported over the B-VPLS core:
 - SVC-ping, MAC-ping, MAC-trace, MAC-populate, MAC-purge, CPE-ping (towards customer CPE), 802.3ah EFM, SAA
- PBB uplinks using MPLS/SPP: there are no PBB specific OAM commands.

B-VPLS

- In case of Ethernet switching backbone (B-SAPs on B-VPLS), 802.1ag OAM is supported on B-SAP, operating on:
 - The customer level (C-SA/C-DA and C-type layer)
 - The tunnel level (B-SA/B-DA and B-type layer)
-

CFM Support

There is no special 802.1ag CFM (Connectivity Fault Management) support for PBB. B-component and I-components run their own maintenance domain and levels. CFM for I-components run transparently over the PBB network and will appear as directly connected.

Configuration Examples

Use the CLI syntax displayed to configure PBB.

PBB ELAN and ELINE

Use the following CLI syntax to bring up PBB B-VPLS - common to both ELAN and ELINE services:

CLI Syntax: config>service# vpls 200 customer 1 **b-vpls** create
description "This is a B-VPLS."
sap 3/1/3:33 create
description "B-VPLS SAP"
spoke-sdp 2:22 create
description "B-VPLS SDP"

Use the following CLI syntax to bring up PBB ELAN:

CLI Syntax: config>service# vpls 2000 customer 6 **i-vpls** create
description "This is an I-VPLS."
sap 4/1/3:20 create
description "I-VPLS SAP"
spoke-sdp 5:32 create
description "I-VPLS SDP"
backbone-vpls 200

Use the following CLI syntax to bring up PBB ELINE:

CLI Syntax: config>service# epipe 1000 customer 10 create
description "This is an Epipe."
sap 4/1/3:20 create
description "Epipe SAP"
pbb-tunnel 200 backbone-dest-mac 00-01-10-1E-C6-67 isid 752

PBB ELAN with MMRP - M:1 model

This section describes a configuration example for B-VPLS with MMRP:

CLI Syntax:

```
config>service# vpls 200 customer 1 b-vpls create
    description "This is a B-VPLS."
    mrp
        flood-time 3
        no shutdown
    sap 3/1/3:33 create
        description "B-VPLS SAP"
    spoke-sdp 2:22 create
        description "B-VPLS SDP"
```

PBB using G.8031 Protected Ethernet Tunnels

The following displays PBB configuration examples:

Ethernet links on BEB1:

BEB1 to BEB1 L1:

BEB1 to BCB1 L1: 1/1/1 – Member port of LAG-emulation ET1, terminate ET3

BEB1 to BCB1 L2: 2/1/1 – Member port of LAG-emulation ET1

BEB1 to BCB1 L3: 3/1/1 - Member port of LAG-emulation ET1

BEB1 to BCB2:4/1/1 – terminate ET3

```
*A:7750_ALU>config>eth-tunnel 1
    description "LAG-emulation to BCB1 ET1"
    protection-type loadsharing
    ethernet
        mac 00:11:11:11:11:12
        encaps-type dot1q
    exit
    ccm-hold-time down 5 up 10 // 50 ms down, 1 sec up
    lag-emulation
        access adapt-qos distribute
        path-threshold 1
    exit
    path 1
        member 1/1/1
        control-tag 0
        eth-cfm
        ...
    exit
    no shutdown
    exit
    path 2
        member 2/1/1
        control-tag 0
        eth-cfm
```

```

        ...
        exit
        no shutdown
    exit
    path 3
        member 3/1/1
        control-tag 0
        eth-cfm
        ...
        exit
        no shutdown
    exit
    no shutdown
-----
*A:7750_ALU>config>eth-tunnel 3
    description "G.8031 tunnel ET3"
    protection-type 8031_ltol
    ethernet
        mac 00:11:11:11:11:11
        encap-type dot1q
    exit
    ccm-hold-time down 5 // 50 ms down, no up hold-down
    path 1
        member 1/1/1
        control-tag 5
        precedence primary
        eth-cfm
            mep 2 domain 1 association 1
                ccm-enable
                control-mep
                no shutdown
            exit
        exit
        no shutdown
    exit
    path 2
        member 4/1/1
        control-tag 5
        eth-cfm
            mep 2 domain 1 association 2
                ccm-enable
                control-mep
                no shutdown
            exit
        exit
        no shutdown
    exit
    no shutdown
-----
# Service config
-----
*A:7750_ALU>config>service vpls 1 customer 1 m-vpls b-vpls create
    description "m-VPLS for multipoint traffic"
    stp
        mst-name "BVPLS"
        mode p-mstp
        mst-instance 10
            mst-priority 4096
            vlan-range 100-199

```

```

        exit
        mst-instance 20
            mst-priority 8192
            vlan-range 200-299
        exit
        no shutdown
    exit

    sap eth-tunnel-1 create // BSAP0 to BCB E
    sap 4/1/1:0 create // physical link to BCB F (NOTE 0 or 0.*)
                        // indicate untagged for m-VPLS)

    exit
    no shutdown
-----
# Service config: one of the same-fate SAP over
# loadsharing tunnel
-----
A:7750_ALU>config service vpls 100 customer 1 b-vpls create
    sap eth-tunnel-1:1 create //to BCB E
        // must specify tags for each path for loadsharing
        eth-tunnel
            path 1 tag 100
            path 2 tag 100
            path 3 tag 100
    exit
    no shutdown ...
    sap 3/1/1:200 // to BCBF
    ...

A:7750_ALU>config service vpls 1000 customer 1 i-vpls create
    pbb backbone-vpls 100 isid 1000
    sap 4/1/1:200 // access SAP to QinQ
    ...
-----
# Service config: one of epipes into b-VPLS protected tunnel
# as per R7.0 R4
-----
A:7750_ALU>config service service vpls 3 customer 1 b-vpls create
    sap eth-tunnel-3 create
    ...
service epipe 2000
    pbb-tunnel 100 backbone-dest-mac to-AS20 isid 2000
    sap 3/1/1:400 create

```

CLI Syntax:

```

port 1/1/1
    ethernet
        encap-type dot1q
port 2/2/2
    ethernet
        encap-type dot1q
config eth-tunnel 1
    path 1
        member 1/1/1
        control-tag 100

```

```
precedence primary
eth-cfm
  mep 51 domain 1 association 1 direction down
  ccm-enable
  low-priority-defect allDef
  mac-address 00:AE:AE:AE:AE:AE
  control-mep
  no shutdown
no shutdown
path 2
  member 2/2/2
  control-tag 200
  eth-cfm
    mep
      mep 52 domain 1 association 2 direction down
      ccm-enable
      low-priority-defect allDef
      mac-address 00:BE:BE:BE:BE:BE
      control-mep
      no shutdown
no shutdown

config service vpls 1 b-vpls
  sap eth-tunnel-1
config service epipe 1000
  pbb-tunnel 1 backbone-dest-mac remote-beb
  sap 3/1/1:400.10
```

PBB MAC Flush

This section describes a configuration example for PBB MAC Flush in an I-VPLS:

CLI Syntax: config>service# vpls 2000 customer 6 **i-vpls** create
description "This is an I-VPLS."
sap 4/1/3:20 create
description "I-VPLS SAP"
spoke-sdp 5:32 create
description "I-VPLS SDP"
backbone-vpls 200
send-bvpls-flush all-from-me

MC-LAG Multihoming for Native PBB

This section describes a configuration example for BEB C configuration given the following assumptions:

- BEB C and BEB D are MC-LAG peers
- B-VPLS 100 on BEB C and BEB D
- VPLS 1000 on BEB C and BEB D
- MC-LAG 1 on BEB C and BEB D

CLI Syntax:

```

service pbb
    source-bmac ab-ac-ad-ef-00-00
port 1/1/1
    ethernet
        encap-type qinq
lag 1
    port 1/1/1 priority 20
    lacp active administrative-key 32768
redundancy
    multi-chassis
        peer 1.1.1.3 create
            source-address 1.1.1.1
            mc-lag
                lag 1 lacp-key 1 system-id 00:00:00:01:01:01
                system-priority 100
                source-bmac-lsb use-lacp-key
service vpls 100 bvpls
    sap 2/2/2:100 // bvid 100
    mac-notification
    no shutdown

service vpls 101 bvpls
    sap 2/2/2:101 // bvid 101
    mac-notification
    no shutdown
// no per BVPLS source-bmac configuration, the chassis one (ab-ac-ad-ef-
00-00) is used

service vpls 1000 ivpls
    backbone-vpls 100
    sap lag-1:1000 //automatically associates the SAP with ab-ac-ad-
ef-00-01 (first 36 bits from BVPLS 100 sbmac+16bit source-bmac-
lsb)

service vpls 1001 ivpls
    backbone-vpls 101
    sap lag-1:1001 //automatically associates the SAP with ab-ac-ad-
ef-00-01(first 36 bits from BVPLS 101 sbmac+16bit source-bmac-lsb)

```

ETH-CFM Configuration on MTU1

This section describes the required configuration on MTU1 for the maintenance association between MEP 51 and MEP 56.

```
*A:alcmtu1-R6>config>eth-cfm# info
-----
      domain 1 name "ivpls" level 4
        association 1 format string name "ivpls"
          bridge-identifier 5000
            mhf-creation explicit
          exit
        ccm-interval 1
        remote-mepid 51
      exit
    exit
  -----
*A:alcag1-R6>config>eth-cfm#

*A:alcmtu1-R6# configure service vpls 5000
*A:alcmtu1-R6>config>service>vpls# info
-----
      send-flush-on-failure
      send-flush-on-failure-into-bvpls
      backbone-vpls 10000
      exit
      stp
        shutdown
      exit
      sap lag-5:5 create
        eth-cfm
          mep 56 domain 1 association 1 direction up
            ccm-enable
            low-priority-defect allDef
          mac-address 00:AF:AF:AF:AF:AF
            no shutdown
          exit
        exit
      exit
      no shutdown
  -----
```

ETH-CFM Configuration on AG1

This section describes the required configuration on AG1 for the maintenance association between MEP 51 and MEP 56.

```
*A:alcag1-R6>config>eth-cfm# info
-----
      domain 1 name "ivpls" level 4
        association 1 format string name "ivpls"
          bridge-identifier 5000
            mhf-creation explicit
          exit
        ccm-interval 1
        remote-mepid 56
      exit
    exit
  -----

*A:alcag1-R6>config>eth-cfm#

*A:alcag1-R6# configure service vpls 5000
*A:alcag1-R6>config>service>vpls# info
-----
      backbone-vpls 10000
      exit
      stp
        shutdown
      exit
      sap 1/2/9:5 create
        eth-cfm
          mep 51 domain 1 association 1 direction up
            ccm-enable
            low-priority-defect allDef
            mac-address 00:AE:AE:AE:AE:AE
            no shutdown
          exit
        exit
      exit
    no shutdown
  -----
```


PBB Command Reference

Command Hierarchies

- [Global Commands on page 825](#)
- [SAP Commands on page 826](#)
- [Mesh SDP Commands on page 827](#)
- [Spoke SDP Commands on page 827](#)
- [Show Commands on page 827](#)
- [Clear Commands on page 828](#)
- [Debug Commands on page 828](#)

Global Commands

```

config
  — service
    — [no] vpls service-id [customer customer-id] [vpn vpn-id] [m-vpls] [b-vpls|i-vpls] [create]
      — service-name service-name
      — no service-name
      — mrp
        — [no] attribute-table-high-wmark high-water-mark
        — [no] attribute-table-low-wmark low-water-mark
        — [no] attribute-table-size max-attributes
        — flood-time flood-time
        — no flood-time
        — [no] shutdown
      — mrp
        — [no] mrp-policy policy-name
          — description description-string
          — no description
          — scope {exclusive | template}
          — no scope
          — default-action {block | allow}
          — [no] entry entry-id
            — description description-string
            — no description
            — [no] match
              — [no] isid value | from value to higher-value
            — action {block | allow | end-station}
            — no action
        — copy mrp-policy source-name to dest-name
          — renum old-entry-id to new-entry-id

config
  — service
    — pbb

```

Command Hierarchies

```
— mac-name name ieee-address
— no mac-name
— source-bmac ieee-address
— no source-bmac

config
— service
— [no] vpls service-id [customer customer-id] [b-vpls] [create]
— pbb
— [no] force-qtag-forwarding
— source-bmac ieee-address
— no source-bmac
— [no] use-sap-bmac
— mac-notification
— [no] interval value
— [no] count value

config
— service
— [no] vpls service-id [customer customer-id] [i-vpls] [create]
— pbb
— backbone-vpls service-id [isis isid]
— no backbone-vpls
— igmp-snooping
— [no] mrouter-dest mac-name
— [no] sap sap-id
— igmp-snooping
— [no] mrouter-port
— [no] sdp sdp-id:vc-id
— igmp-snooping
— [no] mrouter-port
— [no] stp
— [no] force-qtag-forwarding
— [no] send-bvpls-flush {[all-from-me] | [all-but-mine]}

config
— service
— [no] epipe service-id [customer customer-id] [create] [vpn vpn-id] [vc-switching]
— no epipe service-id
— pbb
— [no] force-qtag-forwarding
— tunnel service-id backbone-dest-mac mac-name| ieee-address isid ISID
— no tunnel
```

SAP Commands

```
config
— service
— [no] vpls service-id [customer customer-id] [vpn vpn-id] [mvpls] [b-vpls|i-vpls] [create]
— sap sap-id [split-horizon-group group-name] [create] [capture-sap]
— no sap sap-id
— mrp
— [no] join-time value
```

- [no] **leave-all-time** *value*
- [no] **leave-time** *value*
- [no] **mrp-policy** *policy-name*
- [no] **periodic-time** *value*
- [no] **periodic-timer**

Mesh SDP Commands

- ```

config
 — service
 — [no] vpls service-id [customer customer-id] [vpn vpn-id] [mvpls] [b-vpls|i-vpls] [create]
 — mesh-sdp sdp-id[:vc-id] [vc-type {ether | vlan}]
 — no mesh-sdp sdp-id[:vc-id]
 — mrp
 — [no] join-time value
 — [no] leave-all-time value
 — [no] leave-time value
 — [no] mrp-policy policy-name
 — [no] periodic-time value
 — [no] periodic-timer

```

## Spoke SDP Commands

- ```

config
  — service
    — [no] vpls service-id [customer customer-id] [vpn vpn-id] [mvpls] [b-vpls|i-vpls] [create]
      — spoke-sdp sdp-id[:vc-id] [vc-type {ether | vlan}] [split-horizon-group group-name]
      — no spoke-sdp sdp-id[:vc-id]
        — mrp
          — [no] join-time value
          — [no] leave-all-time value
          — [no] leave-time value
          — [no] mrp-policy policy-name
          — [no] periodic-time value
          — [no] periodic-timer

```

Show Commands

- ```

show
 — eth-cfm
 — association [ma-index] [detail]
 — cfm-stack-table [port port-id [vlan vlan-id]] | sdp sdp-id[:vc-id] [level 0..7] [direction up|down]
 — domain [md-index] [association ma-index | all-associations] [detail]
 — mep mep-id domain md-index association ma-index [loopback] [linktrace]
 — service
 — id service-id
 — i-vpls
 — mrp-policy mac [ieee-address]
 — mrp
 — mrp-policy [mrp-policy]

```

## Command Hierarchies

- **mrp-policy** *mrp-policy* [**association**]
- **mrp-policy** *mrp-policy* [**entry** *entry-id*]
- **pbb**
  - **base**
  - **mac-name** [**detail**]

## Clear Commands

- clear**
  - **service**
    - **statistics**
      - **id** *service-id*
        - **counters**
        - **mesh-sdp** *sdp-id[:vc-id]* {**all** | **counters** | **stp** | **mrp**}
        - **mrp**
        - **spoke-sdp** *sdp-id[:vc-id]* {**all** | **counters** | **stp** | **mrp**}
        - **stp**
      - **sap** *sap-id* {**all** | **counters** | **stp** | **l2pt** | **mrp**}

## Debug Commands

- debug**
  - **service**
    - **id** *service-id*
      - [**no**] **mrp**
        - **all-events**
        - [**no**] **applicant-sm**
        - [**no**] **leave-all-sm**
        - [**no**] **mmrp-mac** *ieee-address*
        - [**no**] **mrpdu**
        - [**no**] **periodic-sm**
        - [**no**] **registrant-sm**
        - [**no**] **sap** *sap-id*
        - [**no**] **sdp** *sdp-id:vc-id*



# PBB Service Commands

## VPLS Service Commands

### vpls

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vpls</b> <i>service-id</i> <b>customer</b> <i>customer-id</i> <b>vpn</b> <i>vpn-id</i> [ <b>m-vpls</b> ] [ <b>bvpls</b>   <b>i-vpls</b> ] [ <b>create</b> ]<br><b>vpls</b> <i>service-id</i><br><b>no vpls</b> <i>service-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command creates or edits a Virtual Private LAN Services (VPLS) instance. The <b>vpls</b> command is used to create or maintain a VPLS service. If the <i>service-id</i> does not exist, a context for the service is created. If the <i>service-id</i> exists, the context for editing the service is entered.</p> <p>A VPLS service connects multiple customer sites together acting like a zero-hop, layer 2 switched domain. A VPLS is always a logical full mesh.</p> <p>When a service is created, the <b>create</b> keyword must be specified if the <b>create</b> command is enabled in the <b>environment</b> context. When a service is created, the <b>customer</b> keyword and <i>customer-id</i> must be specified and associates the service with a customer. The <i>customer-id</i> must already exist having been created using the <b>customer</b> command in the service context. Once a service has been created with a customer association, it is not possible to edit the customer association. The service must be deleted and recreated with a new customer association.</p> <p>Once a service is created, the use of the <b>customer</b> <i>customer-id</i> is optional for navigating into the service configuration context. Attempting to edit a service with the incorrect <i>customer-id</i> specified will result in an error.</p> <p>More than one VPLS service may be created for a single customer ID.</p> <p>By default, no VPLS instances exist until they are explicitly created.</p> <p>The <b>no</b> form of this command deletes the VPLS service instance with the specified <i>service-id</i>. The service cannot be deleted until all SAPs and SDPs defined within the service ID have been shutdown and deleted, and the service has been shutdown.</p> <p><i>service-id</i> — The unique service identification number identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The <i>service-id</i> must be the same number used for every 7750 SR on which this service is defined.</p> <p><b>Values</b>      1 — 2147483648</p> <p><b>customer</b> <i>customer-id</i> — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting.</p> <p><b>Values</b>      1 — 2147483647</p> <p><b>vpn</b> <i>vpn-id</i> — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN identification number.</p> |

**Values** 1 — 2147483647

**Default** null (0)

**m-vpls** — Specifies a management VPLS.

**b-vpls** | **i-vpls** — Creates a backbone-vpls or ISID-vpls for use with PBB

## service-name

**Syntax** **service-name** *service-name*  
**no service-name**

**Context** config>service>vpls *service-id*

**Description** This command configures an optional service name, up to 64 characters in length, which adds a name identifier to a given service to then use that service name in configuration references as well as display and use service names in show commands throughout the system. This helps the service provider/administrator to identify and manage services within the 7750 SR, 7450 ESS and 7710 SR platforms.

All services are required to assign a service ID to initially create a service. However, either the service ID or the service name can be used to identify and reference a given service once it is initially created.

**Parameters** *service-name* — Specifies a unique service name to identify the service. Service names may not begin with an integer (0-9).

## eth-tunnel

**Syntax** **eth-tunnel** *tunnel-id*

**Context** config>service>vpls

**Description** This command associates a BVPLS SAP with the global Ethernet tunnel object specified by *tunnel-id*. Only one-to-one mapping between SAP and Ethernet tunnel is supported in the initial implementation. The global eth-tunnel *tunnel-id* with at least a member port must be configured in advance for the command to be successful. A SAP will be instantiated using the active path components (member port and control-tag) for VPLS forwarding. The last member port in the Ethernet Tunnel cannot be deleted if there is a SAP configured on that eth-tunnel. This command is only available in the BVPLS context.

The **no** form of this command removes the sap from the Ethernet tunnel object.

**Default** no sap is specified

**Parameters** *tunnel-id* — Specifies the value of the Ethernet tunnel identifier to be used for the SAP.

**Values** 1-64

## mrp

|                    |                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mrp</b>                                                                                                      |
| <b>Context</b>     | config>service>vpls<br>config>service>vpls>mesh-sdp<br>config>service>vpls>sap<br>config>service>vpls>spoke-sdp |
| <b>Description</b> | This command configures Multiple Registration Protocol (MRP) parameters. MRP is valid only under B-VPLS.        |

## attribute-table-size

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] attribute-table-size</b> <i>value</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vpls>mrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command controls the number of attributes accepted on a per B-VPLS basis. When the limit is reached, no new attributes will be registered.<br><br>If a new lower limit (smaller than the current number of attributes) from a local or dynamic I-VPLS is being provisioned, a CLI warning will be issued stating that the system is currently beyond the new limit. The value will be accepted, but any creation of new attributes will be blocked under the attribute count drops below the new limit; the software will then start enforcing the new limit. |
| <b>Default</b>     | maximum number of attributes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>value</i> — [1-2048] for ESS-6/7/12 or SR-7/SR-12<br>[1-1023] for ESS1/SR1/7710                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## attribute-table-high-wmark

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] attribute-table-high-wmark</b> <i>high-water-mark</i>                                                  |
| <b>Context</b>     | config>service>vpls>mrp                                                                                        |
| <b>Description</b> | This command specifies the percentage filling level of the MMRP attribute table where logs and traps are sent. |
| <b>Default</b>     | 95%                                                                                                            |
| <b>Parameters</b>  | <i>high-water-mark</i> — 1%-100%                                                                               |

## attribute-table-low-wmark

|                |                                                             |
|----------------|-------------------------------------------------------------|
| <b>Syntax</b>  | <b>[no] attribute-table-low-wmark</b> <i>low-water-mark</i> |
| <b>Context</b> | config>service>vpls>mrp                                     |

|                    |                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command specifies the MMRP attribute table low watermark as a percentage. When the percentage filling level of the MMRP attribute table drops below the configured value, the corresponding trap is cleared and/or a log entry is added. |
| <b>Default</b>     | 90%                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>low-water-mark</i> — 1%-100%                                                                                                                                                                                                               |

## flood-time

|                    |                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>flood-time</b> <i>flood-time</i><br><b>no flood-time</b>                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vpls>mrp                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command configures the amount of time, in seconds, after a status change in the VPLS service during which traffic is flooded. Once that time expires, traffic will be delivered according to the MMRP registrations that exist in the VPLS. When “no flood-time” is executed, flooding behavior is disabled. |
| <b>Default</b>     | no flood-time                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>flood-time</i> — Specifies the MRP flood time, in seconds.<br><b>Values</b> 3 — 600                                                                                                                                                                                                                            |

## join-time

|                    |                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] join-time</b> <i>value</i>                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vpls>sap>mrp<br>config>service>vpls>spoke-sdp>mrp<br>config>service>vpls>mesh-sdp>mrp                                                                                                                                                                                    |
| <b>Description</b> | This command controls the interval between transmit opportunities that are applied to the Applicant state machine. An instance of this Join Period Timer is required on a per-Port, per-MRP Participant basis. For additional information, refer to IEEE 802.1ak-2007 section 10.7.4.1. |
| <b>Default</b>     | 2                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>value</i> — [1-10] tenths of a second                                                                                                                                                                                                                                                |

## leave-time

|                |                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>[no] leave-time</b> <i>value</i>                                                                  |
| <b>Context</b> | config>service>vpls>sap>mrp<br>config>service>vpls>spoke-sdp>mrp<br>config>service>vpls>mesh-sdp>mrp |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | <p>This command controls the period of time that the Registrar state machine will wait in the leave state before transitioning to the MT state when it is removed. An instance of the timer is required for each state machine that is in the leave state. The Leave Period Timer is set to the value leave-time when it is started.</p> <p>A registration is normally in “in” state where there is an MFIB entry and traffic is being forwarded. When a “leave all” is performed (periodically around every 10-15 seconds per SAP/SDP binding - see leave-all-time-below), a node sends a message to its peer indicating a leave all is occurring and puts all of its registrations in leave state.</p> <p>The peer refreshes its registrations based on the leave all PDU it receives and sends a PDU back to the originating node with the state of all its declarations.</p> <p>Refer to IEEE 802.1ak-2007 section 10.7.4.2.</p> |
| <b>Default</b>     | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>value</i> — [30-60] tenths of a second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## leave-all-time

|                    |                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] leave-all-time <i>value</i></b>                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vpls>sap>mrp<br>config>service>vpls>spoke-sdp>mrp<br>config>service>vpls>mesh-sdp>mrp                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command controls the frequency with which the LeaveAll state machine generates LeaveAll PDUs. The timer is required on a per-Port, per-MRP Participant basis. The Leave All Period Timer is set to a random value, T, in the range <math>\text{LeaveAllTime} &lt; T &lt; 1.5 * \text{leave-all-time}</math> when it is started. Refer to IEEE 802.1ak-2007 section 10.7.4.3.</p> |
| <b>Default</b>     | 100                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>value</i> — [60-300] tenths of a second                                                                                                                                                                                                                                                                                                                                               |

## periodic-time

|                    |                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] periodic-time <i>value</i></b>                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vpls>sap>mrp<br>config>service>vpls>spoke-sdp>mrp<br>config>service>vpls>mesh-sdp>mrp                                                                                                                                                                           |
| <b>Description</b> | <p>This command controls the frequency the PeriodicTransmission state machine generates periodic events if the Periodic Transmission Timer is enabled. The timer is required on a per-Port basis. The Periodic Transmitting Timer is set to one second when it is started.</p> |
| <b>Default</b>     | 10                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <i>value</i> — [10-100] tenths of a second                                                                                                                                                                                                                                     |

## periodic-timer

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] periodic-timer</b>                                                                           |
| <b>Context</b>     | config>service>vpls>sap>mrp<br>config>service>vpls>spoke-sdp>mrp<br>config>service>vpls>mesh-sdp>mrp |
| <b>Description</b> | This command enables or disables the Periodic Transmission Timer.                                    |
| <b>Default</b>     | disabled                                                                                             |

## send-flush-on-failure

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] send-flush-on-failure</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vpls                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command enables sending out “flush-all-from-ME” messages to all LDP peers included in affected VPLS, in the event of physical port failures or “oper-down” events of individual SAPs. This feature provides an LDP-based mechanism for recovering a physical link failure in a dual-homed connection to a VPLS service. This method provides an alternative to RSTP solutions where dual homing redundancy and recovery, in the case of link failure, is resolved by RSTP running between a PE router and CE devices. If the endpoint is configured within the VPLS and send-flush-on-failure is enabled, flush-all-from-me messages will be sent out only when all spoke SDPs associated with the endpoint go down.</p> <p>This feature cannot be enabled on management VPLS.</p> |
| <b>Default</b>     | no send-flush-on-failure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## pbb

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>Syntax</b>      | <b>pbb</b>                                                   |
| <b>Context</b>     | config>service<br>config>service>vpl<br>config>service>epipe |
| <b>Description</b> | This command configures global PBB parameters.               |

## mac-name

|                |                                                                                   |
|----------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>mac-name</b> <i>name</i> <i>ieee-address</i><br><b>no mac-name</b> <i>name</i> |
| <b>Context</b> | config>service>pbb                                                                |

|                    |                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command configures the MAC name for the MAC address. It associates an ASCII name with an IEEE MAC to improve the PBB Epipe configuration. It can also change the dest-BMAC in one place instead of 1000s of Epipe.                |
| <b>Parameters</b>  | <p><i>name</i> — Specifies the MAC name up to 32 characters in length.</p> <p><i>ieee-address</i> — The MAC address assigned to the MAC name. The value should be input in either a xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx format.</p> |

## source-bmac

|                    |                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>source-bmac</b> <i>ieee-address</i><br><b>no source-bmac</b>                                                                                  |
| <b>Context</b>     | config>service>pbb                                                                                                                               |
| <b>Description</b> | This command configures the source B-VPLS MAC address to use with PBB and provisions a chassis level source BMAC.                                |
| <b>Parameters</b>  | <i>ieee-address</i> — The MAC address assigned to the BMAC. The value should be input in either a xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx format. |

## force-qtag-forwarding

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] force-qtag-forwarding</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vpls ivpls>pbb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command forces the addition of a IEEE 802.1q tag after the Customer MAC (CMAC) address when the PBB header is built as it egresses a related BVPLS. It is used to preserve the dot1q and DE bits from the customer domain when the service delimiting qtags are stripped as the packet is ingressing a PBB Epipe or an IVPLS. The VLAN value of the service delimiting QTAG, if one exists, is used for the corresponding inserted dot1q field. If a service delimiting QTAG does not exist, then the value of zero is used for all the inserted QTAG bits. The no form of this command sets default behavior.</p> <p>The <b>no</b> form of this command disables the command.</p> |

## source-bmac

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>source-bmac</b> <i>ieee-address</i>                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vpls bvpls>pbb                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command configures the base source BMAC for the B-VPLS. The first 32 bits must be the same with what is configured in the MC-LAG peer. If not configured here, it will inherit the chassis level BMAC configured under the new PBB object added in the previous section. If the <b>use-sap-bmac</b> command is on, the value of the last 16 bits (lsb) of the source BMAC must be part of the <b>reserved-</b> |

**source-bmac-lsb** configured at chassis level, under service PBB component. If that is not the case, the command will fail.

## use-sap-bmac

|                    |                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] use-sap-bmac</b>                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vpls bvpls>pbb                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command enables on a per BVPLS basis the use of source BMACs allocated to multi-homed SAPs (assigned to an MC-LAG) in the related IVPLS or Epipe service. The command will fail if the value of the source-bmac assigned to the BVPLS is the hardware (chassis) BMAC. In other words, the <b>source-bmac</b> must be a configured one. |
| <b>Default</b>     | no use-sap-bmac                                                                                                                                                                                                                                                                                                                             |

## mac-notification

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac-notification</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vpls bvpls                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command controls the settings for the MAC notification message.</p> <p>The mac-notification message must be generated under the following events:</p> <ol style="list-style-type: none"><li>1. When enabled in the BVPLS using no shutdown, a MAC notification will be sent for every active MC-LAG link. The following 3 cases assume no shutdown in the BVPLS.</li><li>2. Whenever a related MC-LAG link becomes active (related MC-LAG link = has at least 1 SAP associated with the BVPLS) if the MC-LAG peering is initialized and the PE peers are synchronized.</li><li>3. 1st SAP on an active MC-LAG is associated (via IVPLS/Epipe) with the BVPLS</li><li>4. The link between IVPLS/Epipe and BVPLS is configured and there are I-SAPs configured on an active MC-LAG link.</li></ol> <p>The MAC notification is not sent for the following events:</p> <ol style="list-style-type: none"><li>1. Change of source-bmac or source-bmac-lsb</li><li>2. On changes of use-sap-bmac parameter</li><li>3. If MC-LAG peering is not (initialized and in sync).</li></ol> |

## interval

|                    |                                                                              |
|--------------------|------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] interval <i>value</i></b>                                            |
| <b>Context</b>     | config>service>vpls bvpls>mac-notification                                   |
| <b>Description</b> | This command controls the frequency of subsequent MAC notification messages. |



|                   |                                                                                                       |
|-------------------|-------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | Inherits the chassis level configuration from config>service>mac-notification                         |
| <b>Parameters</b> | <i>value</i> — Specifies the frequency of subsequent MAC notification messages.                       |
| <b>Values</b>     | 100 ms – 10 sec, in increments of 100 ms up to 1 sec and then in increments of 1 second up to 10 sec. |

## count

|                    |                                                                                     |
|--------------------|-------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] count</b> <i>value</i>                                                      |
| <b>Context</b>     | config>service>vpls bvpls>mac-notification                                          |
| <b>Description</b> | This command configures how often MAC notification messages are sent.               |
| <b>Parameters</b>  | <i>value</i> — Specifies, in seconds, how often MAC notification messages are sent. |
| <b>Values</b>      | 1-10                                                                                |
| <b>Default</b>     | Inherits the chassis level configuration from config>service>mac-notification       |

## shutdown

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] shutdown</b>                                                               |
| <b>Context</b>     | config>service>vpls bvpls                                                          |
| <b>Description</b> | This command disables the sending of the notification message in the BVPLS domain. |
| <b>Default</b>     | shutdown                                                                           |

## backbone-vpls

|                    |                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>backbone-vpls</b> <i>service-id</i> [ <b>isid</b> <i>isid</i> ]<br><b>no backbone-vpls</b> |
| <b>Context</b>     | config>service>vpls>pbb                                                                       |
| <b>Description</b> | This command configures B-VPLS service associated with the I-VPLS.                            |
| <b>Parameters</b>  | <i>service-id</i> — Specifies the service ID.                                                 |
| <b>Values</b>      | 1..2147483648                                                                                 |
|                    | <i>isid</i> — Specifies the ISID.                                                             |
| <b>Values</b>      | 0..16777215                                                                                   |

## igmp-snooping

|                    |                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>igmp-snooping</b>                                                                                                            |
| <b>Context</b>     | config>service>vpls>pbb>backbone-vpls<br>config>service>vpls>pbb>backbone-vpls>sap<br>config>service>vpls>pbb>backbone-vpls>sdp |
| <b>Description</b> | This command configures IGMP snooping attributes for I-VPLS.                                                                    |

## mrouter-dest

|                    |                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mrouter-dest</b> <i>mac-name</i>                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vpls>pbb>backbone-vpls                                                                                                                                                                                                                                               |
| <b>Description</b> | This command configures the destination BMAC address name to be used in the related backbone VPLS to reach a specific IGMP snooping MRouter. The name is associated at system level with the MAC address using the command “config>service>pbb>mac-name <i>name ieee-address</i> ”. |
| <b>Parameters</b>  | <i>mac-name</i> — Specifies the MAC name.                                                                                                                                                                                                                                           |
| <b>Values</b>      | 32 chars max                                                                                                                                                                                                                                                                        |

## sap

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap</b> <i>sap-id</i>                                      |
| <b>Context</b>     | config>service>vpls>pbb>backbone-vpls                              |
| <b>Description</b> | This command configures attributes of a SAP on the B-VPLS service. |

## mrouter-port

|                    |                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mrouter-port</b>                                                                                           |
| <b>Context</b>     | config>service>vpls>pbb>backbone-vpls>sap>igmp-snooping<br>config>service>vpls>pbb>backbone-vpls>sdp>igmp-snooping |
| <b>Description</b> | This command defines the higher level object under which is configured (SAP or SDP-binding) as an mrouter port.    |
| <b>Parameters</b>  | <i>mac-name</i> — Specifies the MAC name.                                                                          |
| <b>Values</b>      | 32 chars max                                                                                                       |

## sdp

|                |                                       |
|----------------|---------------------------------------|
| <b>Syntax</b>  | <b>[no] sdp</b> <i>sdp-id:vc-id</i>   |
| <b>Context</b> | config>service>vpls>pbb>backbone-vpls |

|                    |                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command configures attributes of a SDP binding on the B-VPLS service.                                                            |
| <b>Parameters</b>  | <i>sdp-id</i> — Specifies the SDP ID.<br><b>Values</b> 1..17407<br><i>vc-id</i> — Specifies the VC ID.<br><b>Values</b> 1..4294967295 |

## stp

|                    |                                                             |
|--------------------|-------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] stp</b>                                             |
| <b>Context</b>     | config>service>Vpls>pbb>backbone-vpls                       |
| <b>Description</b> | This command enables or disable STP through B-VPLS service. |

## force-qtag-forwarding

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] force-qtag-forwarding</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vpls ivpls>pbb<br>config>service>epipe>pbb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command forces the addition of a IEEE 802.1q tag after the Customer MAC (CMAC) addresses when the PBB header is built, as it egresses a related BVPLS.<br><br>It is used to preserve the dot1q and DE bits from the customer domain when the service delimiting qtags are stripped when the packet is ingressing a PBB Epipe or an IVPLS. The VLAN value of the service delimiting QTAG if one exists is used for the corresponding inserted dot1q field. If a service delimiting QTAG does not exist, then the value of zero is used for all the inserted QTAG bits.<br><br>The <b>no</b> form of this command sets default behavior. |
| <b>Default</b>     | disabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## mrp-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mrp-policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vpls>sap>mrp<br>config>service>vpls>spoke-sdp>mrp<br>config>service>vpls>mesh-sdp>mrp                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command instructs MMRP to use the mrp-policy defined in the command to control which group BMAC attributes will be declares and registered on the egress SAP/Mesh-SDP/Spoke-SDP. The Group BMACs will be derived from the ISIDs using the procedure used in the PBB solution. The Group MAC = standard OUI with the last 24 bits being the ISID value. If the policy-name refers to a non-existing mrp-policy the command should return error. Changes to a mrp-policy are allowed and applied to the SAP/SDPs under which the policy is referenced. |

**Default** no mrp-policy

## send-bvpls-flush

**Syntax** [no] send-bvpls-flush {[all-from-me] | [all-but-mine]}

**Context** config>service>vpls

**Description** This command configures the BVPLS flush. If B-SDPs are used and MAC notification mechanism is turned on in the related BVPLS (MPLS use case), it makes sense to turn off the T-LDP MAC Flush.

## mac-notification

**Syntax** mac-notification

**Context** config>service>pbb

**Description** This command controls the settings for the MAC notification messages.

## interval

**Syntax** [no] interval *value*

**Context** config>service>pbb>mac-notification

**Description** This command controls the frequency of subsequent MAC notification messages.

**Default** 100 ms

**Parameters** *value* — Specifies the frequency of subsequent MAC notification messages.

**Values** 100 ms – 10 sec, in increments of 100 ms up to 1 sec and then in increments of 1 second up to 10 sec.

## count

**Syntax** [no] count *value*

**Context** config>service>pbb>mac-notification

**Description** This command configures how often MAC notification messages are sent.

**Parameters** *value* — Specifies, in seconds, how often MAC notification messages are sent.

**Values** 1-10

**Default** 3

## epipe

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>epipe</b> <i>service-id</i> <b>customer</b> <i>customer-id</i> [ <b>vpn</b> <i>vpn-id</i> ] [ <b>vc-switching</b> ] [ <b>create</b> ]<br><b>epipe</b> <i>service-id</i><br><b>no epipe</b> <i>service-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures an Epipe service instance. This command is used to configure a point-to-point epipe service. An Epipe connects two endpoints defined as Service Access Points (SAPs). Both SAPs may be defined in one 7750 SR or they may be defined in separate 7750 SR devices connected over the service provider network. When the endpoint SAPs are separated by the service provider network, the far end SAP is generalized into a Service Distribution Point (SDP). This SDP describes a destination 7750 SR and the encapsulation method used to reach it.</p> <p>No MAC learning or filtering is provided on an Epipe.</p> <p>When a service is created, the <b>customer</b> keyword and <i>customer-id</i> must be specified and associates the service with a customer. The <i>customer-id</i> must already exist having been created using the <b>customer</b> command in the service context. Once a service has been created with a customer association, it is not possible to edit the customer association. The service must be deleted and recreated with a new customer association.</p> <p>Once a service is created, the use of the <b>customer</b> <i>customer-id</i> is optional for navigating into the service configuration context. Attempting to edit a service with the incorrect <i>customer-id</i> specified will result in an error.</p> <p>By default, no epipe services exist until they are explicitly created with this command.</p> <p>The <b>no</b> form of this command deletes the epipe service instance with the specified <i>service-id</i>. The service cannot be deleted until the service has been shutdown.</p> <p><i>service-id</i> — The unique service identification number identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The <i>service-id</i> must be the same number used for every 7750 SR on which this service is defined.</p> <p><b>Values</b>      1 — 2147483648</p> <p><b>customer</b> <i>customer-id</i> — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting.</p> <p><b>Values</b>      1 — 2147483647</p> <p><b>vpn</b> <i>vpn-id</i> — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN ID. If this parameter is not specified, the VPN ID uses the same service ID number.</p> <p><b>Values</b>      1 — 2147483647</p> <p><b>Default</b>      null (0)</p> <p><b>vc-switching</b> — Specifies if the pseudowire switching signalling is used for the spoke SDPs configured in this service.</p> |

**create** — Keyword used to create the service instance. The **create** keyword requirement can be enabled/disabled in the **environment>create** context.

## tunnel

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tunnel</b> <i>service-id</i> <b>backbone-dest-mac</b> { <i>mac-name</i>   <i>ieee-mac</i> } <b>isid</b> <i>ISID</i><br><b>no tunnel</b>                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>epipe>pbb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command configures a Provider Backbone Bridging (PBB) tunnel with Backbone VPLS (B-VPLS) service information.                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>service-id</i> — Specifies the B-VPLS service for the PBB tunnel associated with this service.<br><b>Values</b> 1 — 2147483648<br><b>backbone-dest-mac</b> { <i>mac-name</i>   <i>ieee-mac</i> } — Specifies the backbone destination MAC-address for PBB packets.<br><b>isid</b> <i>ISID</i> — Specifies a 24 bit service instance identifier for the PBB tunnel associated with this service. As part of the PBB frames, it is used at the destination PE as a demultiplexor field.<br><b>Values</b> 0 — 16777215 |

## PBB Show Commands

### eth-cfm

|                    |                                                |
|--------------------|------------------------------------------------|
| <b>Syntax</b>      | <b>eth-cfm</b>                                 |
| <b>Context</b>     | show                                           |
| <b>Description</b> | This command displays 802.1ag CFM information. |

### association

|                    |                                                          |
|--------------------|----------------------------------------------------------|
| <b>Syntax</b>      | <b>association</b> [ <i>ma-index</i> ] [ <b>detail</b> ] |
| <b>Context</b>     | show>eth-cfm                                             |
| <b>Description</b> | Shows association information.                           |
| <b>Parameters</b>  | <i>ma-index</i> — Specifies the MA index value.          |

**Values** 1 — 4294967295

**detail** — Displays all association detail.

**Output**

```
*A:alcag1-R6# show eth-cfm association
=====
CFM Association Table
=====
Md-index Ma-index Name CCM-interval Bridge-id

1 1 ivpls 1 5000
=====
*A:alcag1-R6#
```

cfm-stack-table

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                         |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------|-------------------------|--|--------|--------|--|-----|---------|--|----|---------|--------|-----------|--------|----------|--------|-------|--------|----------------|
| Syntax      | <b>cfm-stack-table</b><br><b>cfm-stack-table port</b> [ <i>port-id</i> > [ <b>vlan</b> <i>vlan-id</i> ]] [ <b>level</b> 0..7] [ <b>direction up   down</b> ]<br><b>cfm-stack-table sdp</b> [ <i>sdp-id[:vc-id]</i> >] [ <b>level</b> 0..7] [ <b>direction up   down</b> ]<br><b>cfm-stack-table virtual</b> [ <i>service-id</i> ] [ <b>level</b> 0..7]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                         |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
| Context     | show>eth-cfm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                         |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
| Description | Summarizes all MEPs/MIPs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                         |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
| Parameters  | <p><i>port-id</i> — Displays information about the specified port.</p> <table><tr><td>Values</td><td>port-id</td><td>slot/mda/port[.channel]</td></tr><tr><td></td><td>lag-id</td><td>lag-id</td></tr><tr><td></td><td>lag</td><td>keyword</td></tr><tr><td></td><td>id</td><td>1 — 200</td></tr></table> <p><i>sdp-id[:vc-id]</i> — Specifies an existing SDP and VC ID.</p> <table><tr><td>Values</td><td>1 — 17407</td></tr></table> <p><i>vlan-id</i> — Specifies te VLAN ID.</p> <table><tr><td>Values</td><td>0 — 4094</td></tr></table> <p><i>level</i> — Specifies the level.</p> <table><tr><td>Values</td><td>0 — 7</td></tr></table> <p><b>direction up   down</b> — Indicates the direction in which the maintenance association (MEP or MIP) faces on the bridge port.</p> <p>down — Displays continuity check information configured away from the MAC relay entity.</p> <p>up — Displays continuity check information configured toward the MAC relay entity.</p> <p><i>service-id</i> — Specifies information about the specified service ID.</p> <table><tr><td>Values</td><td>1 — 2147483648</td></tr></table> | Values                  | port-id | slot/mda/port[.channel] |  | lag-id | lag-id |  | lag | keyword |  | id | 1 — 200 | Values | 1 — 17407 | Values | 0 — 4094 | Values | 0 — 7 | Values | 1 — 2147483648 |
| Values      | port-id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | slot/mda/port[.channel] |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
|             | lag-id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | lag-id                  |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
|             | lag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | keyword                 |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
|             | id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 — 200                 |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
| Values      | 1 — 17407                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                         |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
| Values      | 0 — 4094                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                         |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
| Values      | 0 — 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |
| Values      | 1 — 2147483648                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                         |         |                         |  |        |        |  |     |         |  |    |         |        |           |        |          |        |       |        |                |

Sample Output

```
*A:alcag1-R6# show eth-cfm cfm-stack-table
=====
CFM SAP Stack Table
=====
Sap Level Dir Md-index Ma-index Mep-id Mac-address

1/2/9:5 4 Up 1 1 51 00:ae:ae:ae:ae:ae
=====
CFM SDP Stack Table
=====
Sdp Level Dir Md-index Ma-index Mep-id Mac-address

No Matching Entries
=====
*A:alcag1-R6#
```



## domain

|                    |                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>domain</b> [ <i>md-index</i> ] [ <b>association</b> <i>ma-index</i>   <b>all-associations</b> [ <b>detail</b> ]]                                                                                                                                                                                                                                  |
| <b>Context</b>     | show>eth-cfm>domain                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command displays domain information.                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><i>md-index</i> — Specifies the maintenance domain (MD) index value.</p> <p><b>Values</b> 1 — 4294967295</p> <p><i>ma-index</i> — Specifies the MA index value.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>all-associations</b> — Displays information all maintenance associations.</p> <p><b>detail</b> — Displays detailed information.</p> |

**Sample Output**

```
*A:alcag1-R6# show eth-cfm domain
=====
CFM Domain Table
=====
Md-index Level Name Format

1 4 ivpls charString
=====
*A:alcag1-R6#

*A:alcag1-R6# show eth-cfm mep 51 domain 1 association 1

Mep Information

Md-index : 1 Direction : Up
Ma-index : 1 Admin : Enabled
MepId : 51 CCM-Enable : Enabled
IfIndex : 38043648 PrimaryVid : 5
FngState : fngReset
LowestDefectPri : allDef HighestDefect : none
Defect Flags : None
Mac Address : 00:ae:ae:ae:ae:ae CcmLtmPriority : 7
CcmTx : 775 CcmSequenceErr : 0
CcmLastFailure Frame:
None
XconCcmFailure Frame:
None
*A:alcag1-R6#
```

## mep

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mep</b> <i>mep-id</i> <b>domain</b> <i>md-index</i> <b>association</b> <i>ma-index</i> [ <b>loopback</b> ] [ <b>linktrace</b> ]                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | show>eth-cfm>domain                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays Maintenance Endpoint (MEP) information.                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>mep-id</i> — Specifies the maintenance association end point identifier.<br><b>Values</b> 1 — 8191<br><i>md-index</i> — Specifies the maintenance domain (MD) index value.<br><b>Values</b> 1 — 4294967295<br><i>ma-index</i> — Specifies the MA index value.<br><b>Values</b> 1 — 4294967295<br><b>loopback</b> — Displays loopback information for the specified MEP.<br><b>linktrace</b> — Displays linktrace information for specified MEP. |

## Sample Output

```
*A:alcag1-R6# oam eth-cfm loopback 00:af:af:af:af:af mep 51 domain 1 association 1
eth-cfm Loopback Test Initiated: Mac-Address: 00:af:af:af:af:af, out sap: 1/2/9:5
Sent 1 packets, received 1 packets [0 out-of-order, 0 Bad Msdu] -- OK
*A:alcag1-R6#

*A:alcag1-R6# oam eth-cfm linktrace 00:af:af:af:af:af mep 51 domain 1 association 1
Index Ingress Mac Egress Mac Relay Action

1 00:00:00:00:00:00 00:AF:AF:AF:AF:AF rlyHit terminate

No more responses received in the last 5 seconds.
*A:alcag1-R6#
```

## i-vpls

|                    |                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>i-vpls</b>                                                                                                        |
| <b>Context</b>     | show>service>id                                                                                                      |
| <b>Description</b> | Displays I-VPLS services associated with the B-VPLS service. This command only applies when the service is a B-VPLS. |

## Sample Output

```
*A:SetupCLI# show service id 2002 i-vpls
=====
Related iVpls services for bVpls service 2002
=====
iVpls SvcId Oper ISID Admin Oper
```

```

2001 122 Up Down

Number of Entries : 1

*A:alcag1-R6#
*A:term17>show>service>id# i-vpls
=====
Related iVpls services for bVpls service 2000
=====
iVpls SvcId Oper ISID Admin Oper

2100 2100 Up Up
2110 123 Up Up

Number of Entries : 2

*A:SetupCLI#

```

## base

**Syntax**     **base**

**Context**    show>service>pbb

### Sample

```

*A:Dut-B# show service pbb base
=====
PBB MAC Information
=====
MAC-Notif Count : 3
MAC-Notif Interval : 1
Source BMAC : Default
=====

```

## mac-name

**Syntax**     **mac-name [detail]**

**Context**    show>service>pbb

**Description** This command displays information on a specific MAC name.

### Sample

```

*A:Dut-B# show service pbb mac-name
=====
MAC Name Table
=====
MAC-Name MAC-Address

test 00:03:03:03:03:02

```

```

=====
*A:Dut-B# show service pbb mac-name test detail
=====
Services Using MAC name='test' addr='00:03:03:03:03:02'
=====
Svc-Id ISID

501 501

Number of services: 1
=====
*A:Dut-B#

```

## id

|                    |                                                             |
|--------------------|-------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                 |
| <b>Context</b>     | show>service                                                |
| <b>Description</b> | This command displays information on a specific service ID. |

## Sample

```

*A:Dut-B# show service id 1 all
=====
Service Detailed Information
=====
Service Id : 1 Vpn Id : 0
Service Type : b-VPLS
Description : (Not Specified)
Customer Id : 1
Last Status Change: 05/17/2009 19:33:11
Last Mgmt Change : 05/17/2009 19:31:59
Admin State : Up Oper State : Up
MTU : 2000 Def. Mesh VC Id : 1
SAP Count : 1 SDP Bind Count : 0
Snd Flush on Fail : Disabled Host Conn Verify : Disabled
Propagate MacFlush: Disabled
Oper Backbone Src : 00:03:00:00:04:01 Use SAP B-MAC : enabled
i-Vpls Count : 0
Epipe Count : 900
*A:Dut-B# show service id 501 all
=====
Service Detailed Information
=====
Service Id : 501 Vpn Id : 0
Service Type : Epipe
Description : (Not Specified)
Customer Id : 1
Last Status Change: 05/17/2009 19:41:32
Last Mgmt Change : 05/17/2009 19:40:03
Admin State : Up Oper State : Up
MTU : 1514
Vc Switching : False
SAP Count : 1 SDP Bind Count : 0

PBB Tunnel Point

```

```

B-vpls Backbone-dest-MAC Isid AdmMTU OperState Flood Oper-dest-MAC

1 test 501 2000 Up Yes 00:03:03:03:03:02

*A:Dut-B#

```

## mrp

**Syntax** **mrp**

**Context** show>service>id

**Description** This command displays information on a a per service MRP configuration.

**Output** \*A:PE-A# show service id 10 mrp

```

MRP Information

Admin State : Up Failed Register Cnt: 0
Max Attributes : 2048 Attribute Count : 10
Flood Time : Off

*A:PE-A#

```

## mrp-policy

**Syntax** **mrp-policy** [*mrp-policy*]  
**mrp-policy** *mrp-policy* [**association**]  
**mrp-policy** *mrp-policy* [**entry** *entry-id*]

**Context** show>service

**Description** This command displays MRP policy information.

**Parameters** *mrp-policy* — Specifies the MRP policy.

**Values** 32 chars max

*entry-id* — Specifies the entry ID.

**Values** 1..65535

## mmrp

**Syntax** **mmrp mac** [*ieee-address*]

**Context** show>service>id

**Description** This command displays information on MACs. If a MAC address is specified, information will be displayed relevant to the specific group. No parameter will display information on all group MACs on a server.

**Parameters** *ieee-address* — Hex string: xx:xx:xx:xx:xx:xx: or xx-xx-xx-xx-xx-xx

**Output**

```
*A:PE-A# show service id 10 mmrp mac 01:1E:83:00:00:65
```

| SAP/SDP      | MAC Address       | Registered | Declared |
|--------------|-------------------|------------|----------|
| sap:1/1/4:10 | 01:1e:83:00:00:65 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:65 | No         | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:65 | Yes        | Yes      |

```
*A:PE-A#
```

```
*A:PE-A# show service id 10 mmrp mac
```

| SAP/SDP      | MAC Address       | Registered | Declared |
|--------------|-------------------|------------|----------|
| sap:1/1/4:10 | 01:1e:83:00:00:65 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:66 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:67 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:68 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:69 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6a | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6b | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6c | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6d | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6e | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:65 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:66 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:67 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:68 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:69 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6a | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6b | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6c | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6d | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6e | No         | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:65 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:66 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:67 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:68 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:69 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:6a | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:6b | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:6c | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:6d | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:6e | Yes        | Yes      |

```
*A:PE-A#
```

## PBB Clear Commands

### counters

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>counters</b>                                                                |
| <b>Context</b>     | clear>service>statistics>id                                                    |
| <b>Description</b> | This command clears all traffic queue counters associated with the service ID. |

### mesh-sdp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mesh-sdp</b> <i>sdp-id[:vc-id]</i> { <b>all</b>   <b>counters</b>   <b>stp</b>   <b>mrp</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | clear>service>statistics>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command clears the statistics for a particular mesh SDP bind.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><i>sdp-id</i> — Specifies the SDP ID for which to display information.</p> <p><b>Default</b> All SDPs.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — Displays information about the virtual circuit identifier.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>all</b> — Clears all queue statistics and STP statistics associated with the SDP.</p> <p><b>counters</b> — Clears all queue statistics associated with the SDP.</p> <p><b>stp</b> — Clears all STP statistics associated with the SDP.</p> <p><b>mrp</b> — Clears all MRP statistics associated with the SDP.</p> |

### mrp

|                    |                                                            |
|--------------------|------------------------------------------------------------|
| <b>Syntax</b>      | <b>mrp</b>                                                 |
| <b>Context</b>     | clear>service>statistics>id                                |
| <b>Description</b> | This command clears all MRP statistics for the service ID. |

### spoke-sdp

|                |                                                                                                                 |
|----------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>spoke-sdp</b> <i>sdp-id[:vc-id]</i> { <b>all</b>   <b>counters</b>   <b>stp</b>   <b>l2pt</b>   <b>mrp</b> } |
| <b>Context</b> | clear>service>statistics>id                                                                                     |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command clears statistics for the spoke SDP bound to the service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>sdp-id</i> — The spoke SDP ID for which to clear statistics.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>all</b> — Clears all queue statistics and STP statistics associated with the SDP.</p> <p><b>counters</b> — Clears all queue statistics associated with the SDP.</p> <p><b>stp</b> — Clears all STP statistics associated with the SDP.</p> <p><b>l2pt</b> — Clears all L2PT statistics associated with the SDP.</p> <p><b>mrp</b> — Clears all MRP statistics associated with the SDP.</p> |

## sap

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> { <b>all</b>   <b>counters</b>   <b>stp</b>   <b>l2pt</b>   <b>mrp</b> }                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | clear>service>statistics>id                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command clears statistics for the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><i>sap-id</i> — The SAP ID for which to clear statistics.</p> <p><b>all</b> — Clears all queue statistics and STP statistics associated with the SAP.</p> <p><b>counters</b> — Clears all queue statistics associated with the SAP.</p> <p><b>stp</b> — Clears all STP statistics associated with the SAP.</p> <p><b>l2pt</b> — Clears all L2PT statistics associated with the SAP.</p> <p><b>mrp</b> — Clears all MRP statistics associated with the SAP.</p> |

## stp

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| <b>Syntax</b>      | <b>stp</b>                                              |
| <b>Context</b>     | clear>service>statistics>id                             |
| <b>Description</b> | Clears all spanning tree statistics for the service ID. |



---

## PBB Debug Commands

### mrp

|                    |                                                    |
|--------------------|----------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mrp</b>                                    |
| <b>Context</b>     | debug>service>id                                   |
| <b>Description</b> | This command enables and configures MRP debugging. |

### all-events

|                    |                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>all-events</b>                                                                                                                                                  |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                               |
| <b>Description</b> | This command enables MRP debugging for the applicant, leave all, periodic and registrant state machines and enables debugging of received and transmuted MRP PDUs. |

### applicant-sm

|                    |                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] applicant-sm</b>                                                                                                                               |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                   |
| <b>Description</b> | This command enables debugging of the applicant state machine.<br>The <b>no</b> form of the command disables debugging of the applicant state machine. |

### leave-all-sm

|                    |                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] leave-all-sm</b>                                                                                                                               |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                   |
| <b>Description</b> | This command enables debugging of the leave all state machine.<br>The <b>no</b> form of the command disables debugging of the leave all state machine. |

### mmrp-mac

|                |                                          |
|----------------|------------------------------------------|
| <b>Syntax</b>  | <b>[no] mmrp-mac</b> <i>ieee-address</i> |
| <b>Context</b> | debug>service>id>mrp                     |

## Show Commands

|                    |                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command filters debug events and only shows events related to the MAC address specified. The <b>no</b> form of the command removes the debug filter. |
| <b>Parameters</b>  | <i>ieee-address</i> — xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx (cannot be all zeroes)                                                                       |

## mrpdu

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mrpdu</b>                                                                                                                                  |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                               |
| <b>Description</b> | This command enables debugging of the MRP PDUs that are received or transmitted. The <b>no</b> form of the command disables debugging of MRP PDUs. |

## periodic-sm

|                    |                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] periodic-sm</b>                                                                                                                           |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                              |
| <b>Description</b> | This command enables debugging of the periodic state machine. The <b>no</b> form of the command disables debugging of the periodic state machine. |

## registrant-sm

|                    |                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] registrant-sm</b>                                                                                                                             |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                  |
| <b>Description</b> | This command enables debugging of the registrant state machine. The <b>no</b> form of the command disables debugging of the registrant state machine. |

## sap

|                    |                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap sap-id</b>                                                                                                                      |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                        |
| <b>Description</b> | This command filters debug events and only shows events for the particular SAP. The <b>no</b> form of the command removes the debug filter. |
| <b>Parameters</b>  | <i>sap-id</i> — See <a href="#">Common CLI Command Descriptions on page 1469</a> for command syntax.                                        |

## sdp

|                    |                                                                                                                                                                                                                                                                                                                                                 |                |           |               |           |               |                |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------|---------------|-----------|---------------|----------------|
| <b>Syntax</b>      | <b>[no] sdp</b> <i>sdp-id:vc-id</i>                                                                                                                                                                                                                                                                                                             |                |           |               |           |               |                |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                                                                                                                                                                                                            |                |           |               |           |               |                |
| <b>Description</b> | This command filters debug events and only shows events for the particular SDP.<br>The <b>no</b> form of the command removes the debug filter.                                                                                                                                                                                                  |                |           |               |           |               |                |
| <b>Parameters</b>  | <i>sdp-id</i> — Specifies the SDP ID for which to display information.<br><table><tr><td><b>Default</b></td><td>All SDPs.</td></tr><tr><td><b>Values</b></td><td>1 — 17407</td></tr></table> <i>vc-id</i> — Displays information about the virtual circuit identifier.<br><table><tr><td><b>Values</b></td><td>1 — 4294967295</td></tr></table> | <b>Default</b> | All SDPs. | <b>Values</b> | 1 — 17407 | <b>Values</b> | 1 — 4294967295 |
| <b>Default</b>     | All SDPs.                                                                                                                                                                                                                                                                                                                                       |                |           |               |           |               |                |
| <b>Values</b>      | 1 — 17407                                                                                                                                                                                                                                                                                                                                       |                |           |               |           |               |                |
| <b>Values</b>      | 1 — 4294967295                                                                                                                                                                                                                                                                                                                                  |                |           |               |           |               |                |



# Internet Enhanced Service

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## In This Chapter

This chapter provides information about Internet Enhanced Service (IES), process overview, and implementation notes.

Topics in this chapter include:

- [IES Service Overview on page 858](#)
- [IES Features on page 859](#)
  - [IP Interfaces on page 859](#)
  - [Subscriber Interfaces on page 860](#)
    - [IPv6 Enhanced Subscriber Management \(ESM\) on page 860](#)
    - [RADIUS Accounting on page 860](#)
  - [Routing Protocols on page 864](#)
  - [QoS Policies on page 865](#)
  - [Filter Policies on page 865](#)
  - [Spoke SDPs on page 866](#)
- [Configuring an IES Service with CLI on page 881](#)
- [Basic Configuration on page 882](#)
- [Common Configuration Tasks on page 883](#)
- [Service Management Tasks on page 893](#)

# IES Service Overview

Internet Enhanced Service (IES) is a routed connectivity service where the subscriber communicates with an IP router interface to send and receive Internet traffic. An IES has one or more logical IP routing interfaces each with a SAP which acts as the access point to the subscriber's network. IES allows customer-facing IP interfaces to participate in the same routing instance used for service network core routing connectivity. IES services require that the IP addressing scheme used by the subscriber be unique between other provider addressing schemes and potentially the entire Internet.

While IES is part of the routing domain, the usable IP address space may be limited. This allows a portion of the service provider address space to be reserved for service IP provisioning, and be administered by a separate but subordinate address authority.

IP interfaces defined within the context of an IES service must have a SAP associated as the access point to the subscriber network. Multiple IES services are created to segregate subscriber-owned IP interfaces.

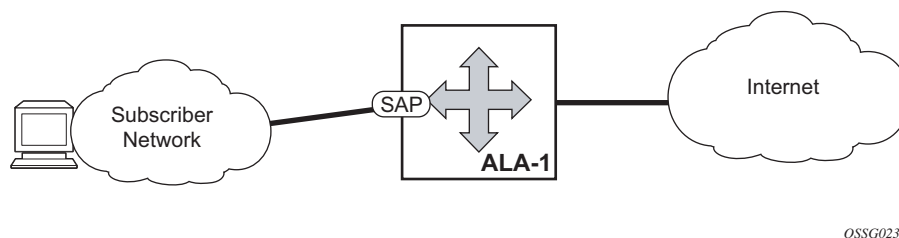


**Figure 122: Internet Enhanced Service**

The IES service provides Internet connectivity. Other features include:

- Multiple IES services are created to separate customer-owned IP interfaces.
- More than one IES service can be created for a single customer ID.
- More than one IP interface can be created within a single IES service ID. All IP interfaces created within an IES service ID belong to the same customer.

Note: Refer to the 7750 SR OS Triple Play Guide for information about how subscriber group-interfaces function in the Routed Central Office model.

## IES Features

This section describes various of the general 7750 SR service features and any special capabilities or considerations as they relate to IES services.

---

## IP Interfaces

IES customer IP interfaces can be configured with most of the same options found on the core IP interfaces. The advanced configuration options supported are:

- VRRP - for IES services with more than one IP interface
- Cflowd
- Secondary IP addresses
- ICMP Options

Configuration options found on core IP interfaces not supported on IES IP interfaces are:

- NTP broadcast receipt

## Subscriber Interfaces

Subscriber interfaces are composed of a combination of two key technologies, subscriber interfaces and group interfaces. While the subscriber interface defines the subscriber subnets, the group interfaces are responsible for aggregating the SAPs.

- Subscriber interface — An interface that allows the sharing of a subnet among one or many group interfaces in the routed CO model.
- Group interface — Aggregates multiple SAPs on the same port.
- Redundant interfaces — A special spoke-terminated Layer 3 interface. It is used in a Layer 3 routed CO dual-homing configuration to shunt downstream (network to subscriber) to the active node for a given subscriber.

---

## IPv6 Enhanced Subscriber Management (ESM)

All IPv6 ESM services require either Routed CO (IES), or Routed CO for VPRN as a supporting service construct. Because of the complexities of the IPv6 link-model, there is currently no support for IPv6 ESM in a VPLS. There is also currently no support for IPv6 in combination with Basic Subscriber Management (BSM).

---

## RADIUS Accounting

In the 7750 SR OS, the accounting paradigm is based on sla-profile instances, yet this is at odds with traditional RADIUS authentication and accounting which is host-centric. In previous OS releases, it was possible to have many hosts sharing a common sla-profile instance, and thus accounting and QoS parameters. Complications would arise with RADIUS accounting because Accounting-Start and Accounting-Stop are a function of sla-profile instance and not the hosts – this meant that some host-specific parameters (like Framed-Ip-Address) would not be consistently included in RADIUS accounting.

Dual-stack subscribers are now two different hosts sharing a single sla-profile instance. A new RADIUS accounting mode has been introduced to support multiple-host environments.

A new command, **host-accounting**, is introduced under **accounting-policy**, which allows configurable behavior.

### No host-accounting:

When **no host-accounting** is configured, accounting behavior is as follows:

- A RADIUS accounting start message is sent when the SLA-profile instance is created. It contains accounting (octets/packets) and the Framed-Ip-Address of the host which caused the sla-profile instance to be created.



- Additional hosts may bind to the sla-profile instance at any time, but no additional accounting messages are sent during these events.
- If the original host disconnects, then future accounting messages will use an IP address of one of the remaining hosts.
- When the final host associated with an sla-profile instance disconnects, an accounting stop message will be sent.

#### **Host-accounting enabled:**

When **host-accounting** is configured, additional RADIUS accounting messages are created for host activity in addition to messages for common queue accounting. The behavior is as follows:

- A RADIUS accounting start message is sent each time a host is authenticated. It contains the Framed-Ip-Address among other things. It does not contain any cctet or packet counts.
- A RADIUS accounting start message is sent each time a sla-profile instance is created.
- Whenever a host disconnects a RADIUS, accounting stop message is sent for that host.
- If all host associated with an sla-profile instance disconnect, a RADIUS accounting stop message is sent for that instance.

This new behavior means certain AVP may be in either host, sla-profile instance, or both accounting records.

Note that Interim-Acct records are not sent for hosts, only the start- and stop-accounting messages.

**Table 15: RADIUS Accounting Table**

| <b>RADIUS Accounting AVP</b> | <b>Host Accounting</b> | <b>SLA-Profile Accounting</b> |
|------------------------------|------------------------|-------------------------------|
| User-Name                    | Yes                    | No                            |
| NAS-Identifier               | Yes                    | Yes                           |
| NAS-IP-Address               | Yes                    | Yes                           |
| Nas-Port-Id                  | Yes                    | No                            |
| Nas-Port                     | Yes                    | No                            |
| Nas-Port-Type                | Yes                    | No                            |
| Service-Type                 | Yes                    | No                            |
| Framed-Protocol              | Yes                    | No                            |
| Framed-Ip-Address            | Yes                    | No                            |
| Framed-Ip-Netmark            | Yes                    | No                            |
| Framed-Route                 | Yes                    | No                            |
| Class                        | Yes                    | No                            |
| Session-Timeout              | Yes                    | Yes                           |

**Table 15: RADIUS Accounting Table (Continued)**

| <b>RADIUS Accounting AVP</b>  | <b>Host Accounting</b> | <b>SLA-Profile Accounting</b> |
|-------------------------------|------------------------|-------------------------------|
| Circuit-Id VSA                | Yes                    | No                            |
| Called-Station-Id             | Yes                    | No                            |
| Calling-Station-Id            | Yes                    | No                            |
| MAC-Addr VSA                  | Yes                    | No                            |
| Remote-Id VSA                 | Yes                    | No                            |
| Acct-Input-Octets             | No                     | Yes                           |
| Acct-Output-Octets            | No                     | Yes                           |
| Acct-Input-Gigawords          | No                     | Yes                           |
| Acct-Output-Gigawords         | No                     | Yes                           |
| Acct-Session-Id               | Yes                    | Yes                           |
| Acct-Session-Time             | Yes                    | Yes                           |
| Acct-Input-Packets            | No                     | Yes                           |
| Acct-Output-Packets           | No                     | Yes                           |
| Agent-Circuit-Id              | Yes                    | No                            |
| Agent-Remote-Id               | Yes                    | No                            |
| Actual-Data-Rate-Upstream     | Yes                    | No                            |
| Actual-Data-Rate-Downstream   | Yes                    | No                            |
| Access-Loop-Encapsulation     | Yes                    | No                            |
| Alc-"Accounting"              | No                     | Yes                           |
| Alc-Subscriber-Id             | Yes                    | Yes                           |
| Alc-Subscriber-Profile-String | Yes                    | Yes                           |
| Alc-Sla-Profile-String        | Yes                    | Yes                           |

## SAPs

---

### Encapsulations

The following SAP encapsulations are supported on IES service:

- Ethernet null
  - Ethernet dot1q
  - SONET/SDH IPCP
  - SONET/SDH BCP-null
  - SONET/SDH BCP-dot1q
  - SONET/SDH ATM
  - ATM - LLC SNAP or VC-MUX
- 

### ATM SAP Encapsulations for IES

The 7750 SR series supports ATM PVC service encapsulation for IES SAPs. Both UNI and NNI cell formats are supported. The format is configurable on a SONET/SDH path basis. A path maps to an ATM VC. All VCs on a path must use the same cell format.

The following ATM encapsulation and transport modes are supported:

- RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*:
  - AAL5 LLC/SNAP IPv4 routed
  - AAL5 VC mux IPv4 routed
  - AAL5 LLC/SNAP IPv4 bridged
  - AAL5 VC mux IPv4 bridged

## Routing Protocols

The IES IP interfaces are restricted as to the routing protocols that can be defined on the interface based on the fact that the customer has a different routing domain for this service. The IES IP interfaces support the following routing protocols:

- RIP
- OSPF
- IS-IS
- BGP
- IGMP
- PIM

Note that the SAP for the IES IP interface is created at the IES service level, but the routing protocols for the IES IP interface are configured at the routing protocol level for the main router instance.

---

## CPE Connectivity Check

Static routes are used within many IES services. Unlike dynamic routing protocols, there is no way to change the state of routes based on availability information for the associated CPE. CPE connectivity check adds flexibility so that unavailable destinations will be removed from the service provider's routing tables dynamically and minimize wasted bandwidth.

The availability of the far-end static route is monitored through periodic polling. The polling period is configured. If the poll fails a specified number of sequential polls, the static route is marked as inactive.

Either ICMP ping or unicast ARP mechanism can be used to test the connectivity. ICMP ping is preferred.

If the connectivity check fails and the static route is de-activated, the router will continue to send polls and re-activate any routes that are restored.

## QoS Policies

When applied to 7750 SR IES services, service ingress QoS policies only create the unicast queues defined in the policy. The multipoint queues are not created on the service. With IES services, service egress QoS policies function as with other services where the class-based queues are created as defined in the policy. Note that both Layer 2 or Layer 3 criteria can be used in the QoS policies for traffic classification in an IES.

---

## Filter Policies

Only IP filter policies can be applied to IES services.

## Spoke SDPs

Distributed services use service distribution points (SDPs) to direct traffic to another SR-Series router via service tunnels. SDPs are created on each participating SR-Series and then bound to a specific service. SDP can be created as either GRE or MPLS. Refer to [Service Distribution Points \(SDPs\) on page 46](#) for information about configuring SDPs.

This feature provides the ability to cross-connect traffic entering on a spoke SDP, used for Layer 2 services (VLLs or VPLS), on to an IES or VPRN service. From a logical point of view, the spoke SDP entering on a network port is cross-connected to the Layer 3 service as if it entered by a service SAP. The main exception to this is traffic entering the Layer 3 service by a spoke SDP is handled with network QoS policies not access QoS policies.

[Figure 123](#) depicts traffic terminating on a specific IES or VPRN service that is identified by the *sdp-id* and VC label present in the service packet.

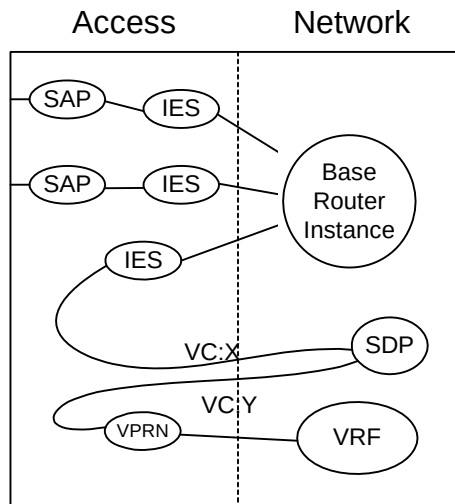


**Figure 123: SDP-ID and VC Label Service Identifiers**

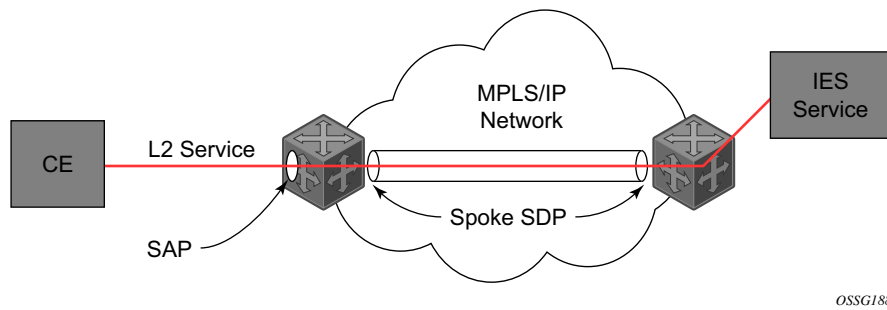


**Figure 124: IES Spoke-SDP Termination**

Figure 124 depicts a spoke SDP terminating directly into an IES. In this case, a spoke SDP could be tied to an Epipe or HVPLS service. There is no configuration required on the PE connected to the CE.

Note that all the routing protocols, including multicast, that are supported by IES are supported for spoke SDP termination.

## SRRP

Subscriber Router Redundancy Protocol (SRRP) is closely tied to the multi-chassis synchronization (MCS) protocol used to synchronize information between redundant nodes. An MCS peer must be configured and operational when subscriber hosts have a redundant connection to two nodes. Subscriber hosts are identified by the ingress SAP, the host's IP and MAC addresses. Once a host is identified on one node, the MCS peering is used to inform the other node that the host exists and conveys the dynamic DHCP lease state information of the host. MCS creates a common association between the virtual ports (SAPs) shared by a subscriber. This association is configured at the MCS peering level by defining a tag for a port and range of SAPs. The same tag is defined on the other nodes peering context for another port (does not need to be the same port-ID) with the same SAP range. In this manner, a subscriber host and Dot1Q tag sent across the peering with the appropriate tag is mapped to the redundant SAP on the other node.

SRRP can only be configured on group interfaces. Once SRRP is active on a group IP interface, the SRRP instance attempts to communicate through in-band (over the group IP interfaces SAPs) and out-of-band (over the group IP interfaces redundant IP interface) messages to a remote router. If the remote router is also running SRRP with the same SRRP instance ID, one router enters a master state while the other router enters a backup state. Since both routers are sharing a common SRRP gateway MAC address that is used for the SRRP gateway IP addresses and for proxy ARP functions, either node may act as the default gateway for the attached subscriber hosts.

For proper operation, each subscriber subnet associated with the SRRP instance must have a gw-address defined. The SRRP instance cannot be activated (no shutdown) unless each subscriber subnet associated with the group IP interface has an SRRP gateway IP address. Once the SRRP instance is activated, new subscriber subnets cannot be added without a corresponding SRRP gateway IP address. [Table 16](#) describes how the SRRP instance state is used to manage access to subscriber hosts associated with the group IP interface.

SRRP instances are created in the disabled state (shutdown). To activate SRRP the no shutdown command in the SRRP context must be executed.

Before activating an SRRP instance on a group IP interface, the following actions are required:

- Add a SRRP gateway IP addresses to all subscriber subnets associated with the group IP interface, including subnets on subscriber IP interfaces associated as retail routing contexts (at least one subnet must be on the subscriber IP interface containing the group IP interface and its SRRP instance).
- Create a redundant IP interface and associate it with the SRRP instances group IP interface for shunting traffic to the remote router when master.
- Specify the group IP interface SAP used for SRRP advertisement and Information messaging.

Before activating an SRRP instance on a group IP interface, the following actions should be considered:



- Associate the SRRP instance to a Multi-Chassis Synchronization (MCS) peering terminating on the neighboring router (the MCS peering should exist as the peering is required for redundant subscriber host management).
- Define a description string for the SRRP instance.
- Specify the SRRP gateway MAC address used by the SRRP instance (must be the same on both the local and remote SRRP instance participating in the same SRRP context).
- Change the base priority for the SRRP instance.
- Specify one or more VRRP policies to dynamically manage the SRRP instance base priority.
- Specify a new keep alive interval for the SRRP instance.

Table 16 lists the SRRP's state effect on subscriber hosts associated with group IP interfaces.

**Table 16: SRRP State Effect on Subscriber Hosts Associated with Group IP Interface**

| <b>SRRP State</b>                                                                           | <b>ARP</b>                                                                                                                                                                                                                                                                                                                                               | <b>Local Proxy ARP Enabled</b>                                                                                                                                                                                   | <b>Remote Proxy ARP Enabled</b>                                                                                                                                                                  | <b>Subscriber Host Routing</b>                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disabled                                                                                    | <ul style="list-style-type: none"> <li>• Responds to ARP for all owned subscriber subnet IP addresses.</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses.</li> <li>• All ARP responses will contain the native MAC of the group IP interface (not the SRRP gateway MAC).</li> </ul>                                     | <ul style="list-style-type: none"> <li>• Responds to ARP for all subscriber hosts on the subscriber subnet.</li> </ul>                                                                                           | <ul style="list-style-type: none"> <li>• Responds to ARP for all reachable remote IP hosts.</li> </ul>                                                                                           | <ul style="list-style-type: none"> <li>• All routing out the group IP interface will use the native group IP interface MAC address.</li> <li>• The group IP interface redundant IP interface will not be used.</li> <li>• Will not accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul>                          |
| Becoming Master<br>(In order to enter becoming master state, a master must currently exist) | <ul style="list-style-type: none"> <li>• Responds to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Responds to ARP for subscriber subnet SRRP gateway IP addresses (hardware address = SRRP gateway IP address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• Responds to ARP for all subscriber hosts on the subscriber subnet (hardware address = SRRP gateway MAC address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• Responds to ARP for all reachable remote IP hosts (hardware address = SRRP gateway MAC address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• All routing out the group IP interface use the native group IP interface MAC address.</li> <li>• Subscriber hosts mapped to the redundant IP interface are remapped to the group IP interface.</li> <li>• Will not accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul> |

**Table 16: SRRP State Effect on Subscriber Hosts Associated with Group IP Interface (Continued)**

| <b>SRRP State</b>                                    | <b>ARP</b>                                                                                                                                                                                                                                                                                                                                               | <b>Local Proxy ARP Enabled</b>                                                                                                                                                                                   | <b>Remote Proxy ARP Enabled</b>                                                                                                                                                                  | <b>Subscriber Host Routing</b>                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Master                                               | <ul style="list-style-type: none"> <li>• Responds to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Responds to ARP for subscriber subnet SRRP gateway IP addresses (hardware address = SRRP gateway IP address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• Responds to ARP for all subscriber hosts on the subscriber subnet (hardware address = SRRP gateway MAC address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• Responds to ARP for all reachable remote IP hosts (hardware address = SRRP gateway MAC address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• All routing out the group IP interface will use the SRRP gateway MAC address.</li> <li>• Subscriber hosts mapped to the redundant IP interface are remapped to the group IP interface.</li> <li>• Will accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul>                         |
| Becoming Backup (redundant IP interface operational) | <ul style="list-style-type: none"> <li>• Responds to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses</li> </ul>                                                                                   | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any subscriber hosts on the subscriber subnet.</li> </ul>                                                                                   | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any remote IP hosts.</li> </ul>                                                                                             | <ul style="list-style-type: none"> <li>• Will not route out the group IP interface for subscriber hosts associated with the subscriber subnet.</li> <li>• Subscriber hosts mapped to the group IP interface are remapped to the redundant IP interface.</li> <li>• Will accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul> |

**Table 16: SRRP State Effect on Subscriber Hosts Associated with Group IP Interface (Continued)**

| <b>SRRP State</b>                                      | <b>ARP</b>                                                                                                                                                                                                                                                              | <b>Local Proxy ARP Enabled</b>                                                                                                 | <b>Remote Proxy ARP Enabled</b>                                                                      | <b>Subscriber Host Routing</b>                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Becoming Backup (redundant IP interface not available) | <ul style="list-style-type: none"> <li>• Responds to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any subscriber hosts on the subscriber subnet.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any remote IP hosts.</li> </ul> | <ul style="list-style-type: none"> <li>• Will route out the group IP interface for subscriber hosts associated with the subscriber subnet using the group IP interface native MAC address.</li> <li>• Subscriber hosts mapped to the redundant IP interface are remapped to the group IP interface.</li> <li>• Will accept packets destined to the SRRP gateway MAC received on the group IP interface</li> </ul> |
| Backup (redundant IP interface operational)            | <ul style="list-style-type: none"> <li>• Responds to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any subscriber hosts on the subscriber subnet</li> </ul>  | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any remote IP hosts</li> </ul>  | <ul style="list-style-type: none"> <li>• Will not route out the group IP interface for subscriber hosts associated with the subscriber subnet.</li> <li>• Subscriber hosts mapped to the group IP interface are remapped to the redundant IP interface.</li> <li>• Will not accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul>                                        |

**Table 16: SRRP State Effect on Subscriber Hosts Associated with Group IP Interface (Continued)**

| <b>SRRP State</b>                                | <b>ARP</b>                                                                                                                                                                                                                                                              | <b>Local Proxy ARP Enabled</b>                                                                                                 | <b>Remote Proxy ARP Enabled</b>                                                                      | <b>Subscriber Host Routing</b>                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Backup<br>(redundant IP interface not available) | <ul style="list-style-type: none"> <li>• Responds to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any subscriber hosts on the subscriber subnet.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any remote IP hosts.</li> </ul> | <ul style="list-style-type: none"> <li>• Will route out the group IP interface for subscriber hosts associated with the subscriber subnet using the group IP interface native MAC address.</li> <li>• Subscriber hosts mapped to the redundant IP interface are remapped to the group IP interface.</li> <li>• Will not accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul> |

## SRRP Messaging

SRRP uses the same messaging format as VRRP with slight modifications. The source IP address is derived from the system IP address assigned to the local router. The destination IP address and IP protocol are the same as VRRP (224.0.0.18 and 112, respectively).

The message type field is set to 1 (advertisement) and the protocol version is set to 8 to differentiate SRRP message processing from VRRP message processing.

The vr-id field supports an SRRP instance ID of 32 bits.

Due to the large number of subnets backed up by SRRP, only one message every minute carries the gateway IP addresses associated with the SRRP instance. These gateway addresses are stored by the local SRRP instance and are compared with the gateway addresses associated with the local subscriber IP interface.

Unlike VRRP, only two nodes may participate in an SRRP instance due to the explicit association between the SRRP instance group IP interface, the associated redundant IP interface and the multi-chassis synchronization (MCS) peering. Since only two nodes are participating, the VRRP skew timer is not utilized when waiting to enter the master state. Also, SRRP always preempts when the local priority is better than the current master and the backup SRRP instance always inherits the master's advertisement interval from the SRRP advertisement messaging.

SRRP advertisement messages carry a *becoming-master* indicator flag. The *becoming-master* flag is set by a node that is attempting to usurp the master state from an existing SRRP master router. When receiving an SRRP advertisement message with a better priority and with the *becoming-master* flag set, the local master initiates its *becoming-backup* state, stops routing with the SRRP gateway MAC and sends an SRRP advertisement message with a priority set to zero. The new master continues to send SRRP advertisement messages with the *becoming-master* flag set until it either receives a return priority zero SRRP advertisement message from the previous master or its *becoming-master* state timer expires. The new backup node continues to send zero priority SRRP advertisement messages every time it receives an SRRP advertisement message with the *becoming-master* flag set. After the new master either receives the old masters priority zero SRRP advertisement message or the *become-master* state timer expires, it enters the *master* state. The *become-master* state timer is set to 10 seconds upon entering the *become-master* state.

The SRRP advertisement message is always evaluated to see if it has a higher priority than the SRRP advertisement that would be sent by the local node. If the advertised priority is equal to the current local priority, the source IP address of the received SRRP advertisement is used as a tie breaker. The node with the lowest IP address is considered to have the highest priority. SRRP will not pre-empt when priorities are equal. Pre-emption occurs only when priorities are specified. The lower IP address is only used as a tie-breaker when there is no master in the network. In other words, when both routers are changing from the "init" state, the lower IP will be used to choose the master. If a master already exists, despite having the lower IP address, the system will not preempt the current master.

The SRRP instance maintains the source IP address of the current master. If an advertisement is received with the current masters source IP address and the local priority is higher priority than the

masters advertised priority, the local node immediately enters the *becoming-master* state unless the advertised priority is zero. If the advertised priority is zero, the local node bypasses the *becoming-master* state and immediately enters the *master* state. Priority zero is a special case and is sent when an SRRP instance is relinquishing the master state.

## SRRP and Multi-Chassis Synchronization

In order to take full advantage of SRRP resiliency and diagnostic capabilities, the SRRP instance should be tied to a MCS peering that terminates on the redundant node. The SRRP instance is tied to the peering using the **srrp srrp-id** command within the appropriate MCS peering configuration. Once the peering is associated with the SRRP instance, MCS will synchronize the local information about the SRRP instance with the neighbor router. MCS automatically derives the MCS key for the SRRP instance based on the SRRP instance ID. For example, an SRRP instance ID of 1 would appear in the MCS peering database with a MCS-key srrp-0000000001.

The SRRP instance information stored and sent to the neighbor router consists of:

- The SRRP instance MCS key
- Containing service type and ID
- Containing subscriber IP interface name
- Subscriber subnet information
- Containing group IP interface information
- The SRRP group IP interface redundant IP interface name, IP address and mask
- The SRRP advertisement message SAP
- The local system IP address (SRRP advertisement message source IP address)
- The Group IP interface MAC address
- The SRRP gateway MAC address
- The SRRP instance administration state (up / down)
- The SRRP instance operational state (disabled / becoming-backup / backup / becoming-master / master)
- The current SRRP priority
- Remote redundant IP interface availability (available / unavailable)
- Local receive SRRP advertisement SAP availability (available / unavailable)



## SRRP Instance

The SRRP instance uses the received information to verify provisioning and obtain operational status of the SRRP instance on the neighboring router.

- [SRRP Instance MCS Key on page 877](#)
  - [Containing Service Type and ID on page 877](#)
  - [Containing Subscriber IP Interface Name on page 877](#)
  - [Subscriber Subnet Information on page 878](#)
- 

### SRRP Instance MCS Key

The SRRP instance MCS key ties the received MCS information to the local SRRP instance with the same MCS key. If the received key does not match an existing SRRP instance, the MCS information associated with the key is ignored. Once an SRRP instance is created and mapped to an MCS peering, the SRRP instance evaluates received information with the same MCS key to verify it corresponds to the same peering. If the received MCS key is on a different peering than the local MCS key an SRRP peering mismatch event is generated detailing the SRRP instance ID, the IP address of the peering the MCS key is received on and the IP address to which the local MCS key is mapped. If the peering association mismatch is corrected, an SRRP peering mismatch clear event is generated.

---

### Containing Service Type and ID

The Containing Service Type is the service type (IES or VPRN) that contains the local SRRP instance. The Containing Service ID is the service ID of that service. This information is supplied for troubleshooting purposes only and is not required to be the same on both nodes.

---

### Containing Subscriber IP Interface Name

The containing subscriber IP interface name is the subscriber IP interface name that contains the SRRP instance and its group IP interface. This information is supplied for troubleshooting purposes only and is not required to be the same on both nodes.

## Subscriber Subnet Information

The subscriber subnet information includes all subscriber subnets backed up by the SRRP instance. The information for each subnet includes the Owned IP address, the mask and the gateway IP address. If the received subscriber subnet information does not match the local subscriber subnet information, an SRRP Subscriber Subnet Mismatch event is generated describing the SRRP instance ID and the local and remote node IP addresses. Once the subscriber subnet information matches, an SRRP Subscriber Subnet Mismatch Clear event is generated.

---

## Containing Group IP Interface Information

The containing group IP interface information is the information about the group IP interface that contains the SRRP instance. The information includes the name of the group IP interface, the list of all SAPs created on the group IP interface, the administrative and operational state of each SAP and the MCS key and the peering destination IP address associated with each SAP. To obtain the MCS information, the SRRP instance queries MCS to determine the peering association of the SRRP instance and then queries MCS for each SAP on the group IP interface. If the local SRRP instance is associated with a different MCS peering than any of the SAPs or if one or more SAPs are not tied to an MCS peering, an SRRP group interface SAP peering mismatch event is generated detailing the SRRP instance ID, and the group IP interface name.

When receiving the remote containing group IP interface information, the local node compares the received SAP information with the local group IP interface SAP information. If a local SAP is not included in the SAP information or a remote SAP is not included in the local group IP interface, an SRRP Remote SAP mismatch event is generated detailing the SRRP instance ID and the local and remote group IP interface names. If a received SAP's MCS key does not match a local SAP's MCS Key, an SRRP SAP MCS key mismatch event is generated detailing the SRRP instance ID, the local and remote group IP interface names, the SAP-ID and the local and remote MCS keys.

---

## Remote Redundant IP Interface Mismatch

If the group IP remote redundant IP interface address space does not exist, is not within the local routing context for the SRRP instances group IP interface or is not on a redundant IP interface, the local node sends redundant IP interface unavailable to prevent the remote neighbor from using its redundant IP interface. An SRRP redundant IP interface mismatch event is generated for the SRRP instance detailing the SRRP instance, the local and remote system IP addresses, the local and remote group IP interface names and the local and remote redundant IP interface names and IP addresses and masks. The local redundant IP interface may still be used if the remote node is not sending redundant IP interface unavailable.

### **Remote Sending Redundant IP Interface Unavailable**

If the remote node is sending redundant IP interface unavailable, the local node will treat the local redundant IP interface associated with the SRRP instances group IP interface as down. A Local Redundant IP Interface Unavailable event is generated detailing the SRRP instance ID, the local and remote system IP addresses, the local group IP interface name, the local redundant IP interface name and the redundant IP interface IP address and mask.

---

### **Remote SRRP Advertisement SAP Non-existent**

If the remote node's SRRP advertisement SAP does not exist on the local SRRP instances group IP interface, the local node sends local receive SRRP advertisement SAP unavailable to the remote node. An SRRP receive advertisement SAP non-existent event is generated detailing the SRRP instance ID, the local and remote system IP addresses, the local group IP interface name and the received remote SRRP advertisement SAP. Since SRRP advertisement messages cannot be received, the local node will immediately become master if it has the lower system IP address.

---

### **Remote Sending Local Receive SRRP Advertisement SAP Unavailable**

If the local node is receiving local receive SRRP advertisement SAP unavailable from the remote node, an SRRP Remote Receive advertisement SAP Unavailable event will be generated detailing the SRRP instance ID, the local and remote system IP addresses, the remote group IP interface name and the local SRRP advertisement SAP. Since the remote node cannot receive SRRP advertisement messages, the local node will immediately become master if it has the lower system IP address.

---

### **Local and Remote Dual Master Detected**

If the local SRRP state is master and the remote SRRP state is master, an SRRP dual master event is generated detailing the SRRP instance ID and the local, remote system IP addresses and the local and remote group IP interface names and port numbers.

## Subscriber Subnet Owned IP Address Connectivity

In order for the network to reliably reach the owned IP addresses on a subscriber subnet, it is not necessary for the owning node to advertise the IP addresses as /32 host routes into the core. Network reachability to the subscriber subnet is advertised into the IGP core by both of the dual homing nodes. The shortest path to the subscriber may not always traverse the active path for a subscriber. In this case, the path traverses the non-active/primary node for the subscriber and the traffic will be redirected through the redundant interface to the other node through the redundant interface to the active path. This ensures that all downstream traffic to a given subscriber will always flow through one node.

---

## Subscriber Subnet SRRP Gateway IP Address Connectivity

The SRRP gateway IP addresses on the subscriber subnets cannot be advertised as /32 host routes since they may be active (master) on multiple group IP interfaces on multiple SRRP routers. Without a /32 host route path, the network will forward any packet destined to an SRRP gateway IP address to the closest router advertising the subscriber subnet. While a case may be made that only a node that is currently forwarding for the gateway IP address in a master state should respond to ping or other diagnostic messages, the distribution of the subnet and the case of multiple masters make any resulting response or non-response inconclusive at best. To provide some ability to ping the SRRP gateway address from the network side reliably, any node receiving the ICMP ping request responds if the gateway IP address is defined on its subscriber subnet.

---

## Receive SRRP Advertisement SAP and Anti-Spoof

The group IP interface SAPs are designed to support subscriber hosts and perform an ingress anti-spoof function that ensures that any IP packet received on the group IP interface is coming in the correct SAP with the correct MAC address. If the IP and MAC are not registered as valid subscriber hosts on the SAP, the packet is silently discarded. Since the SRRP advertisement source IP addresses are not subscriber hosts, an anti-spoof entry will not exist and SRRP advertisement messages would normally be silently discarded. To avoid this issue, when a group IP interface SAP is configured to send and receive SRRP advertisement messages, anti-spoof processing on the SAP is disabled. This precludes subscriber host management on the SRRP messaging SAP.

---

## BFD with SRRP/VRRP

BFD with SRRP is supported. This allows the use of longer timers inside SRRP resulting in more SRRP instances while still retaining fast failure detection with BFD.

## Configuring an IES Service with CLI

This section provides information to configure IES services using the command line interface.

Topics in this section include:

- [Basic Configuration on page 882](#)
- [Common Configuration Tasks on page 883](#)
  - [Configuring IES Components on page 884](#)
    - [Configuring an IES Service on page 884](#)
    - [Configuring IES Subscriber Interface Parameters on page 885](#)
    - [Configuring IES Interface Parameters on page 886](#)
      - [Configuring Spoke-SDP Parameters on page 887](#)
      - [Configuring SAP Parameters on page 888](#)
      - [Configuring IPSec Parameters on page 891](#)
      - [Configuring VRRP on page 890](#)
- [Service Management Tasks on page 893](#)
  - [Modifying IES Service Parameters on page 893](#)
  - [Deleting an IES Service on page 895](#)
  - [Disabling an IES Service on page 896](#)
  - [Re-enabling an IES Service on page 896](#)

## Basic Configuration

The most basic IES service configuration has the following entities:

- Customer ID (refer to [Configuring Customers on page 91](#))
- An interface to create and maintain IP routing interfaces within IES service ID.
- A SAP on the interface specifying the access port and encapsulation values.

The following example displays a sample configuration of an IES service on ALA-48.

```
*A:ALA-48>config>service# info

 ies 1000 customer 50 vpn 1000 create
 description "to internet"
 interface "to-web" create
 address 10.1.1.1/24
 sap 1/1/5:0.* create
 exit
 exit
 no shutdown

*A:ALA-48>config>service#
```

## Common Configuration Tasks

This section provides a brief overview of the tasks that must be performed to configure IES services and provides the CLI commands.

1. Associate an IES service with a customer ID.
2. Associate customer ID with the service.
3. Assign an IP address.
4. Create a subscriber interface (optional).
5. Create an interface.
6. Define SAP parameters on the interface
  - Select node(s) and port(s).
  - Optional — select QoS policies other than the default (configured in the **config>qos** context).
  - Optional — select filter policies (configured in the **config>filter** context).
  - Optional — select accounting policy (configured in the **config>log** context).
7. Enable service.

## Configuring IES Components

Use the CLI syntax to configure the following entities:

- [Configuring an IES Service on page 884](#)
  - [Configuring IES Interface Parameters on page 886](#)
    - [Configuring IES Subscriber Interface Parameters on page 885](#)
    - [Configuring Spoke-SDP Parameters on page 887](#)
    - [Configuring SAP Parameters on page 888](#)
    - [Configuring VRRP on page 890](#)
- 

## Configuring an IES Service

Use the following CLI syntax to create an IES service:

The following example displays a basic IES service configuration.

```
A:ALA-48>config>service#

...
 ies 1001 customer 1730 vpn 1001 create
 description "to-internet"
 no shutdown
 exit

A:ALA-48>config>service#
```



## Configuring IES Subscriber Interface Parameters

NOTE: Subscriber interfaces operate only with basic (or enhanced) subscriber management. At the very least, a host, either statically configured or dynamically learned by DHCP must be present in order for the interface to be useful.

Refer to [IES Services Command Reference on page 897](#) for CLI syntax to configure IES subscriber interface parameters.

The following example displays a subscriber interface configuration:

```
A:ALA-48>config>service>ies>sub-if# info

 address 143.144.140.1/24
 group-interface "abc-if" create
 sap 1/1/19:0 create
 ingress
 qos 2
 filter ip 10
 exit
 static-host ip 143.144.145.100 mac 00:01:00:00:00:01 create
 exit
 exit
 exit

A:ALA-48>config>service>ies>sub-if#
```

## Configuring IES Interface Parameters

The following example displays an IES configuration with interface parameters:

```
A:ALA-48>config>service>ies>if# info

 address 10.1.1.1/24
 sap 1/1/10:0.* create
 ingress
 qos 100
 exit
 egress
 scheduler-policy "SLA1"
 exit
 exit
 vrrp 1 owner
 authentication-type password
 authentication-key "3WErEDozxyQ" hash
 exit

A:ALA-48>config>service>ies>if#
```

## Configuring Spoke-SDP Parameters

The following example displays a spoke SDP configuration.

```
A:ALA-48>config>service>ies# info

 description "to internet"
 interface "spokeSDP-test" create
 spoke-sdp 2:100 create
 egress
 filter ip 10
 exit
 exit
 exit
 exit
 no shutdown

A:ALA-48>config>service>ies#
```

## Configuring SAP Parameters

A SAP is a combination of a port and encapsulation parameters which identifies the service access point on the interface and within the router. Each SAP must be unique within a router.

When configuring IES SAP parameters, a default QoS policy is applied to each ingress and egress SAP. Additional QoS policies and scheduler policies must be configured in the `config>qos` context. Filter policies are configured in the **config>filter** context and must be explicitly applied to a SAP. There are no default filter policies.

IES interface ATM SAP parameters can only be configured on ATM-type MDAs and ATM-configured ports. See the 7750 SR OS Basic System Configuration Guide.

Refer to [IES Services Command Reference on page 897](#) for CLI syntax.

This example displays an IES SAP configuration.

```
*A:ALA-A>config>service>ies>if# info

 address 10.10.36.2/24
 sap 5/1/3.1:0 create
 ingress
 qos 101
 exit
 egress
 scheduler-policy "alpha"
 qos 1010
 exit
 exit

*A:ALA-A>config>service>ies>if#
```

## Configuring IES SAP ATM Parameters

The following example displays the command usage to create Apipe SAPs:

PE router 1 (A:ALA-41):

```
Example: A:ALA-41>config>service# ies 5
A:ALA-41>config>service>ies# sap 1/1/1:0/32 create
A:ALA-41>config>service>ies>sap# ingress
A:ALA-41>config>service>ies>sap>ingress# qos 102
A:ALA-41>config>service>ies>sap>ingress# exit
A:ALA-41>config>service>ies>sap# egress
A:ALA-41>config>service>ies>sap>egress# qos 103
A:ALA-41>config>service>ies>sap>egress# exit
A:ALA-41>config>service>ies>sap# no shutdown
A:ALA-41>config>service>ies>sap# exit
A:ALA-41>config>service>ies#
```

PE router 2 (A:ALA-42):

```
Example: A:ALA-42>config>service# ies 5
A:ALA-42>config>service>ies# sap 2/2/2:0/32 create
A:ALA-42>config>service>ies>sap# ingress
A:ALA-42>config>service>ies>sap>ingress# qos 102
A:ALA-42>config>service>ies>sap>ingress# exit
A:ALA-42>config>service>ies>sap# egress
A:ALA-42>config>service>ies>sap>egress# qos 103
A:ALA-42>config>service>ies>sap>egress# exit
A:ALA-42>config>service>ies>sap# no shutdown
A:ALA-42>config>service>ies>sap# exit
A:ALA-42>config>service>ies#
```

The following output displays the IES SAP configuration.

PE Router 1 (ALA-41):

```
A:ALA-41>config>service# info

...
 ies 5 customer 1 create
 description "apipe test"
 service-mtu 1400
 sap 1/1/1:0/32 create
 ingress
 qos 102
 exit
 egress
 qos 103
 exit
 exit
 no shutdown
 exit
...

A:ALA-41>config>service#
```

## Configuring VRRP

Configuring VRRP parameters on an IES interface is optional. VRRP can be configured in either an owner or non-owner mode. The owner is the VRRP router whose virtual router IP address is the same as the real interface IP address. This is the router that responds to packets addressed to one of the IP addresses for ICMP pings, TCP connections, etc. All other virtual router instances participating in this message domain must have the same VRID configured and cannot be configured as owner.

For further information about VRRP CLI syntax and command descriptions refer to the 7750 SR OS Router Configuration Guide.

The following example displays the IES configuration:

```
*A:ALA-A>config>service>ies>if# info

 address 10.10.36.2/24
 vrrp 2 owner
 backup 10.10.36.2
 authentication-type password
 authentication-key "3WErEDozxyQ" hash
 exit

*A:ALA-A>config>service#
```

## Configuring IPSec Parameters

The following output displays an IES service with IPSec parameters configured.

```
*A:ALA-49>config# info

...
 service
 ies 100 customer 1 create
 interface "ipsec-public" create
 address 10.10.10.1/24
 sap ipsec-1.public:1 create
 exit
 exit
 no shutdown
 exit
exit
...

*A:ALA-49>config#
```

## IGMP Host Tracking

The following output displays an IES service with IGMP host tracking parameters configured.

```
*A:ALA-49>config>service# info

...
 ies 25 customer 1 create
 interface "ip_if_4" create
 loopback
 delayed-enable 1200
 address 64.64.64.64/24
 sap lag-64:64 create
 no shutdown
 exit
 allow-directed-broadcasts
 host-connectivity-verify
 ip-mtu 9000
 local-dhcp-server "server 1"
 local-proxy-arp
 proxy-arp-policy treetrace-1
 remote-proxy-arp
 secondary 2.3.4.5 255.255.255.0
 secondary 2.3.4.5/24
 tos-marking-state trusted
 tos-marking-state untrusted
 urpf-check
 exit
 exit
 igmp-host-tracking
 expiry-time 65535
 no shutdown
 exit
 ...

*A:ALA-49>config>service#
```



## Service Management Tasks

This section discusses the following service management tasks:

- [Modifying IES Service Parameters on page 893](#)
- [Deleting a Spoke-SDP on page 894](#)
- [Deleting an IES Service on page 895](#)

### Modifying IES Service Parameters

Existing IES service parameters in the CLI or NMS can be modified, added, removed, enabled or disabled. The changes are applied immediately to all services when the changes are applied.

To display a list of customer IDs, use the `show service customer` command.

Enter the parameter(s) (such as description, SAP information and SDP information) and then enter the new information.

The following displays the modified service:

```
*A:ALA-A>config>service>ies# info

 ies 1000 customer 50 vpn 1000 create
 description "This is a new description"
 interface "to-web" create
 address 10.1.1.1/24
 mac 00:dc:98:1d:00:00
 allow-directed-broadcast
 sap 2/1/50:0 create
 exit
 exit
 no shutdown
 exit

*A:ALA-A>config>service#
```

## Deleting a Spoke-SDP

To delete the spoke SDP from the service interface must be shut it first. This cleans up the associated VC labels.

Use the following CLI syntax to delete a spoke SDP from an interface:

**CLI Syntax:** `config>service# ies service-id [customer customer-id] [vpn vpn-id]`

```
interface ip-int-name
 [no] spoke-sdp sdp-id:vc-id
 shutdown
```

The following example displays the spoke SDP configuration.

```
A:ALA-48>config>service>ies# info

description "to internet"
interface "spokeSDP-test" create
exit
no shutdown

A:ALA-48>config>service>ies#
```

## Deleting an IES Service

An IES service cannot be deleted until SAPs and interfaces are shut down *and* deleted and the service is shutdown on the service level.

Use the following CLI syntax to delete an IES service:

**CLI Syntax:**config>service#  
[no] ies *service-id*  
shutdown  
[no] interface *ip-int-name*  
shutdown  
[no] sap *sap-id*  
shutdown

## Disabling an IES Service

An IES service can be shut down without deleting the service parameters.

**CLI Syntax:** `config>service> ies service-id  
shutdown`

---

## Re-enabling an IES Service

To re-enable an IES service that was shut down.

**CLI Syntax:** `config>service> ies service-id  
[no] shutdown`

**Example:** `config>service# ies 2000  
config>service>ies# no shutdown  
config>service>ies# exit`

---

# IES Services Command Reference

---

## Command Hierarchies

- [Global Commands on page 897](#)
- [Interface Commands on page 897](#)
- [Redundant Interface Commands on page 901](#)
- [Interface SAP Commands on page 902](#)
- [VRRP Commands on page 906](#)
- [Spoke SDP Commands on page 908](#)
- [Subscriber Interface Commands on page 909](#)
- [Show Commands on page 915](#)
- [Clear Commands on page 916](#)
- [Debug Commands on page 916](#)
- [Monitor Commands on page 917](#)

### Global Commands

```

config
 — service
 — ies service-id [customer customer-id] [vpn vpn-id]
 — description description-string
 — no description
 — igmp-host-tracking
 — expiry-time expiry-time
 — [no] shutdown
 — service-name service-name
 — no service-name
 — [no] shutdown

```

### Interface Commands

```

config
 — service
 — ies service-id [customer customer-id] [vpn vpn-id]
 — [no] interface ip-int-name
 — [no] active-cpm-protocols
 — address {ip-address/mask | ip-address netmask} [broadcast [all-ones | host-ones]]
 — no address
 — [no] allow-directed-broadcasts
 — [no] arp-populate
 — arp-timeout seconds
 — no arp-timeout
 — authentication-policy name name
 — no authentication-policy name

```

- **bfd** *transmit-interval* [**receive** *receive-interval*] [**multiplier** *multiplier*][**echo-receive** *echo-interval*] [**type** *cpm-np*]
- **no bfd**
- **cflowd** [*acl* | *interface*]
- **no cflowd**
- **cpu-protection** *policy-id*
- **no cpu-protection**
- **description** *description-string*
- **no description**
- **dhcp**
  - **description** *description-string*
  - **no description**
  - **gi-address** *ip-address* [*src-ip-addr*]
  - **no gi-address**
  - **lease-populate** [*nbr-of-leases*]
  - **no lease-populate**
  - **[no] option**
    - **action** {*replace* | *drop* | *keep*}
    - **no action**
    - **circuit-id** [*ascii-tuple* | *ifindex* | *sap-id* | *vlan-ascii-tuple*]
    - **no circuit-id**
    - **remote-id** [*mac* | *string string*]
    - **no remote-id**
    - **[no] vendor-specific-option**
      - **[no] client-mac-address**
      - **[no] sap-id**
      - **[no] service-id**
      - **string** *text*
      - **no string**
      - **[no] system-id**
  - **proxy-server**
    - **emulated-server** *ip-address*
    - **no emulated-server**
    - **lease-time** [*days days*] [*hrs hours*] [*min minutes*] [*sec seconds*] [*radius-override*]
    - **no lease-time**
    - **[no] shutdown**
  - **server** *server1* [*server2...*(up to 8 max)]
  - **no server**
  - **[no] shutdown**
  - **[no] trusted**
- **host-connectivity-verify** [*source* {*vrrp* | *interface*}] [*interval interval*] [*action* {*remove* | *alarm*}]
- **icmp**
  - **[no] mask-reply**
  - **redirects** [*number seconds*]
  - **no redirects**
  - **ttl-expired** [*number seconds*]
  - **no ttl-expired**
  - **unreachables** [*number seconds*]
  - **no unreachables**
- **ip-mtu** *octets*
- **no ip-mtu**
- **ipcp**
  - **dns** *ip-address* [*secondary ip-address*]
  - **dns** *secondary ip-address*

- **no dns** *[ip-address] [secondary ip-address]*
- **peer-ip-address** *ip-address*
- **no peer-ip-address**
- **[no] ipv6**
  - **address** *ipv6-address/prefix-length [eui-64]*
  - **no address** *ipv6-address/prefix-length*
  - **[no] dhcp6-relay**
    - **description** *description-string*
    - **no description**
    - **lease-populate** *[nbr-of-leases]*
    - **no lease-populate**
    - **[no] neighbor-resolution**
    - **[no] option**
      - **interface-id**
      - **interface-id** *ascii-tuple*
      - **interface-id** *ifindex*
      - **interface-id** *sap-id*
      - **interface-id** *string*
      - **no interface-id**
      - **[no] remote-id**
    - **server** *ipv6z-address [ipv6z-address...(up to 8 max)]*
    - **no server** *[ipv6z-address...(up to 8 max)]*
    - **[no] shutdown**
    - **source-address** *ipv6-address*
    - **no source-address**
  - **[no] dhcp6-server**
    - **max-nbr-of-leases** *max-nbr-of-leases*
    - **no max-nbr-of-leases**
    - **[no] prefix-delegation**
      - **[no] prefix** *ipv6-address/prefix-length*
      - **duid** *duid [iaid iaid]*
      - **no duid**
      - **preferred-lifetime** *seconds*
      - **preferred-lifetime** *infinite*
      - **no preferred-lifetime**
      - **valid-lifetime** *seconds*
      - **valid-lifetime** *infinite*
      - **no valid-lifetime**
      - **[no] shutdown**
  - **icmp6**
    - **packet-too-big** *[number seconds]*
    - **no packet-too-big**
    - **param-problem** *[number seconds]*
    - **no param-problem**
    - **redirects** *[number seconds]*
    - **no redirects**
    - **time-exceeded** *[number seconds]*
    - **no time-exceeded**
    - **unreachables** *[number seconds]*
    - **no unreachables**
  - **[no] local-proxy-nd**
  - **neighbor** *ipv6-address mac-address*
  - **no neighbor** *ipv6-address*
  - **proxy-nd-policy** *policy-name [policy-name...(up to 5 max)]*
  - **no proxy-nd-policy**

- [no] **local-dhcp-server**
- [no] **local-proxy-arp**
- [no] **loopback**
- [no] **mac** *ieee-address*
- [no] **proxy-arp-policy** *policy-name* [*policy-name...*(up to 5 max)]
- [no] **remote-proxy-arp**
- **secondary** {*ip-address/mask* | *ip-address netmask*} [**broadcast all-ones** | **host-ones**] [**igmp-inhibit**]
- no **secondary** *ip-address*
- [no] **shutdown**
- [no] **static-arp** *ip-address*
- **tos-marking-state** {**trusted** | **untrusted**}
- no **tos-marking-state**
- **unnumbered** [*ip-int-name* | *ip-address*]
- no **unnumbered**
- [no] **urpf-check**
  - **mode** {**strict** | **loose**}
  - no **mode**



## Redundant Interface Commands

```

config
 — service
 — ies service-id [customer customer-id] [vpn vpn-id]
 — [no] redundant-interface ip-int-name
 — address {ip-address/mask | ip-address netmask} [remote-ip ip-address]
 — no address
 — description description-string
 — no description
 — [no] shutdown
 — no spoke-sdp sdp-id:vc-id
 — egress
 — filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
 — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
 — vc-label egress-vc-label
 — no vc-label [egress-vc-label]
 — ingress
 — filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
 — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
 — vc-label ingress-vc-label
 — no vc-label [ingress-vc-label]
 — [no] shutdown

```

## Interface SAP Commands

```

config
 — service
 — ies service-id [customer customer-id] [vpn vpn-id]
 — [no] interface ip-int-name
 — [no] sap sap-id
 — accounting-policy acct-policy-id
 — no accounting-policy [acct-policy-id]
 — anti-spoof {ip | ip-mac}
 — no anti-spoof
 — app-profile app-profile-name
 — no app-profile
 — atm
 — egress
 — traffic-desc traffic-desc-profile-id
 — no traffic-desc
 — encapsulation atm-encap-type
 — ingress
 — traffic-desc traffic-desc-profile-id
 — no traffic-desc
 — oam
 — [no] alarm-cells
 — [no] periodic-loopback
 — [no] collect-stats
 — eth-cfm
 — mep mep-id domain md-index association ma-index
 [direction {up | down}]
 — no mep mep-id domain md-index association ma-
 index
 — [no] ccm-enable
 — ccm-ltm-priority priority
 — no ccm-ltm-priority
 — fault-propagation-enable {use-if-tlv | sus-
 pend-ccm}
 — no fault-propagation-enable
 — low-priority-defect {allDef | macRemErrX-
 con | remErrXcon | errXcon | xcon | noX-
 con}
 — mac-address mac-address
 — no mac-address
 — [no] shutdown
 — description description-string
 — no description
 — egress
 — agg-rate-limit agg-rate [queue-frame-based-
 accounting]
 — no agg-rate-limit
 — [no] qinq-mark-top-only
 — filter [ip ip-filter-id]
 — filter [ipv6 ipv6-filter-id]
 — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
 — [no] hsm-da-queue-override
 — packet-byte-offset {add add-bytes | subtract
 sub-bytes}
 — no packet-byte-offset
 — queue queue-id [create]

```

```

— no queue queue-id
— rate pir-rate [cir cir-rate]
— no rate
— slope-policy hsmda-slope-policy-name
— no slope-policy
— secondary-shaper secondary-shaper-name
— no secondary-shaper
— qos sap-egress-policy-id
— no qos
— [no] queue-override
— [no] queue queue-id
— adaptation-rule [pir {max | min | closest}] [cir {max | min | closest}]
— no adaptation-rule
— avg-frame-overhead percentage
— no avg-frame-overhead
— cbs size-in-kbytes
— no cbs
— high-prio-only percent
— no high-prio-only
— mbs size-in-kbytes
— no mbs
— rate pir-rate [cir cir-rate]
— no rate
— [no] scheduler-override
— [no] scheduler scheduler-name
— rate pir-rate [cir cir-rate]
— no rate
— scheduler-policy scheduler-policy-name
— no scheduler-policy
— frame-relay
— [no] frf-12
— ete-fragment-threshold fragment-threshold
— no ete-fragment-threshold
— [no] interleave
— [no] scheduling-class class-id
— host {[ip ip-address] [mac ieee-address]} [subscriber sub-ident-string] [sub-profile sub-profile-name] [sla-profile sla-profile-name]
— no host {[ip ip-address] [mac ieee-address]}
— no host all
— ingress
— filter [ip ip-filter-id]
— filter [ipv6 ipv6-filter-id]
— no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
— [no] hsmda-queue-override
— packet-byte-offset {add add-bytes | subtract sub-bytes}
— no packet-byte-offset
— queue queue-id [create]
— no queue queue-id
— rate pir-rate [cir cir-rate]
— no rate
— slope-policy hsmda-slope-policy-name

```

- **no slope-policy**
- **secondary-shaper** *secondary-shaper-name*
- **no secondary-shaper**
- **match-qinq-dot1p** {**top** | **bottom**}
- **no match-qinq-dot1p**
- **qos** *policy-id* [**shared-queuing** | **multipoint-shared**]
- **no qos** *policy-id*
- **[no] queue-override**
  - **[no] queue** *queue-id*
  - **adaptation-rule** [**pir** {**max** | **min** | **closest**}] [**cir** {**max** | **min** | **closest**}]
  - **no adaptation-rule**
  - **avg-frame-overhead** *percentage*
  - **no avg-frame-overhead**
  - **cbs** *size-in-kbytes*
  - **no cbs**
  - **high-prio-only** *percent*
  - **no high-prio-only**
  - **mbs** *size-in-kbytes*
  - **no mbs**
  - **rate** *pir-rate* [**cir** *cir-rate*]
  - **no rate**
- **[no] scheduler-override**
  - **[no] scheduler** *scheduler-name*
  - **rate** *pir-rate* [**cir** *cir-rate*]
  - **no rate**
- **scheduler-policy** *scheduler-policy-name*
- **no scheduler-policy**
- **[no] ipsec-gw**
  - **default-secure-service** *service-id* **ipsec-interface** *ip-int-name*
  - **no default-secure-service**
  - **default-tunnel-template** *ipsec template identifier*
  - **no default-tunnel-template**
  - **local-gateway-address** *ip-address*
  - **no local-gateway-address**
  - **pre-shared-key** *key*
  - **no pre-shared-key**
  - **[no] shutdown**
- **multi-service-site** *customer-site-name*
- **no multi-service-site**
- **static-host** **ip** *ip/did-address* [**mac** *ieee-address*] [**create**]
- **static-host** **mac** *ieee-address* [**create**]
- **no static-host** [**ip** *ip-address*] **mac** *ieee-address*
- **no static-host** **all** [**force**]
- **no static-host** **ip** *ip-address*
  - **ancp-string** *ancp-string*
  - **no ancp-string**
  - **app-profile** *app-profile-name*
  - **no app-profile**
  - **inter-dest-id** *intermediate-destination-id*
  - **no inter-dest-id**
  - **[no] shutdown**
  - **sla-profile** *sla-profile-name*
  - **no sla-profile**
  - **sub-profile** *sub-profile-name*

- **no sub-profile**
- **subscriber** *sub-ident*
- **no subscriber**
- **[no] subscriber-sap-id**
- **tod-suite** *tod-suite-name*
- **no tod-suite**
- **[no] shutdown**

## VRRP Commands

```

config
 — service
 — ies service-id [customer customer-id] [vpn vpn-id]
 — [no] interface ip-int-name
 — [no] ipv6
 — vrrp virtual-router-id [owner]
 — no vrrp virtual-router-id
 — [no] backup ip-address
 — init-delay seconds
 — no init-delay
 — mac mac-address
 — no mac
 — [no] master-int-inherit
 — message-interval {[seconds] [milliseconds milliseconds]}
 — no message-interval
 — [no] ping-reply
 — policy vrrp-policy-id
 — no policy
 — [no] preempt
 — priority base-priority
 — no priority
 — [no] shutdown
 — [no] standby-forwarding
 — [no] telnet-reply
 — [no] traceroute-reply
 — vrrp virtual-router-id [owner]
 — no vrrp virtual-router-id
 — authentication-key {authentication-key | hash-key} [hash |
 hash2]
 — no authentication-key
 — authentication-type {password | message-digest}
 — no authentication-type
 — [no] backup ip-address
 — [no] bfd-enable [base | service-id] interface interface-name
 dst-ip ip-address
 — init-delay seconds
 — no init-delay
 — mac ieee-address
 — no mac
 — [no] master-int-inherit
 — message-interval {[seconds] [milliseconds milliseconds]}
 — no message-interval
 — [no] ping-reply
 — policy vrrp-policy-id
 — no policy
 — [no] preempt
 — priority priority
 — no priority
 — [no] shutdown
 — [no] ssh-reply
 — [no] standby-forwarding

```

- **[no] telnet-reply**
- **[no] traceroute-reply**

## Spoke SDP Commands

```

config
 — service
 — ies service-id [customer customer-id] [vpn vpn-id]
 — [no] interface ip-int-name
 — [no] spoke-sdp sdp-id:vc-id [vc-type {ether | ipipe}] [create]
 — accounting-policy acct-policy-id
 — no accounting-policy
 — app-profile app-profile-name
 — no app-profile
 — [no] collect-stats
 — eth-cfm
 — mep mep-id domain md-index association ma-index
 [direction {up | down}]
 — no mep mep-id domain md-index association ma-index
 — [no] ccm-enable
 — ccm-ltm-priority priority
 — no ccm-ltm-priority
 — fault-propagation-enable {use-if-tlv | suspend-ccm}
 — no fault-propagation-enable
 — low-priority-defect {allDef | macRemErrXcon | remErrXcon | errXcon | xcon | noXcon}
 — mac-address mac-address
 — no mac-address
 — [no] shutdown
 — egress
 — filter [ip ip-filter-id]
 — filter [ipv6 ipv6-filter-id]
 — no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
 — vc-label egress-vc-label
 — no vc-label [egress-vc-label]
 — [no] hash-label
 — ingress
 — filter {ip ip-filter-id}
 — filter [ipv6 ipv6-filter-id]
 — no filter
 — vc-label ingress-vc-label
 — no vc-label [ingress-vc-label]
 — [no] shutdown

```



## Subscriber Interface Commands

```

config
 — service
 — ies service-id [customer customer-id] [vpn vpn-id]
 — [no] subscriber-interface ip-int-name
 — [no] address {ip-address/mask | ip-address netmask} [gw-ip-address ip-address]
 — delayed-enable seconds [init-only]
 — no delayed-enable
 — description description-string
 — no description
 — dhcp
 — gi-address ip-address [src-ip-addr]
 — no gi-address
 — [no] group-interface ip-int-name
 — arp-host
 — host-limit max-num-hosts
 — no host-limit
 — min-auth-interval min-auth-interval
 — no min-auth-interval
 — sap-host-limit max-num-hosts-sap
 — no sap-host-limit
 — [no] shutdown
 — [no] arp-populate
 — arp-timeout seconds
 — no arp-timeout
 — authentication-policy name
 — no authentication-policy
 — description description-string
 — no description
 — dhcp
 — client-applications dhcp
 — client-applications pppoe
 — client-applications dhcp pppoe
 — no client-applications
 — description description-string
 — no description
 — gi-address ip-address [src-ip-addr]
 — no gi-address
 — lease-populate nbr-of-leases
 — no lease-populate
 — [no] match-circuit-id
 — [no] option
 — action {replace | drop | keep}
 — no action
 — circuit-id [ascii-tuple | ifindex | sap-id | vlan-ascii-tuple]
 — no circuit-id
 — remote-id [mac | string string]
 — no remote-id
 — [no] vendor-specific-option
 — [no] client-mac-address
 — [no] sap-id
 — [no] service-id

```

```

— string text
— no string
— [no] system-id
— proxy-server
— emulated-server ip-address
— no emulated-server
— lease-time [days days] [hrs hours] [min min-utes] [sec seconds] [radius-override]
— no lease-time
— [no] lease-time
— [no] shutdown
— server server1 [server2...(up to 8 max)]
— no server
— [no] shutdown
— [no] trusted
— user-db local-user-db-name
— no user-db
— host-connectivity-verify [interval interval] [action {remove | alarm}]
— icmp
— [no] mask-reply
— redirects [number seconds]
— no redirects
— ttl-expired [number seconds]
— no ttl-expired
— unreachables [number seconds]
— no unreachables
— [no] ipv6
— [no] router-advertisements
— current-hop-limit hop-count
— no current-hop-limit
— [no] managed-configuration
— max-advertisement-interval seconds
— no max-advertisement-interval
— min-advertisement-interval seconds
— no min-advertisement-interval
— mtu bytes
— no mtu
— [no] other-stateful-configuration
— [no] prefix-options
— [no] autonomous
— preferred-lifetime [seconds | infinite]
— no preferred-lifetime
— valid-lifetime [seconds | infinite]
— no valid-lifetime
— reachable-time milliseconds
— no reachable-time
— retransmit-time milliseconds
— no retransmit-time
— router-lifetime seconds
— router-lifetime no-default-router
— no router-lifetime
— [no] dhcp6
— [no] proxy-server
— renew-timer seconds
— no renew-timer
— rebind-timer seconds

```

- **no rebind-timer**
- **preferred-lifetime** *[seconds | infinite]*
- **no preferred-lifetime**
- **valid-lifetime** *[seconds | infinite]*
- **no valid-lifetime**
- **client-applications** *[dhcp] [pppoe]*
- **no client-applications**
- **[no] shutdown**
- **[no] local-proxy-arp**
- **[no] mac** *ieee-address*
- **[no] oper-up-while-empty**
- **[no] pppoe**
  - **description** *description-string*
  - **no description**
  - **dhcp-client**
    - **[no] ccag-use-origin-sap**
  - **pap-chap-user-db** *local-user-db-name*
  - **no pap-chap-user-db**
  - **pppoe-policy** *pppoe-policy-name*
  - **no pppoe-policy**
  - **sap-session-limit** *sap-session-limit*
  - **no sap-session-limit**
  - **session-limit** *session-limit*
  - **no session-limit**
  - **user-db** *local-user-db-name*
  - **no user-db**
  - **[no] shutdown**
- **[no] proxy-arp-policy** *policy-name [policy-name...(up to 5 max)]*
- **redundant-interface** *red-ip-int-name*
- **no redundant-interface**
- **[no] remote-proxy-arp**
- **[no] ipv6**
  - **[no] delegated-prefix-length** *prefix-length*
  - **[no] subscriber-prefixes**
    - **prefix** *ipv6-address/prefix-length [pd|wan-host]*
    - **no prefix** *ipv6-address/prefix-length*

## Group Interface SAP Commands

```

config
— service
— ies service-id [customer customer-id] [vpn vpn-id]
— [no] subscriber-interface ip-int-name
— group-interface ip-int-name [create]
— no group-interface ip-int-name
— [no] sap sap-id
— accounting-policy acct-policy-id
— no accounting-policy [acct-policy-id]
— anti-spoof {ip | ip-mac | nh-mac}
— no anti-spoof
— app-profile app-profile-name
— no app-profile
— atm
— egress
— traffic-desc traffic-desc-profile-id
— no traffic-desc
— encapsulation atm-encap-type
— ingress
— traffic-desc traffic-desc-profile-id
— no traffic-desc
— oam
— [no] alarm-cells
— [no] periodic-loopback
— calling-station-id calling-station-id
— no calling-station-id
— [no] collect-stats
— description description-string
— no description
— egress
— agg-rate-limit agg-rate [queue-frame-
based-accounting]
— no agg-rate-limit agg-rate
— filter ip ip-filter-id
— no filter
— filter ipv6 ipv6-filter-id
— no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
— [no] qinq-mark-top-only
— qos policy-id
— no qos policy-id
— [no] queue-override
— [no] queue queue-id
— adaptation-rule [pir {max | min | clos-
est}] [cir {max | min | closest}]
— no adaptation-rule
— avg-frame-overhead percentage
— no avg-frame-overhead
— cbs size-in-kbytes
— no cbs
— high-prio-only percent
— no high-prio-only
— mbs {size-in-kbytes | default}
— no mbs
— rate pir-rate [cir cir-rate]

```

- **no rate**
- **scheduler-policy** *scheduler-policy-name*
- **scheduler-policy**
- **eth-cfm**
  - **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**direction** {**up** | **down**}]
  - **no mep** *mep-id* **domain** *md-index* **association** *ma-index*
  - **fault-propagation-enable** {**use-if-tlv** | **suspend-ccm**}
  - **no fault-propagation-enable**
- **host ip** *ip-address* [**mac** *ieee-address*] [**subscriber** *sub-ident-string*] [**sub-profile** *sub-profile-name*] [**sla-profile** *sla-profile-name*] [**ancp-string** *ancp-string*]
- **no host** {[**ip** *ip-address*] [**mac** *ieee-address*]}
- **no host** **all**
- **igmp-host-tracking**
  - **expiry-time** *expiry-time*
  - **no expiry-time**
  - **import** *policy-name*
  - **no import**
  - **max-num-group** *max-num-groups*
  - **no max-num-group**
  - **max-num-sources** *max-num-sources*
  - **no max-num-sources**
- [**no**] **shutdown**
- **ingress**
  - **filter ip** *ip-filter-id*
  - **no filter**
  - **filter ipv6** *ipv6-filter-id*
  - **no filter** [**ip** *ip-filter-id*] [**ipv6** *ipv6-filter-id*]
  - **match-qinq-dot1p** {**top**|**bottom**}
  - **no match-qinq-dot1p**
  - **qos** *policy-id* [**shared-queuing**]
  - **no qos** *policy-id*
  - **scheduler-policy** *scheduler-policy-name*
  - **no scheduler-policy**
- **multi-service-site** *customer-site-name*
- **no multi-service-site**
- **static-host ip** *ip/did-address* [**mac** *ieee-address*] [**create**]
- **static-host mac** *ieee-address* [**create**]
- **no static-host** [**ip** *ip-address*] **mac** *ieee-address*
- **no static-host** **all** [**force**]
- **no static-host ip** *ip-address*
  - **ancp-string** *ancp-string*
  - **no ancp-string**
  - **app-profile** *app-profile-name*
  - **no app-profile**
  - **inter-dest-id** *intermediate-destination-id*
  - **no inter-dest-id**
  - **managed-routes**
    - **route** {*ip-prefix/length* | *ip-prefix net-mask*} [**create**]

- **no route** {ip-prefix/length | ip-prefix net-mask}
- **[no] shutdown**
- **sla-profile** sla-profile-name
- **no sla-profile**
- **sub-profile** sub-profile-name
- **no sub-profile**
- **subscriber** sub-ident
- **no subscriber**
- **[no] subscriber-sap-id**
- **[no] shutdown**
- **[no] sub-sla-mgmt**
  - **def-sla-profile** default-sla-profile-name
  - **no def-sla-profile**
  - **def-sub-profile** default-subscriber-profile-name
  - **no def-sub-profile**
  - **multi-sub-sap** subscriber-limit
  - **no multi-sub-sap**
  - **[no] shutdown**
  - **single-sub-parameters**
    - **non-sub-traffic sub-profile** sub-profile-name **sla-profile** sla-profile-name [**subscriber** sub-ident-string]
    - **no non-sub-traffic**
    - **[no] profiled-traffic-only**
    - **sub-ident-policy** sub-ident-policy-name
    - **no sub-ident-policy**
    - **tod-suite** tod-suite-name
    - **no tod-suite**
- **[no] shutdown**
- **[no] srrp** srrp-id
  - **[no] bfd-enable** [base |service-id] **interface** interface-name **dst-ip** ip-address
  - **description** description-string
  - **no description**
  - **gw-mac** mac-address
  - **no gw-mac**
  - **keep-alive-interval** interval
  - **no keep-alive-interval**
  - **message-path** sap-id
  - **no message-path**
  - **[no] policy** vrrp-policy-id
  - **priority** priority
  - **no priority**
  - **[no] shutdown**

## Show Commands

```

show
 — service
 — customer [customer-id] [site customer-site-name]
 — egress-label start-label [end-label]
 — ingress-label end-label [end-label]
 — sap-using [sap sap-id]
 — sap-using interface [ip-address | ip-int-name]
 — sap-using [ingress | egress] atm-td-profile td-profile-id
 — sap-using [ingress | egress] filter filter-id
 — sap-using [ingress | egress] qos-policy qos-policy-id
 — sap-using authentication-policy policy-name
 — service-using [ies] [customer customer-id]
 — subscriber-using [service-id service-id] [sap-id sap-id] [interface ip-int-name] [ip ip-address[/mask]] [mac ieee-address] [sub-profile sub-profile-name] [sla-profile sla-profile-name]
 — id service-id
 — all
 — arp [ip-address] [[mac ieee-address]] [sap sap-id] [[interface ip-int-name]] [sdp sdp-id:vc-id]
 — arp-host [wholesaler service-id] [sap sap-id | interface interface-name | ip-address ip-address[/mask] | mac ieee-address | {[port port-id] [no-inter-dest-id | inter-dest-id inter-dest-id]}] [detail]
 — arp-host statistics [sap sap-id | interface interface-name]
 — arp-host summary [interface interface-name]
 — authentication
 — statistics [policy name] [sap sap-id]
 — base
 — dhcp
 — lease-state [[sap sap-id] | [sdp sdp-id:vc-id] | [interface interface-name] | [ip-address ip-address]] [detail]
 — statistics [sap sap-id]
 — statistics [sdp sdp-id:vc-id]
 — statistics [interface interface-name]
 — summary
 — gsmp
 — neighbors group [name] [ip-address]
 — sessions [group name] neighbor ip-address [port port-number] [association] [statistics]
 — host
 — host-connectivity-verify statistics [sap sap-id]
 — interface [ip-address | ip-int-name] [interface-type] [detail] [family]
 — interface
 — retailers
 — sap sap-id [detail]
 — sdp [{sdp-id | far-end ip-address}] [detail]
 — subscriber-hosts [sap sap-id] [ip ip-address[/mask]] [mac ieee-address] [sub-profile sub-profile-name] [sla-profile sla-profile-name] [detail]
 — wholesalers
 — router
 — dhcp
 — statistics [ip-int-name | ip-address]
 — summary

```

- **vrrp**
  - **instance**
  - **instance interface** *interface-name* [**vrid** *virtual-router-id*]
  - **instance interface** *interface-name* **vrid** *virtual-router-id* **ipv6**
  - **statistics**

## Clear Commands

- clear**
  - **router**
    - **dhcp**
      - **statistics** [*ip-int-name* | *ip-address*]
    - **interface** [*ip-int-name* | *ip-address*] [**icmp**]
    - **vrrp**
    - **interface** *interface-name* [**vrid** *virtual-router-id*]
    - **interface** *interface-name* **vrid** *virtual-router-id* **ipv6**
    - **statistics**
    - **statistics interface** *interface-name* [**vrid** *virtual-router-id*]
    - **statistics interface** *interface-name* **vrid** *virtual-router-id* **ipv6**
- clear**
  - **service**
    - **id** *service-id*
      - **arp-host**
      - **arp-host** { **mac** *ieee-address* | **sap** *sap-id* | **ip-address** *ip-address*[/mask] }
      - **arp-host** [**port** *port-id*] [**inter-dest-id** *intermediate-destination-id* | **no-inter-dest-id**]
      - **arp-host statistics** [**sap** *sap-id* | **interface** *interface-name*]
      - **fdb** {**all** | **mac** *ieee-address* | **sap** *sap-id* | **mesh-sdp** *sdp-id*[:*vc-id*] | **spoke-sdp** *sdp-id*[:*vc-id*]}]
      - **dhcp**
        - **lease-state**
        - **lease-state ip-address** *ip-address*
        - **lease-state mac** *ieee-address*
        - **lease-state sap** *sap-id*
        - **lease-state sdp** *sdp-id*[:*vc-id*]
      - **dhcp6**
        - **lease-state** [**ip-address** *ipv6-address/prefix-length*] [**mac** *ieee-address*]
        - **lease-state** [**interface** *ip-int-name* | *ipv6-address*]
      - **site** *service-id*
      - **spoke-sdp** *sdp-id*[:*vc-id*] *ingress-vc-label*
      - **stp**

## Debug Commands

- debug**
  - **service**
    - **id** *service-id*
    - [**no**] **arp-host**
      - [**no**] **host-connectivity-verify**
        - [**no**] **ip** *ip-address*
        - [**no**] **mac** *ieee-address*
        - [**no**] **sap** *sap-id*
  - **router**
    - **vrrp**



- **[no] events**
- **events** *interface-name* [**vrid** *virtual-router-id*]
- **events** *interface-name* **vrid** *virtual-router-id* **ipv6**
- **[no] packets**
- **packets** *interface-name* [**vrid** *virtual-router-id*]
- **packets** *interface-name* **vrid** *virtual-router-id* **ipv6**

## Monitor Commands

- monitor**
  - **router**
    - **vrrp**
      - **instance** **interface** *interface-name* **vr-id** *virtual-router-id* [**ipv6**] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]



# IES Service Configuration Commands

## Generic Commands

### shutdown

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>[no] shutdown</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>       | <pre> config&gt;service&gt;ies config&gt;service&gt;ies&gt;igmp-trk config&gt;service&gt;ies&gt;if&gt;sap&gt;eth-cfm config&gt;service&gt;ies&gt;sub-if config&gt;service&gt;ies&gt;sub-if&gt;grp-if config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;dhcp config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap&gt;sub-sla-mgmt config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;srrp config&gt;service&gt;ies&gt;interface config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;ipv6&gt;dhcp6&gt;proxy-server config&gt;service&gt;ies&gt;if&gt;vrrp config&gt;service&gt;ies&gt;if&gt;dhcp config&gt;service&gt;ies&gt;if&gt;dhcp&gt;proxy-server config&gt;service&gt;ies&gt;if&gt;sap&gt;static-host config&gt;service&gt;ies&gt;redundant-interface config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;pppoe </pre>                                                                                   |
| <b>Description</b>   | <p>This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics. The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they may be deleted.</p> <p>Services are created in the administratively down (<b>shutdown</b>) state. When a <b>no shutdown</b> command is entered, the service becomes administratively up and then tries to enter the operationally up state. Default administrative states for services and service entities is described below in Special Cases.</p> <p>The <b>no</b> form of this command places the entity into an administratively enabled state.</p>                                                                                                                                                                    |
| <b>Special Cases</b> | <p><b>IES</b> — The default administrative status of an IES service is down. While the service is down, all its associated virtual router interfaces will be operationally down. The administrative state of the service is not reflected in the administrative state of the virtual router interface.</p> <p>For example if:</p> <ol style="list-style-type: none"> <li>1) An IES service is operational and an associated interface is shut down.</li> <li>2) The IES service is administratively shutdown and brought back up.</li> <li>3) The interface shutdown will remain in administrative shutdown state.</li> </ol> <p>A service is regarded as operational provided that one IP Interface is operational.</p> <p>Shutting down a subscriber interface will operationally shut down all child group interfaces and SAPs. Shutting down a group interface will operationally shut down all SAPs that are part of that group-interface.</p> |

**IES IP Interfaces** — When the IP interface is shutdown, it enters the administratively and operationally down states. For a SAP bound to the IP interface, no packets are transmitted out the SAP and all packets received on the SAP will be dropped while incrementing the packet discard counter.

description

|                    |                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>description</b> <i>description-string</i><br><b>no description</b>                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>ies<br>config>service>ies>sub-if<br>config>service>ies>sub-if>grp-if<br>config>service>ies>sub-if>grp-if>dhcp<br>config>service>ies>if>dhcp<br>config>service>ies>redundant-interface<br>config>service>ies>sub-if>grp-if>srrp<br>config>service>ies>sub-if>grp-if>pppoe                                                               |
| <b>Description</b> | <p>This command creates a text description stored in the configuration file for a configuration context.</p> <p>The <b>description</b> command associates a text string with a configuration context to help identify the content in the configuration file.</p> <p>The <b>no</b> form of this command removes the string from the configuration.</p> |
| <b>Default</b>     | No description associated with the configuration context.                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <i>string</i> — The description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                     |

## IES Global Commands

### ies

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <pre>ies service-id customer customer-id [vpn vpn-id] ies service-id no ies service-id</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command creates or edits an IES service instance.</p> <p>The <b>ies</b> command is used to create or maintain an Internet Enhanced Service (IES). If the <i>service-id</i> does not exist, a context for the service is created. If the <i>service-id</i> exists, the context for editing the service is entered.</p> <p>IES services allow the creation of customer facing IP interfaces in the same routing instance used for service network core routing connectivity. IES services require that the IP addressing scheme used by the subscriber must be unique between it and other addressing schemes used by the provider and potentially the entire Internet.</p> <p>While IES is part of the routing domain, the usable IP address space may be limited. This allows a portion of the service provider address space to be set aside for service IP provisioning, becoming administered by a separate but subordinate address authority. This feature is defined using the <b>config router service-prefix</b> command.</p> <p>IP interfaces defined within the context of an IES service ID must have a SAP created as the access point to the subscriber network. This allows a combination of bridging and IP routing for redundancy purposes.</p> <p>When a service is created, the <b>customer</b> keyword and <i>customer-id</i> must be specified and associates the service with a customer. The <i>customer-id</i> must already exist having been created using the <b>customer</b> command in the service context. Once a service has been created with a customer association, it is not possible to edit the customer association. The service must be deleted and recreated with a new customer association.</p> <p>Once a service is created, the use of the <b>customer</b> <i>customer-id</i> is optional for navigating into the service configuration context. Attempting to edit a service with the incorrect <i>customer-id</i> specified will result in an error.</p> <p>Multiple IES services are created to separate customer owned IP interfaces. More than one IES service may be created for a single customer ID. More than one IP interface may be created within a single IES service ID. All IP interfaces created within an IES service ID belongs to the same customer.</p> <p>By default, no IES service instances exist until they are explicitly created.</p> <p>The <b>no</b> form of this command deletes the IES service instance with the specified <i>service-id</i>. The service cannot be deleted until all the IP interfaces defined within the service ID have been shutdown and deleted.</p> |
| <b>Parameters</b>  | <p><i>service-id</i> — The unique service identification number or string identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

type. The *service-id* must be the same number used for every 7750 SR, 7450 ESS and 7710 SR on which this service is defined.

**Values**      *service-id:*      1 — 2147483648  
                  *svc-name:*        64 characters maximum

**customer** *customer-id* — Specifies the customer ID number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting.

**Values**      1 — 2147483647

**vpn** *vpn-id* — Specifies the VPN ID number which allows you to identify virtual private networks (VPNs) by a VPN identification number.

**Values**      1 — 2147483647

**Default**     null (0)

service-name

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>service-name</b> <i>service-name</i><br><b>no service-name</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>ies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command configures an optional service name, up to 64 characters in length, which adds a name identifier to a given service to then use that service name in configuration references as well as display and use service names in show commands throughout the system. This helps the service provider/administrator to identify and manage services within the 7750 SR, 7450 ESS and 7710 SR platforms.</p> <p>All services are required to assign a service ID to initially create a service. However, either the service ID or the service name can be used to identify and reference a given service once it is initially created.</p> |
| <b>Parameters</b>  | <i>service-name</i> — Specifies a unique service name to identify the service. Service names may not begin with an integer (0-9).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

igmp-host-tracking

|                    |                                                                              |
|--------------------|------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>igmp-host-tracking</b>                                                    |
| <b>Context</b>     | config>service>ies<br>config>service>ies>sub-if>grp-if>sap                   |
| <b>Description</b> | This command enables the context to configure IGMP host tracking parameters. |

## expiry-time

|                    |                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>expiry-time</b> <i>expiry-time</i><br><b>no expiry-time</b>                                                                                                      |
| <b>Context</b>     | config>service>ies>igmp-trk<br>config>service>ies>sub-if>grp-if>sap>igmp-trk                                                                                        |
| <b>Description</b> | This command configures the time that the system continues to track inactive hosts.<br>The <b>no</b> form of the command removes the values from the configuration. |
| <b>Default</b>     | no expiry-time                                                                                                                                                      |
| <b>Parameters</b>  | <i>expiry-time</i> — Specifies the time, in seconds, that this system continues to track an inactive host.<br><b>Values</b> 1 — 65535                               |

## max-num-group

|                    |                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-num-groups</b> <i>max-num-groups</i><br><b>no max-num-groups</b>                                                                                               |
| <b>Context</b>     | config>service>ies>sap>igmp-trk                                                                                                                                       |
| <b>Description</b> | This command configures the maximum number of multicast groups allowed to be tracked.<br>The <b>no</b> form of the command removes the values from the configuration. |
| <b>Default</b>     | no max-num-groups                                                                                                                                                     |
| <b>Parameters</b>  | <i>max-num-groups</i> — Specifies the maximum number of multicast groups allowed to be tracked.<br><b>Values</b> 1 — 196607                                           |

## max-num-sources

|                    |                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-num-sources</b> <i>max-num-sources</i><br><b>no max-num-sources</b>                                                                                                      |
| <b>Context</b>     | config>service>ies>sap>igmp-trk                                                                                                                                                 |
| <b>Description</b> | This command configures the maximum number of multicast sources allowed to be tracked per group.<br>The <b>no</b> form of the command removes the value from the configuration. |
| <b>Parameters</b>  | <i>max-num-sources</i> — Specifies the maximum number of multicast sources allowed to be tracked per group.<br><b>Values</b> 1 — 1000                                           |

## import

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>import</b> <i>policy-name</i><br><b>no import</b>                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap>igmp-trk                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command specifies the import routing policy to be used for IGMP packets to be used on this SAP. Only a single policy can be imported on a single SAP at any time.<br><br>The <b>no</b> form of the command removes the policy association from the SAP.                                                                                                                                                   |
| <b>Default</b>     | <b>no import</b> — No import policy is specified.                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>policy-name</i> — The import policy name. Values can be string up to 32 characters long of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. These policies are configured in the <b>config&gt;router&gt;policy-options</b> context The router policy must be defined before it can be imported. |



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## Redundant Interface Commands

### redundant-interface

|                    |                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] redundant-interface</b> <i>ip-int-name</i>                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>ies                                                                                                                                                                                                                                  |
| <b>Description</b> | This command configures a redundant interface.                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the name of the IP interface. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. |

### address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>address</b> { <i>ip-address/mask</i>   <i>ip-address netmask</i> } [ <b>remote-ip</b> <i>ip-address</i> ]<br><b>no address</b>                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>ies>redundant-interface                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command assigns an IP address mask or netmask and a remote IP address to the interface.                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>ip-address/mask</i> — Assigns an IP address/IP subnet format to the interface.<br><i>ip-address netmask</i> — Specifies a string of 0s and 1s that mask or screen out the network part of an IP address so that only the host computer part of the address remains.<br>Assigns an IP address netmask to the interface.<br><b>remote-ip</b> <i>ip-address</i> — Assigns a remote IP to the interface. |

---

## IES Subscriber Interface Commands

### subscriber-interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] subscriber-interface</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command allows the operator to create special subscriber-based interfaces. It is used to contain multiple group interfaces. Multiple subnets associated with the subscriber interface can be applied to any of the contained group interfaces in any combination. The subscriber interface allows subnet sharing between group interfaces.</p> <p>Use the <b>no</b> form of the command to remove the subscriber interface.</p> |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the name of the IP interface. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                                                     |

### group-interface

|                    |                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group-interface</b> <i>ip-int-name</i>                                                                                                                                                                                               |
| <b>Context</b>     | config>service>ies>sub-if                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command enables the context to configure a group interface. A group interface is an interface that may contain one or more SAPs. This interface is used in triple-play services where multiple SAPs are part of the same subnet.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>ip-int-name</i> — Configures the interface group name. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                          |

### authentication-policy

|                    |                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-policy</b> <i>name</i><br><b>no authentication-policy</b>                                                                                                      |
| <b>Context</b>     | config>service>ies>if<br>config>service>ies>sub-if>grp-if                                                                                                                        |
| <b>Description</b> | <p>This command assigns an authentication policy to the interface.</p> <p>The <b>no</b> form of this command removes the policy name from the group interface configuration.</p> |
| <b>Default</b>     | no authentication-policy                                                                                                                                                         |

**Parameters** *name* — Specifies the authentication policy name. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

## srrp

**Syntax** **[no] srrp srrp-id**

**Context** config>service>ies>sub-if>grp-if

**Description** This command creates a Subscriber Router Redundancy Protocol (SRRP) instance on a group IP interface. An SRRP instance manages all subscriber subnets within the group interfaces subscriber IP interface or other subscriber IP interfaces that are associated through a wholesale/retail relationship. Only one unique SRRP instance can be configured per group interface.

The **no** form of the command removes an SRRP instance from a group IP interface. Once removed, the group interface ignores ARP requests for the SRRP gateway IP addresses that may exist on subscriber subnets associated with the group IP interface. Then the group interface stops routing using the redundant IP interface associated with the group IP interface and will stop routing with the SRRP gateway MAC address. Ingress packets destined to the SRRP gateway MAC will also be silently discarded. This is the same behavior as a group IP interface that is disabled (shutdown).

**Default** no srrp

**Parameters** *srrp-id* — Specifies a 32 bit instance ID that must be unique to the system. The instance ID must also match the instance ID used by the remote router that is participating in the same SRRP context. SRRP is intended to perform a function similar to VRRP where adjacent IP hosts within local subnets use a default gateway to access IP hosts on other subnets.

**Values** 1 — 4294967295

## bfd-enable

**Syntax** **[no] bfd-enable [base | service-id] interface interface-name dst-ip ip-address**

**Context** config>service>ies>sub-if>grp-if>srrp

**Description** This commands assigns a bi-directional forwarding (BFD) session providing heart-beat mechanism for the given VRRP/SRRP instance. There can be only one BFD session assigned to any given VRRP/SRRP instance, but there can be multiple SRRP/VRRP sessions using the same BFD session. If the interface configured with BFD is using a LAG or a spoke-SDP, the BFD transmit and receive intervals need to be set to at least 300ms.

BFD control the state of the associated interface. By enabling BFD on a given protocol interface, the state of the protocol interface is tied to the state of the BFD session between the local node and the remote node. The parameters used for the BFD are set via the BFD command under the IP interface. The specified interface may not be configured with BFD; when it is, the virtual router will then initiate the BFD session.

The no form of this command removes BFD from the configuration.

**Default** none

|                   |                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>service-id</i> — Specifies the service ID of the interface running BFD.                                                                                                             |
| <b>Values</b>     | <p><i>service-id</i>: 1 — 2147483648</p> <p><i>svc-name</i>: Specifies an existing service name up to 64 characters in length.</p> <p>No service ID indicates a network interface.</p> |
|                   | <b>interface</b> <i>interface-name</i> — Specifies the name of the interface running BFD.                                                                                              |
|                   | <b>dst-ip</b> <i>ip-address</i> — Specifies the destination address to be used for the BFD session.                                                                                    |

## gw-mac

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>gw-mac</b> <i>mac-address</i><br><b>no gw-mac</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command overrides the default SRRP gateway MAC address used by the SRRP instance. Unless specified, the system uses the same base MAC address for all SRRP instances with the last octet overridden by the lower 8 bits of the SRRP instance ID. . The same SRRP gateway MAC address should be in-use by both the local and remote routers participating in the same SRRP context.</p> <p>One reason to change the default SRRP gateway MAC address is if two SRRP instances sharing the same broadcast domain are using the same SRRP gateway MAC. The system will use the SRRP instance ID to separate the SRRP messages (by ignoring the messages that does not match the local instance ID), but a unique SRRP gateway MAC is essential to separate the routed packets for each gateway IP address.</p> <p>The <b>no</b> form of the command removes the explicit SRRP gateway MAC address from the SRRP instance. The SRRP gateway MAC address can only be changed or removed when the SRRP instance is shutdown.</p> |
| <b>Parameters</b>  | <p><i>mac-address</i> — Specifies a MAC address that is used to override the default SRRP base MAC address</p> <p><b>Values</b> Any MAC address except all zeros, broadcast or multicast addresses. The offset is expressed in normal Ethernet MAC address notation. The defined gw-mac cannot be 00:00:00:00:00:00, ff:ff:ff:ff:ff:ff or any multicast address.</p> <p>If not specified, the system uses the default SRRP gateway MAC address with the last octet set to the 8 least significant bits of the SRRP instance ID.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## keep-alive-interval

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keep-alive-interval</b> <i>interval</i><br><b>no keep-alive-interval</b>                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command defines the interval between SRRP advertisement messages sent when operating in the master state. The interval is also the basis for setting the master-down timer used to determine when the master is no longer sending. The system uses three times the keep-alive interval to set the timer. Every time an SRRP advertisement is seen that is better than the local priority, the timer is</p> |

reset. If the timer expires, the SRRP instance assumes that a master does not exist and initiates the attempt to become master.

When in backup state, the SRRP instance takes the keep-alive interval of the master as represented in the masters SRRP advertisement message. Once in master state, the SRRP instance uses its own configured keep-alive interval. The keep-alive-interval may be changed at anytime, but will have no effect until the SRRP instance is in the master state.

The **no** form of the command restores the default interval.

|                   |                                                                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>interval</i> — Specifies the interval, in milliseconds, between SRRP advertisement messages sent when operating in the master state. |
| <b>Values</b>     | 1 — 100                                                                                                                                 |
| <b>Default</b>    | 10 milliseconds                                                                                                                         |

## message-path

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>message-path</b> <i>sap-id</i><br><b>no message-path</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command defines a specific SAP for SRRP in-band messaging. A message-path SAP must be defined prior to activating the SRRP instance. The defined SAP must exist on the SRRP instances group IP interface for the command to succeed and cannot currently be associated with any dynamic or static subscriber hosts. Once a group IP interface SAP has been defined as the transmission path for SRRP Advertisement messages, it cannot be administratively shutdown, will not support static or dynamic subscriber hosts and cannot be removed from the group IP interface.</p> <p>The SRRP instance message-path command may be executed at anytime on the SRRP instance. Changing the message SAP will fail if a dynamic or static subscriber host is associated with the new SAP. Once successfully changed, the SRRP instance will immediately disable anti-spoof on the SAP and start sending SRRP Advertisement messages if the SRRP instance is activated.</p> <p>Changing the current SRRP message SAP on an active pair of routers should be done in the following manner:</p> <ol style="list-style-type: none"> <li>1. Shutdown the backup SRRP instance.</li> <li>2. Change the message SAP on the shutdown node.</li> <li>3. Change the message SAP on the active master node.</li> <li>4. Re-activate the shutdown SRRP instance.</li> </ol> <p>Shutting down the backup SRRP instance prevents the SRRP instances from becoming master due to temporarily using differing message path SAPs.</p> <p>If an MCS peering is operational between the redundant nodes and the SRRP instance has been associated with the peering, the designated message path SAP will be sent from each member.</p> <p>The <b>no</b> form of the command can only be executed when the SRRP instance is shutdown. Executing no message-path allows the existing SAP to be used for subscriber management functions. A new message-path SAP must be defined prior to activating the SRRP instance.</p> |

**Parameters**     *sap-id* — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.

## policy

**Syntax**     **[no] policy** *vrrp-policy-id*

**Context**     config>service>ies>sub-if>grp-if>srrp

**Description**     This command associates one or more VRRP policies with the SRRP instance. A VRRP policy is a collection of connectivity and verification tests used to manipulate the in-use priorities of VRRP and SRRP instances. A VRRP policy can test the link state of ports, ping IP hosts, discover the existence of routes in the routing table or the ability to reach L2 hosts. When one or more of these tests fail, the VRRP policy has the option of decrementing or setting an explicit value for the in-use priority of an SRRP instance. More than one VRRP policy may be associated with an SRRP instance. When more than one VRRP policy is associated with an SRRP instance the delta decrement of the in-use priority is cumulative unless one or more test fail that have explicit priority values. When one or more explicit tests fail, the lowest priority value event takes effect for the SRRP instance. When the highest delta-in-use-limit is used to manage the lowest delta derived in-use priority for the SRRP instance. VRRP policy associations may be added and removed at anytime. A maximum of two VRRP policies can be associated with a single SRRP instance.

The **no** form of the command removes the association with *vrrp-policy-id* from the SRRP instance.

**Parameters**     *vrrp-policy-id* — Specifies one or more VRRP policies with the SRRP instance.

**Values**     1 — 9999

## priority

**Syntax**     **priority** *priority*  
**no priority**

**Context**     config>service>ies>sub-if>grp-if>srrp

**Description**     This command overrides the default base priority for the SRRP instance. The SRRP instance priority is advertised by the SRRP instance to its neighbor router and is compared to the priority received from the neighbor router. The router with the best (highest) priority enters the master state while the other router enters the backup state. If the priority of each router is the same, the router with the lowest source IP address in the SRRP advertisement message assumes the master state. The base priority of an SRRP instance can be managed by VRRP policies. A VRRP policy defines a set of connectivity or verification tests which, when they fail, may lower an SRRP instances base priority (creating an in-use priority for the instance). Every time an SRRP instances in-use priority changes when in master state, it sends an SRRP advertisement message with the new priority. If the dynamic priority drops to zero or receives an SRRP Advertisement message with a better priority, the SRRP instance transitions to the *becoming backup* state. When the priority command is not specified, or the no priority command is executed, the system uses a default base priority of 100. The priority command may be executed at anytime.

The **no** form of the command restores the default base priority to the SRRP instance. If a VRRP policy is associated with the SRRP instance, it will use the default base priority as the basis for any

modifications to the SRRP instances in-use priority.

**Parameters**    *priority* — Specifies a base priority for the SRRP instance to override the default.

**Values**        1 — 254

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## IES Subscriber Interface Commands

### subscriber-interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] subscriber-interface</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>ies                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command allows the operator to create a special subscriber-based interfaces. It is used to contain multiple group interfaces. Multiple subnets associated with the subscriber interface can be applied to any of the contained group interfaces in any combination. The subscriber interface allows subnet sharing between group interfaces.</p> <p>Use the <b>no</b> form of the command to remove the subscriber interface.</p> |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the name of the IP interface. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                                                       |

### group-interface

|                    |                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group-interface</b> <i>ip-int-name</i>                                                                                                                                                                                               |
| <b>Context</b>     | config>service>ies>sub-if                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command enables the context to configure a group interface. A group interface is an interface that may contain one or more SAPs. This interface is used in triple-play services where multiple SAPs are part of the same subnet.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>ip-int-name</i> — Configures the interface group name. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                          |

### authentication-policy

|                    |                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-policy</b> <i>name</i><br><b>no authentication-policy</b>                                                                                                            |
| <b>Context</b>     | config>service>ies>if<br>config>service>ies>sub-if>grp-if                                                                                                                              |
| <b>Description</b> | <p>This command assigns a RADIUS authentication policy to the interface.</p> <p>The <b>no</b> form of this command removes the policy name from the group interface configuration.</p> |
| <b>Default</b>     | no authentication-policy                                                                                                                                                               |
| <b>Parameters</b>  | <i>name</i> — Specifies the authentication policy name. If the string contains special characters (#, \$,                                                                              |



spaces, etc.), the entire string must be enclosed within double quotes.

## srrp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] srrp srrp-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>ies>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command creates an SRRP instance on a group IP interface. An SRRP instance manages all subscriber subnets within the group interfaces subscriber IP interface or other subscriber IP interfaces that are associated through a wholesale/retail relationship. Only one unique SRRP instance can be configured per group interface.</p> <p>The <b>no</b> form of the command removes an SRRP instance from a group IP interface. Once removed, the group interface ignores ARP requests for the SRRP gateway IP addresses that may exist on subscriber subnets associated with the group IP interface. Then the group interface stops routing using the redundant IP interface associated with the group IP interface and will stop routing with the SRRP gateway MAC address. Ingress packets destined to the SRRP gateway MAC will also be silently discarded. This is the same behavior as a group IP interface that is disabled (shutdown).</p> |
| <b>Default</b>     | no srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><i>srrp-id</i> — Specifies a 32 bit instance ID that must be unique to the system. The instance ID must also match the instance ID used by the remote router that is participating in the same SRRP context. SRRP is intended to perform a function similar to VRRP where adjacent IP hosts within local subnets use a default gateway to access IP hosts on other subnets.</p> <p><b>Values</b> 1 — 4294967295</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## gw-mac

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>gw-mac mac-address</b><br><b>no gw-mac</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command overrides the default SRRP gateway MAC address used by the SRRP instance. Unless specified, the system uses the same base MAC address for all SRRP instances with the last octet overridden by the lower 8 bits of the SRRP instance ID. . The same SRRP gateway MAC address should be in-use by both the local and remote routers participating in the same SRRP context.</p> <p>One reason to change the default SRRP gateway MAC address is if two SRRP instances sharing the same broadcast domain are using the same SRRP gateway MAC. The system will use the SRRP instance ID to separate the SRRP messages (by ignoring the messages that does not match the local instance ID), but a unique SRRP gateway MAC is essential to separate the routed packets for each gateway IP address.</p> <p>The <b>no</b> form of the command removes the explicit SRRP gateway MAC address from the SRRP instance. The SRRP gateway MAC address can only be changed or removed when the SRRP instance is shutdown.</p> |

|                   |                                                                                                                                                                                                                                  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>mac-address</i> — Specifies a MAC address that is used to override the default SRRP base MAC address                                                                                                                          |
| <b>Values</b>     | Any MAC address except all zeros, broadcast or multicast addresses. The offset is expressed in normal Ethernet MAC address notation. The defined gw-mac cannot be 00:00:00:00:00:00, ff:ff:ff:ff:ff:ff or any multicast address. |
|                   | If not specified, the system uses the default SRRP gateway MAC address with the last octet set to the 8 least significant bits of the SRRP instance ID.                                                                          |

## keep-alive-interval

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keep-alive-interval</b> <i>interval</i><br><b>no keep-alive-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command defines the interval between SRRP advertisement messages sent when operating in the master state. The interval is also the basis for setting the master-down timer used to determine when the master is no longer sending. The system uses three times the keep-alive interval to set the timer. Every time an SRRP advertisement is seen that is better than the local priority, the timer is reset. If the timer expires, the SRRP instance assumes that a master does not exist and initiates the attempt to become master.</p> <p>When in backup state, the SRRP instance takes the keep-alive interval of the master as represented in the masters SRRP advertisement message. Once in master state, the SRRP instance uses its own configured keep-alive interval.</p> <p>The keep-alive-interval may be changed at anytime, but will have no effect until the SRRP instance is in the master state.</p> <p>The <b>no</b> form of the command restores the default interval.</p> |
| <b>Parameters</b>  | <i>interval</i> — Specifies the interval, in tenths of seconds, between SRRP advertisement messages sent when operating in the master state.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Values</b>      | 1 — 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Default</b>     | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## message-path

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>message-path</b> <i>sap-id</i><br><b>no message-path</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command defines a specific SAP for SRRP in-band messaging. A message-path SAP must be defined prior to activating the SRRP instance. The defined SAP must exist on the SRRP instances group IP interface for the command to succeed and cannot currently be associated with any dynamic or static subscriber hosts. Once a group IP interface SAP has been defined as the transmission path for SRRP Advertisement messages, it cannot be administratively shutdown, will not support static or dynamic subscriber hosts and cannot be removed from the group IP interface.</p> |

The SRRP instance message-path command may be executed at anytime on the SRRP instance. Changing the message SAP will fail if a dynamic or static subscriber host is associated with the new SAP. Once successfully changed, the SRRP instance will immediately disable anti-spoof on the SAP and start sending SRRP Advertisement messages if the SRRP instance is activated.

Changing the current SRRP message SAP on an active pair of routers should be done in the following manner:

1. Shutdown the backup SRRP instance.
2. Change the message SAP on the shutdown node.
3. Change the message SAP on the active master node.
4. Re-activate the shutdown SRRP instance.

Shutting down the backup SRRP instance prevents the SRRP instances from becoming master due to temporarily using differing message path SAPs.

If an MCS peering is operational between the redundant nodes and the SRRP instance has been associated with the peering, the designated message path SAP will be sent from each member.

The **no** form of the command can only be executed when the SRRP instance is shutdown. Executing no message-path allows the existing SAP to be used for subscriber management functions. A new message-path SAP must be defined prior to activating the SRRP instance.

**Parameters**     *sap-id* — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.

## policy

**Syntax**     **[no] policy vrrp-policy-id**

**Context**     config>service>ies>sub-if>grp-if>srrp

**Description**     This command associates one or more VRRP policies with the SRRP instance. A VRRP policy is a collection of connectivity and verification tests used to manipulate the in-use priorities of VRRP and SRRP instances. A VRRP policy can test the link state of ports, ping IP hosts, discover the existence of routes in the routing table or the ability to reach L2 hosts. When one or more of these tests fail, the VRRP policy has the option of decrementing or setting an explicit value for the in-use priority of an SRRP instance.

More than one VRRP policy may be associated with an SRRP instance. When more than one VRRP policy is associated with an SRRP instance the delta decrement of the in-use priority is cumulative unless one or more test fail that have explicit priority values. When one or more explicit tests fail, the lowest priority value event takes effect for the SRRP instance. When the highest delta-in-use-limit is used to manage the lowest delta derived in-use priority for the SRRP instance.

VRRP policy associations may be added and removed at anytime. A maximum of two VRRP policies can be associated with a single SRRP instance.

The **no** form of the command removes the association with vrrp-policy-id from the SRRP instance.

**Parameters**     *vrrp-policy-id* — Specifies one or more VRRP policies with the SRRP instance.

**Values**     1 — 9999

priority

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |         |                |     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|----------------|-----|
| <b>Syntax</b>      | <b>priority</b> <i>priority</i><br><b>no priority</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |         |                |     |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |         |                |     |
| <b>Description</b> | <p>This command overrides the default base priority for the SRRP instance. The SRRP instance priority is advertised by the SRRP instance to its neighbor router and is compared to the priority received from the neighbor router. The router with the best (highest) priority enters the master state while the other router enters the backup state. If the priority of each router is the same, the router with the lowest source IP address in the SRRP advertisement message assumes the master state.</p> <p>The base priority of an SRRP instance can be managed by VRRP policies. A VRRP policy defines a set of connectivity or verification tests which, when they fail, may lower an SRRP instances base priority (creating an in-use priority for the instance). Every time an SRRP instances in-use priority changes when in master state, it sends an SRRP advertisement message with the new priority. If the dynamic priority drops to zero or receives an SRRP Advertisement message with a better priority, the SRRP instance transitions to the <i>becoming backup</i> state.</p> <p>When the priority command is not specified, or the no priority command is executed, the system uses a default base priority of 100. The priority command may be executed at anytime.</p> <p>The <b>no</b> form of the command restores the default base priority to the SRRP instance. If a VRRP policy is associated with the SRRP instance, it will use the default base priority as the basis for any modifications to the SRRP instances in-use priority.</p> |               |         |                |     |
| <b>Parameters</b>  | <p><i>priority</i> — Specifies a base priority for the SRRP instance to override the default.</p> <table><tr><td><b>Values</b></td><td>1 — 254</td></tr><tr><td><b>Default</b></td><td>100</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Values</b> | 1 — 254 | <b>Default</b> | 100 |
| <b>Values</b>      | 1 — 254                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |         |                |     |
| <b>Default</b>     | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |         |                |     |

## IES Interface Commands

### interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> <i>ip-int-name</i><br><b>no interface</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>ies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command creates a logical IP routing interface for an Internet Enhanced Service (IES). Once created, attributes like an IP address and service access point (SAP) can be associated with the IP interface.</p> <p>The <b>interface</b> command, under the context of services, is used to create and maintain IP routing interfaces within IES service IDs. The <b>interface</b> command can be executed in the context of an IES service ID. The IP interface created is associated with the service core network routing instance and default routing table. The typical use for IP interfaces created in this manner is for subscriber internet access. An IP address cannot be assigned to an IES interface. Multiple SAPs can be assigned to a single group interface.</p> <p>Interface names are case sensitive and must be unique within the group of defined IP interfaces defined for <b>config router interface</b> and <b>config service ies interface</b> (that is, the network core router instance). Interface names must not be in the dotted decimal notation of an IP address. For example, the name “1.1.1.1” is not allowed, but “int-1.1.1.1” is allowed. Show commands for router interfaces use either interface names or the IP addresses. Use unique IP address values and IP address names to maintain clarity. It could be unclear to the user if the same IP address and IP address name values are used. Although not recommended, duplicate interface names can exist in different router instances.</p> <p>The available IP address space for local subnets and routes is controlled with the <b>config router service-prefix</b> command. The <b>service-prefix</b> command administers the allowed subnets that can be defined on IES IP interfaces. It also controls the prefixes that may be learned or statically defined with the IES IP interface as the egress interface. This allows segmenting the IP address space into <b>config router</b> and <b>config service</b> domains.</p> <p>When a new name is entered, a new logical router interface is created. When an existing interface name is entered, the user enters the router interface context for editing and configuration.</p> <p>By default, there are no default IP interface names defined within the system. All IES IP interfaces must be explicitly defined. Interfaces are created in an enabled state.</p> <p>The <b>no</b> form of this command removes IP the interface and all the associated configuration. The interface must be administratively shutdown before issuing the <b>no interface</b> command.</p> <p>For IES services, the IP interface must be shutdown before the SAP on that interface may be removed. IES services do not have the <b>shutdown</b> command in the SAP CLI context. IES service SAPs rely on the interface status to enable and disable them.</p> |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the name of the IP interface. Interface names must be unique within the group of defined IP interfaces for <b>config router interface</b> and <b>config service ies interface</b> commands. An interface name cannot be in the form of an IP address. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

If *ip-int-name* already exists within the service ID, the context will be changed to maintain that IP interface. If *ip-int-name* already exists within another service ID or is an IP interface defined within the **config router** commands, an error will occur and context will not be changed to that IP interface. If *ip-int-name* does not exist, the interface is created and context is changed to that interface for further command processing.

### active-cpm-protocols

|                    |                                                       |
|--------------------|-------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] active-cpm-protocols</b>                      |
| <b>Context</b>     | config>service>ies>interface                          |
| <b>Description</b> | This command enables CPM protocols on this interface. |

### address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>address</b> { <i>ip-address/mask</i>   <i>ip-address netmask</i> } [ <b>broadcast</b> <b>[all-ones   host-ones]</b> ]<br><b>address</b> <i>ip-address mask</i><br><b>address</b> <i>ip-address</i><br><b>no address</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>ies>interface<br>config>service>ies>subscriber-interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command assigns an IP address, IP subnet, and broadcast address format to an IES IP router interface. Only one IP address can be associated with an IP interface. An IP address must be assigned to each IES IP interface. An IP address and a mask are used together to create a local IP prefix. The defined IP prefix must be unique within the context of the routing instance. It cannot overlap with other existing IP prefixes defined as local subnets on other IP interfaces in the same routing context within the 7750 SR.</p> <p>In the IES subscriber interface context, this command is used to assign one or more (16 maximum) host IP addresses and subnets. This differs from a normal IES interfaces where the <b>secondary</b> command creates an additional subnet after the primary address is assigned. A user can then add or remove addresses without having to keep a primary address.</p> <p>The local subnet that the <b>address</b> command defines must be part of the services address space within the routing context using the <b>config router service-prefix</b> command. The default is to disallow the complete address space to services. Once a portion of the address space is allocated as a service prefix, that portion can be made unavailable for IP interfaces defined within the <b>config router interface</b> CLI context for network core connectivity with the <b>exclude</b> option in the <b>config router service-prefix</b> command.</p> <p>The IP address for the interface can be entered in either CIDR (Classless Inter-Domain Routing) or traditional dotted decimal notation. The show commands display CIDR notation and is stored in configuration files.</p> <p>By default, no IP address or subnet association exists on an IP interface until it is explicitly created.</p> <p>Use the <b>no</b> form of this command to remove the IP address assignment from the IP interface. When the <b>no address</b> command is entered, the interface becomes operationally down.</p> |

| Address    | Admin state | Oper state |
|------------|-------------|------------|
| No address | up          | down       |
| No address | down        | down       |
| 1.1.1.1    | up          | up         |
| 1.1.1.1    | down        | down       |

The operational state is a read-only variable and the only controlling variables are the address and admin states. The address and admin states are independent and can be set independently. If an interface is in an administratively up state and an address is assigned, it becomes operationally up and the protocol interfaces and the MPLS LSPs associated with that IP interface will be reinitialized.

*ip-address* — The IP address of the IP interface. The *ip-address* portion of the **address** command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).

*/* — The forward slash is a parameter delimiter and separates the *ip-address* portion of the IP address from the mask that defines the scope of the local subnet. No spaces are allowed between the *ip-address*, the “/” and the *mask-length* parameter. If a forward slash is not immediately following the *ip-address*, a dotted decimal mask must follow the prefix.

*mask-length* — The subnet mask length when the IP prefix is specified in CIDR notation. When the IP prefix is specified in CIDR notation, a forward slash (/) separates the *ip-address* from the *mask-length* parameter. The mask length parameter indicates the number of bits used for the network portion of the IP address; the remainder of the IP address is used to determine the host portion of the IP address. Allowed values are integers in the range 0 – 30. Note that a mask length of 32 is reserved for system IP addresses.

*mask* — The subnet mask in dotted decimal notation. When the IP prefix is not specified in CIDR notation, a space separates the *ip-address* from a traditional dotted decimal mask. The *mask* parameter indicates the complete mask that will be used in a logical ‘AND’ function to derive the local subnet of the IP address. Allowed values are dotted decimal addresses in the range 128.0.0.0 – 255.255.255.252. Note that a mask of 255.255.255.255 is reserved for system IP addresses.

*netmask* — Specifies a string of 0s and 1s that mask or screen out the network part of an IP address so that only the host computer part of the address remains.

**broadcast** — The optional **broadcast** parameter overrides the default broadcast address used by the IP interface when sourcing IP broadcasts on the IP interface. If no broadcast format is specified for the IP address, the default value is **host-ones** which indicates a subnet broadcast address. Use this parameter to change the broadcast address to **all-ones** or revert back to a broadcast address of **host-ones**.

The broadcast format on an IP interface can be specified when the IP address is assigned or changed.

This parameter does not affect the type of broadcasts that can be received by the IP interface. A host sending either the local broadcast (**all-ones**) or the valid subnet broadcast address (**host-ones**) will be received by the IP interface. (Default: *host-ones*)

**all-ones** — The **all-ones** keyword following the **broadcast** parameter specifies the broadcast address used by the IP interface for this IP address will be 255.255.255.255, also known as the local broadcast.

**host-ones** — The **host-ones** keyword following the **broadcast** parameter specifies that the broadcast address used by the IP interface for this IP address will be the subnet broadcast address. This is an IP address that corresponds to the local subnet described by the *ip-address* and the *mask-length* or *mask* with all the host bits set to binary one. This is the default broadcast address used by an IP interface.

The **broadcast** parameter within the **address** command does not have a negate feature, which is usually used to revert a parameter to the default value. To change the **broadcast** type to **host-ones** after being changed to **all-ones**, the **address** command must be executed with the **broadcast** parameter defined.

## address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] address</b> { <i>ip-address/mask</i>   <i>ip-address netmask</i> } [ <b>gw-ip-address</b> <i>ip-address</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>ies>sub-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command configures the local subscriber subnets available on a subscriber IP interface. The configured <i>ip-address</i> and <i>mask</i> define the address space associated with the subscriber subnet. Up to 16 IP subnets can be created on a single subscriber IP interface. Each subnet supports a locally owned IP host address within the subnet that is not expected to appear on other routers that may be servicing the same subscriber subnet. For redundancy purposes, the keyword <b>gw-address</b> defines a separate IP address within the subnet for Subscriber Routed Redundancy Protocol (SRRP) routing. This IP address must be the same on the local and remote routers participating in a common SRRP instance.</p> <p>In SRRP, a single SRRP instance is tied to a group IP interface. The group IP interface is contained directly within a subscriber IP interface context and thus directly associated with the subscriber subnets on the subscriber IP interface. The SRRP instance is also indirectly associated with any subscriber subnets tied to the subscriber interface through wholesale/retail VPRN configurations. With the directly-associated and the indirectly-associated subscriber interface subnets, a single SRRP instance can manage hundreds of SRRP gateway IP addresses. This automatic subnet association to the SRRP instance is different from VRRP where the redundant IP address is defined within the VRRP context.</p> <p>Defining an SRRP gateway IP address on a subscriber subnet is not optional when the subnet is associated with a group IP interface with SRRP enabled. Enabling SRRP (<b>no shutdown</b>) will fail if one or more subscriber subnets do not have an SRRP gateway IP address defined. Creating a new subscriber subnet without an SRRP gateway IP address defined will fail when the subscriber subnet is associated with a group IP interface with an active SRRP instance. Once SRRP is enabled on a group interface, the SRRP instance will manage the ARP response and routing behavior for all subscriber hosts reachable through the group IP interface.</p> <p>The <b>no</b> form of the command removes the address from a subscriber subnet. The <b>address</b> command for the specific subscriber subnet must be executed without the <b>gw-address</b> parameter. To succeed, all SRRP instances associated with the subscriber subnet must be removed or shutdown.</p> |
| <b>Parameters</b>  | <i>ip-address/mask</i>   <i>ip-address netmask</i> — Specifies the address space associated with the subscriber subnet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |



**gw-ip-address** *ip-address* — Specifies a separate IP address within the subnet for SRRP routing purposes. This parameter must be followed by a valid IP interface that exists within the subscriber subnet created by the address command. The defined gateway IP address cannot currently exist as a subscriber host (static or dynamic). If the defined ip-address already exists as a subscriber host address, the address command will fail. The specified ip-address must be unique within the system.

The gw-address parameter may be specified at anytime. If the subscriber subnet was created previously, executing the address command with a gw-address parameter will simply add the SRRP gateway IP address to the existing subnet.

If the address command is executed without the gw-address parameter when the subscriber subnet is associated with an active SRRP instance, the address will fail. If the SRRP instance is inactive or removed, executing the address command without the gw-address parameter will remove the SRRP gateway IP address from the specified subscriber subnet.

If the address command is executed with a new gw-address, all SRRP instances currently associated with the specified subscriber subnet will be updated with the new SRRP gateway IP address.

## delayed-enable

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>delayed-enable</b> <i>seconds</i> [ <b>init-only</b> ]<br><b>no delayed-enable</b>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>sub-if                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command delays making interface operational by the specified number of seconds.<br><br>In environments with many subscribers, it can take time to synchronize the subscriber state between peers when the subscriber-interface is enabled (perhaps, after a reboot). To ensure that the state has time to be synchronized, the <b>delayed-enable</b> timer can be specified. The optional parameter <b>init-only</b> can be added to use this timer only after a reboot. |
| <b>Default</b>     | no delayed-enable                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the number of seconds to delay before the interface is operational.<br><br><b>Values</b> 1 — 1200<br><br><b>init-only</b> — Delays the initialization of the subscriber-interface to give the rest of the system time to complete necessary tasks such as allowing routing protocols to converge and/or to allow MCS to sync the subscriber information. The delay only occurs immediately after a reboot.                                         |

## oper-up-while-empty

|                    |                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>oper-up-while-empty</b>                                                                                                 |
| <b>Context</b>     | config>service>ies>sub-if>grp-if                                                                                                |
| <b>Description</b> | This command allows the subscriber interface to treat this group interface to be operationally enabled without any active SAPs. |

This command is typically used with MSAPs where advertising the subnet prior to having a MSAP dynamically created is needed.

## allow-directed-broadcasts

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] allow-directed-broadcasts</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>ies>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command enables the forwarding of directed broadcasts out of the IP interface.</p> <p>A directed broadcast is a packet received on a local router interface destined for the subnet broadcast address on another IP interface. The <b>allow-directed-broadcasts</b> command on an IP interface enables or disables the transmission of packets destined to the subnet broadcast address of the egress IP interface.</p> <p>When enabled, a frame destined to the local subnet on this IP interface will be sent as a subnet broadcast out this interface. Care should be exercised when allowing directed broadcasts as it is a well-known mechanism used for denial-of-service attacks.</p> <p>When disabled, directed broadcast packets discarded at this egress IP interface will be counted in the normal discard counters for the egress SAP.</p> <p>By default, directed broadcasts are not allowed and will be discarded at this egress IP interface.</p> <p>The <b>no</b> form of this command disables the forwarding of directed broadcasts out of the IP interface.</p> |
| <b>Default</b>     | <b>no allow-directed-broadcasts</b> — Directed broadcasts are dropped.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## anti-spoof

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>anti-spoof {ip   mac   ip-mac}</b><br><b>no anti-spoof</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>ies>if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command enables anti-spoof filtering and optionally changes the anti-spoof matching type for the SAP.</p> <p>The type of anti-spoof filtering defines what information in the incoming packet is used to generate the criteria to lookup an entry in the anti-spoof filter table. The type parameter (<b>ip</b>, <b>ip-mac</b>, <b>nh-mac</b>) defines the anti-spoof filter type enforced by the SAP when anti-spoof filtering is enabled.</p> <p>The <b>no</b> form of the command disables anti-spoof filtering on the SAP.</p>   |
| <b>Default</b>     | no anti-spoof                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><b>ip</b> — Configures SAP anti-spoof filtering to use only the source IP address in its lookup. If a static host exists on the SAP without an IP address specified, the anti-spoof type <b>ip</b> command will fail.</p> <p><b>mac</b> — Configures SAP anti-spoof filtering to use only the source MAC address in its lookup. Setting the anti-spoof filter type to <b>mac</b> is not allowed on non-Ethernet encapsulated SAPs. If a static host exists on the SAP without a specified MAC address, the anti-spoof type <b>mac</b></p> |

command will fail. The anti-spoof type **mac** command will also fail if the SAP does not support Ethernet encapsulation.

**ip-mac** — Configures SAP anti-spoof filtering to use both the source IP address and the source MAC address in its lookup. If a static host exists on the SAP without both the IP address and MAC address specified, the anti-spoof type **ip-mac** command will fail. This is also true if the default anti-spoof filter type of the SAP is **ip-mac** and the default is not overridden. The anti-spoof type **ip-mac** command will also fail if the SAP does not support Ethernet encapsulation.

## app-profile

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>app-profile</b> <i>app-profile-name</i><br><b>no app-profile</b>                                                                                |
| <b>Context</b>     | config>service>ies>if>sap<br>config>service>ies>sub-if>grp-if>sap                                                                                  |
| <b>Description</b> | This command configures the application profile name.                                                                                              |
| <b>Parameters</b>  | <i>app-profile-name</i> — Specifies an existing application profile name configured in the <b>config&gt;app-assure&gt;group&gt;policy</b> context. |

## anti-spoof

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>anti-spoof</b> { <b>ip</b>   <b>ip-mac</b>   <b>nh-mac</b> }<br><b>no anti-spoof</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command enables anti-spoof filtering and optionally changes the anti-spoof matching type for the SAP.</p> <p>The type of anti-spoof filtering defines what information in the incoming packet is used to generate the criteria to lookup an entry in the anti-spoof filter table. The type parameter (<b>ip</b>, <b>ip-mac</b>) defines the anti-spoof filter type enforced by the SAP when anti-spoof filtering is enabled.</p> <p>The <b>no</b> form of the command disables anti-spoof filtering on the SAP.</p>                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Default</b>     | ip-mac                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <p><b>ip</b> — Configures SAP anti-spoof filtering to use only the source IP address in its lookup. If a static host exists on the SAP without an IP address specified, the anti-spoof type <b>ip</b> command will fail.</p> <p><b>ip-mac</b> — Configures SAP anti-spoof filtering to use both the source IP address and the source MAC address in its lookup. If a static host exists on the SAP without both the IP address and MAC address specified, the anti-spoof type <b>ip-mac</b> command will fail. This is also true if the default anti-spoof filter type of the SAP is <b>ip-mac</b> and the default is not overridden. The anti-spoof type <b>ip-mac</b> command will also fail if the SAP does not support Ethernet encapsulation.</p> <p><b>nh-mac</b> — Indicates that the ingress anti-spoof is based on the source MAC address and the egress anti-spoof is based on the nh-ip-address.</p> |

## arp-timeout

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-timeout</b> <i>seconds</i><br><b>no arp-timeout</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>interface<br>config>service>ies>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command configures the minimum time in seconds an ARP entry learned on the IP interface will be stored in the ARP table. ARP entries are automatically refreshed when an ARP request or gratuitous ARP is seen from an IP host, otherwise, the ARP entry is aged from the ARP table. If <b>arp-timeout</b> is set to a value of zero seconds, ARP aging is disabled.</p> <p>When the <b>arp-populate</b> and <b>lease-populate</b> commands are enabled on an IES interface, the ARP table entries will no longer be dynamically learned, but instead by snooping DHCP ACK message from a DHCP server. In this case the configured <b>arp-timeout</b> value has no effect.</p> <p>The <b>no</b> form of this command restores <b>arp-timeout</b> to the default value.</p> |
| <b>Default</b>     | 14400 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><i>seconds</i> — The minimum number of seconds a learned ARP entry will be stored in the ARP table, expressed as a decimal integer. A value of zero specifies that the timer is inoperative and learned ARP entries will not be aged.</p> <p><b>Values</b>      0 — 65535</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## bfd

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>bfd</b> <i>transmit-interval</i> [ <b>receive</b> <i>receive-interval</i> ] [ <b>multiplier</b> <i>multiplier</i> ] [ <b>echo-receive</b> <i>echo-interval</i> ] [ <b>type</b> <b>cpm-np</b> ]<br><b>no bfd</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>ies>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command specifies the BFD parameters for the associated IP interface. If no parameters are defined the default value are used.</p> <p>The multiplier specifies the number of consecutive BFD messages that must be missed from the peer before the BFD session state is changed to down and the upper level protocols (OSPF, IS-IS, BGP or PIM) is notified of the fault.</p> <p>The <b>no</b> form of the command removes BFD from the interface.</p> <p><b>Important notes:</b> On the 7750-SR, the <i>transmit-interval</i>, <b>receive</b> <i>receive-interval</i>, and <b>echo-receive</b> <i>echo-interval</i> values can only be modified to a value less than 100 when:</p> <ol style="list-style-type: none"> <li>1. The <b>type</b> <b>cpm-np</b> option is explicitly configured.</li> <li>2. The service is shut down (<b>shutdown</b>)</li> <li>3. The interval is specified 10 — 100000.</li> <li>4. The service is re-enabled (<b>no shutdown</b>)</li> </ol> <p>To remove the <b>type</b> <b>cpm-np</b> option, re-issue the <b>bfd</b> command without specifying the <b>type</b> parameter.</p> |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no bfd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b> | <p><i>transmit-interval</i> — Sets the transmit interval for the BFD session.</p> <p><b>Values</b> 100 — 100000<br/>10 — 100000 (see Important Notes above)</p> <p><b>Default</b> 100</p> <p><i>receive receive-interval</i> — Sets the receive interval for the BFD session.</p> <p><b>Values</b> 100 — 100000<br/>10 — 100000 (see Important Notes above)</p> <p><b>Default</b> 100</p> <p><i>multiplier multiplier</i> — Set the multiplier for the BFD session.</p> <p><b>Values</b> 3 — 20</p> <p><b>Default</b> 3</p> <p><i>echo-receive echo-interval</i> — Sets the minimum echo receive interval, in milliseconds, for the BFD session.</p> <p><b>Values</b> 100 — 100000<br/>10 — 100000 (see Important Notes above)</p> <p><b>Default</b> 100</p> <p><i>type cpm-np</i> — Specifies that the type is cpm-np.</p> |

## cflowd

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cflowd {acl   interface}</b><br><b>no cflowd</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command enables <b>cflowd</b> to collect traffic flow samples through a router for analysis.</p> <p><b>cflowd</b> is used for network planning and traffic engineering, capacity planning, security, application and user profiling, performance monitoring, usage-based billing, and SLA measurement. When <b>cflowd</b> is enabled at the interface level, all packets forwarded by the interface are subjected to analysis according to the <b>cflowd</b> configuration.</p> |
| <b>Default</b>     | no cflowd                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><i>ACL</i> — <i>cflowd</i> configuration associated with a filter.</p> <p><i>interface</i> — <i>cflowd</i> configuration associated with an IP interface.</p>                                                                                                                                                                                                                                                                                                                        |

## cpu-protection

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cpu-protection</b> <i>policy-id</i><br><b>no cpu-protection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>ies>if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command assigns an existing CPU protection policy to the associated service interface. For these interface types, the per-source rate limit is not applicable. The CPU protection policies are configured in the <b>config&gt;sys&gt;security&gt;cpu-protection&gt;policy</b> <i>cpu-protection-policy-id</i> context.</p> <p>If no <b>cpu-protection</b> policy is assigned to a service interface, then the default policy is used to limit the overall-rate. The default policy is policy number 254 for access interfaces and 255 for network interfaces.</p> <p>The <b>no</b> form of the command removes the association of the CPU protection policy from the associated interface and reverts to the default policy values.</p> |
| <b>Default</b>     | <p>cpu-protection 254 (for access interfaces)</p> <p>cpu-protection 255 (for network interfaces)</p> <p>none (for video-interfaces, shown as no cpu-protection in CLI)</p> <p>The configuration of <b>no cpu-protection</b> returns the interface/SAP to the default policies as shown above.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><i>policy-id</i> — Specifies an existing CPU protection policy.</p> <p><b>Values</b>      1 — 255</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## cpu-protection

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cpu-protection</b> <i>policy-id</i> [ <b>mac-monitoring</b> ]<br><b>no cpu-protection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command assigns an existing CPU protection policy to the associated group interface. The CPU protection policies are configured in the <b>config&gt;sys&gt;security&gt;cpu-protection&gt;policy</b> <i>cpu-protection-policy-id</i> context.</p> <p>If no CPU-Protection policy is assigned to a group interface SAP, then the default policy is used to limit the overall-rate. The default policy is policy number 254 for access interfaces and 255 for network interfaces.</p> <p>The <b>no</b> form of the command removes the association of the CPU protection policy from the associated interface and reverts to the default policy values.</p> |
| <b>Default</b>     | <p>cpu-protection 254 (for access interfaces)</p> <p>cpu-protection 255 (for network interfaces)</p> <p>The configuration of no cpu-protection returns the interface/SAP to the default policies as shown above.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>policy-id</i> — Specifies an existing CPU protection policy.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**Values** 1 — 255

**mac-monitoring** — When specified, the per MAC rate limiting should be performed, using the per-source-rate from the associated cpu-protection policy.

## ipv6

**Syntax** [no] ipv6

**Context** config>service>ies>sub-if>grp-if

**Description** This command enables IPv6 forwarding on the specified group-interface.

## router-advertisements

**Syntax** [no] router-advertisements

**Context** config>service>ies>sub-if>grp-if>ipv6

**Description** This command enables router advertisement transmission on this group interface.

**Default** router-advertisements

## current-hop-limit

**Syntax** current-hop-limit *hop-count*  
no current-hop-limit

**Context** config>service>ies>sub-if>grp-if>ipv6>router-ad

**Description** This command specifies the hop-limit advertised to hosts in router advertisements.

**Default** 64

**Parameters** *hop-count* — Specifies the current hop limit (decimal) inserted into router advertisements.

**Values** 0-255

## managed-configuration

**Syntax** [no] managed-configuration

**Context** config>service>ies>sub-if>grp-if>ipv6>router-ad

**Description** This command sets the managed address configuration flag. This flag indicates that DHCPv6 is available for address configuration in addition to any address auto-configured using stateless address auto-configuration. See RFC 3315 for additional details.

**Default** no managed-configuration

## max-advertisement-interval

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-advertisement-interval</b> <i>seconds</i><br><b>no max-advertisement-interval</b>                  |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad                                                           |
| <b>Description</b> | This command configures the maximum interval between sending router advertisement messages.               |
| <b>Default</b>     | 900                                                                                                       |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the maximum interval in seconds between sending router advertisement messages. |
| <b>Values</b>      | 900-1800                                                                                                  |

## min-advertisement-interval

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>min-advertisement-interval</b> <i>seconds</i><br><b>no min-advertisement-interval</b>                  |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad                                                           |
| <b>Description</b> | This command configures the minimum interval between sending router advertisement messages.               |
| <b>Default</b>     | 900                                                                                                       |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the minimum interval in seconds between sending router advertisement messages. |
| <b>Values</b>      | 900-1350                                                                                                  |

## mtu

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>bytes</i><br><b>no mtu</b>                                           |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad                                    |
| <b>Description</b> | This command configures the MTU for the nodes to use to send packets on the link.  |
| <b>Default</b>     | no mtu                                                                             |
| <b>Parameters</b>  | <i>bytes</i> — Specifies the MTU for the nodes to use to send packets on the link. |
| <b>Values</b>      | 1280-9212                                                                          |



## other-stateful-configuration

|                    |                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] other-stateful-configuration</b>                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command sets the "other configuration" flag. This flag indicates that DHCPv6 is available for autoconfiguration of other (non-address) information such as DNS-related information or information on other servers in the network. See RFC 3736, <i>Stateless Dynamic Host Configuration Protocol (DHCP) for IPv6</i> . |
| <b>Default</b>     | no other-stateful-configuration                                                                                                                                                                                                                                                                                              |

## prefix-options

|                    |                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] prefix-options</b>                                                                                                                                                  |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad                                                                                                                             |
| <b>Description</b> | This command configures Router Advertisement parameters for IPv6 prefixes returned via RADIUS Framed-IPv6-Prefix. All prefixes will inherit these configuration parameters. |
| <b>Default</b>     | no prefix-options                                                                                                                                                           |

## autonomous

|                    |                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] autonomous</b>                                                                     |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad>prefix-op                                  |
| <b>Description</b> | This command specifies whether the prefix can be used for stateless address configuration. |
| <b>Default</b>     | no autonomous                                                                              |

## preferred-lifetime

|                    |                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>preferred-lifetime</b> [seconds   infinite]<br><b>no preferred-lifetime</b>                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad>prefix-op                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command configures the remaining length of time in seconds that this prefix will continue to be preferred, for example, time until deprecation. The address generated from a deprecated prefix should not be used as a source address in new communications, but packets received on such an interface are processed as expected. |
| <b>Default</b>     | 3600                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | seconds — Specifies a decimal time interval in seconds.                                                                                                                                                                                                                                                                                |

**Values** 0-4294967295

**infinite** — Specifies a 0xffffffff value, Dec = 4294967295

## valid-lifetime

|                    |                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>valid-lifetime</b> <i>[seconds   infinite]</i><br><b>no valid-lifetime</b>                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad>prefix-op                                                                                                                                                                                                                                              |
| <b>Description</b> | This command specifies the length of time in seconds that the prefix is valid for the purpose of on-link determination. A value of all one bits (0xffffffff) represents infinity. The address generated from an invalidated prefix should not appear as the destination or source address of a packet. |
| <b>Default</b>     | 86,400                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>seconds</i> — Specifies a decimal time interval in seconds.<br><b>Values</b> 0-4294967295<br><b>infinite</b> — Specifies a 0xffffffff value, Dec = 4294967295                                                                                                                                       |

## reachable-time

|                    |                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>reachable-time</b> <i>milliseconds</i><br><b>no reachable-time</b>                                                                               |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad                                                                                                     |
| <b>Description</b> | This command configures how long this router should be considered reachable by other nodes on the link after receiving a reachability confirmation. |
| <b>Default</b>     | no reachable-time                                                                                                                                   |
| <b>Parameters</b>  | <i>milliseconds</i> — The length of time the router should be considered reachable for default router selection.<br><b>Values</b> 0-3,600,000       |

## retransmit-time

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>retransmit-time</b> <i>milliseconds</i><br><b>no retransmit-time</b>                 |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad                                         |
| <b>Description</b> | This command configures the retransmission frequency of neighbor solicitation messages. |
| <b>Default</b>     | no retransmit-time                                                                      |
| <b>Parameters</b>  | <i>milliseconds</i> — Specifies how often retransmissions occur.                        |

**Values** 0-1,800,000

## router-lifetime

|                    |                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>router-lifetime</b> <i>seconds</i><br><b>router-lifetime no-default-router</b><br><b>no router-lifetime</b>                |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>router-ad                                                                               |
| <b>Description</b> | This command sets the router lifetime. A value of zero indicates this router should not be used by hosts as a default router. |
| <b>Default</b>     | 4500                                                                                                                          |
| <b>Parameters</b>  | <i>seconds</i> — Specifies how long the router is valid for default router selection.                                         |
|                    | <b>Values</b> 2700-9000                                                                                                       |

## dhcp6

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dhcp6</b>                                                                                                                                  |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6                                                                                                              |
| <b>Description</b> | This command allows access to the DHCP6 context within the group interface configuration. Within this context, DHCP6 parameters can be configured. |
| <b>Default</b>     | no dhcp6                                                                                                                                           |

## proxy-server

|                    |                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] proxy-server</b>                                                                                                                                  |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>dhcp6                                                                                                               |
| <b>Description</b> | This command allows access to the DHCP6 proxy server context. Within this context, DHCP6 proxy server parameters of the group interface can be configured |
| <b>Default</b>     | no proxy-server.                                                                                                                                          |

## renew-timer

|                |                                                            |
|----------------|------------------------------------------------------------|
| <b>Syntax</b>  | <b>renew-timer</b> <i>seconds</i><br><b>no renew-timer</b> |
| <b>Context</b> | config>service>ies>sub-if>grp-if>ipv6>dhcp6>proxy-server   |

|                    |                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command configures the renew-timer (T1), the time at which the client contacts the server from which the addresses in the IA_NA or IA_PD were obtained to extend the lifetimes of the addresses or prefixes assigned to the client. |
| <b>Default</b>     | 1800                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the time duration relative to the current time, expressed in units of seconds. A value of zero leaves the renew-time at the discretion of the client.                                                         |
| <b>Values</b>      | 0-604,800                                                                                                                                                                                                                                |

## rebind-timer

|                    |                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rebind-timer</b> <i>seconds</i><br><b>no rebind-timer</b>                                                                                                                           |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                                                                                               |
| <b>Description</b> | This command configures the rebind-timer (T2), the time at which the client contacts any available server to extend the lifetimes of the addresses or prefixes assigned to the client. |
| <b>Default</b>     | 2880                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>seconds</i> — T2 is a time duration relative to the current time. A value of zero leaves the rebind-time at the discretion of the client.                                           |
| <b>Values</b>      | 0-1,209,600                                                                                                                                                                            |

## preferred-lifetime

|                    |                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>preferred-lifetime</b> [ <i>seconds</i>   <i>infinite</i> ]<br><b>no preferred-lifetime</b>                                                                                 |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                                                                                       |
| <b>Description</b> | The preferred lifetime for the IPv6 prefix or address in the option, expressed in units of seconds. When the preferred lifetime expires, any derived addresses are deprecated. |
| <b>Default</b>     | 3600                                                                                                                                                                           |
| <b>Parameters</b>  | <i>seconds</i> — Specifies a decimal time interval in seconds.                                                                                                                 |
| <b>Values</b>      | 600-42967295                                                                                                                                                                   |
|                    | <b>infinite</b> — Specifies a 0xffffffff value, Dec = 4294967295                                                                                                               |

## valid-lifetime

|                    |                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>valid-lifetime</b> [ <i>seconds</i>   <i>infinite</i> ]<br><b>no valid-lifetime</b>                                                                                                                       |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                                                                                                                     |
| <b>Description</b> | The valid lifetime for the IPv6 prefix or address in the option, expressed in units of seconds.                                                                                                              |
| <b>Default</b>     | 86,400                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>seconds</i> — Specifies a decimal time interval in seconds.<br><br><div style="margin-left: 40px;"><b>Values</b>      600-42967295</div> <i>infinite</i> — Specifies a 0xffffffff value, Dec = 4294967295 |

## client-applications

|                    |                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>client-applications</b> [ <i>dhcp</i> ] [ <i>pppoe</i> ]<br><b>no client-applications</b>                  |
| <b>Context</b>     | config>services>ies>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                     |
| <b>Description</b> | This command configures the client host types to which the DHCP6 proxy server is allowed to assign addresses. |
| <b>Parameters</b>  | <b>dhcp</b> — Specifies IP over Ethernet hosts.<br><b>pppoe</b> — Specifies PPP over Ethernet hosts.          |

## local-dhcp-server

|                    |                                                                                  |
|--------------------|----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-dhcp-server</b> <i>local-server-name</i><br><b>no local-dhcp-server</b> |
| <b>Context</b>     | config>service>ies>if                                                            |
| <b>Description</b> | This command assigns a DHCP server to the interface.                             |
| <b>Parameters</b>  | <i>local-server-name</i> — Specifies an existing local server name.              |

## local-proxy-arp

|                    |                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] local-proxy-arp</b>                                                                                                                                                                 |
| <b>Context</b>     | config>service>ies>interface<br>config>service>ies>sub-if>grp-if                                                                                                                            |
| <b>Description</b> | This command enables local proxy ARP. When local proxy ARP is enabled on an IP interface, the system responds to all ARP requests for IP addresses belonging to the subnet with its own MAC |

## IES Interface Commands

address, and thus will become the forwarding point for all traffic between hosts in that subnet. When local-proxy-arp is enabled, ICMP redirects on the ports associated with the service are automatically blocked.

**Default**    ies>interface: no local-proxy-arp  
              ies>sub-if>grp-if: local-proxy-arp

## ip-mtu

**Syntax**     **ip-mtu** *octets*  
              **no ip-mtu**

**Context**     config>service>ies>interface

**Description** This command configures the IP maximum transmit unit (packet) for this interface.  
  
Note that because this connects a Layer 2 to a Layer 3 service, this parameter can be adjusted under the IES interface.  
  
The MTU that is advertised from the IES size is:  
MINIMUM((SdpOperPathMtu - EtherHeaderSize), (Configured ip-mtu)).  
  
By default (for ethernet network interface) if no ip-mtu is configured it is (1568 - 14) = 1554.  
  
The **no** form of the command returns the default value.

**Default**     no ip-mtu

## ipcp

**Syntax**     **ipcp**

**Context**     config>service>ies>if

**Description** This command creates allows access to the IPCP context within the interface configuration. Within this context, IPCP extensions can be configured to define such things as the remote IP address and DNS IP address to be signaled via IPCP on the associated PPP interface. This command is only applicable if the associated SAP/port is a PPP/MLPPP interface.

**Default**     none

## dns

**Syntax**     **dns ip-address** [**secondary ip-address**]  
              **dns secondary ip-address**  
              **no dns** [*ip-address*] [**secondary ip-address**]

**Context**     config>service>ies>if>ipcp

**Description** This command defines the dns address(es) to be assigned to the far-end of the associated PPP/MLPPP

link via IPCP extensions. This command is only applicable if the associated SAP/port is a PPP/MLPPP interface with an IPCP encapsulation.

The **no** form of the command deletes either the specified primary DNS address, secondary DNS address or both addresses from the IPCP extension peer-ip-address configuration.

**Default** no dns

**Parameters** *ip-address* — This parameter specifies a unicast IPv4 address for the primary DNS server to be signaled to the far-end of the associate PPP/MLPPP link via IPCP extensions.

**secondary ip-address** — This parameter specifies a unicast IPv4 address for the secondary DNS server to be signaled to the far-end of the associate PPP/MLPPP link via IPCP extensions.

## peer-ip-address

**Syntax** **peer-ip-address** *ip-address*  
**no peer-ip-address**

**Context** config>service>ies>if>ipcp

**Description** This command defines the remote IP address to be assigned to the far-end of the associated PPP/MLPPP link via IPCP extensions. This command is only applicable if the associated SAP/port is a PPP/MLPPP interface with an IPCP encapsulation.

The **no** form of the command deletes the IPCP extension peer-ip-address configuration.

**Default** no peer-ip-address (0.0.0.0)

**Parameters** *ip-address* — Specifies a unicast IPv4 address to be signaled to the far-end of the associated PPP/MLPPP link by IPCP extensions.

## loopback

**Syntax** [**no**] **loopback**

**Context** config>service>ies>interface

**Description** This command specifies that the associated interface is a loopback interface that has no associated physical interface. As a result, the associated IES interface cannot be bound to a SAP.

Note that you can configure an IES interface as a loopback interface by issuing the **loopback** command instead of the **sap** command. The loopback flag cannot be set on an interface where a SAP is already defined and a SAP cannot be defined on a loopback interface.

**Default** none

## mac

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac</b> <i>ieee-address</i><br><b>no mac</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>ies>interface<br>config>service>ies>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command assigns a specific MAC address to an IES IP interface.</p> <p>For Routed Central Office (CO), a group interface has no IP address explicitly configured but inherits an address from the parent subscriber interface when needed. For example, a MAC will respond to an ARP request when an ARP is requested for one of the IPs associated with the subscriber interface through the group interface.</p> <p>The <b>no</b> form of the command returns the MAC address of the IP interface to the default value.</p> |
| <b>Default</b>     | The physical MAC address associated with the Ethernet interface that the SAP is configured on (the default MAC address assigned to the interface, assigned by the system).                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>ieee-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.                                                                                                                                                                                                                                                  |

## secondary

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>secondary</b> { <i>ip-address/mask</i>   <i>ip-address netmask</i> } [ <b>broadcast all-ones</b>   <b>host-ones</b> ]<br>[ <b>igmp-inhibit</b> ]<br><b>no secondary</b> <i>ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>ies>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command assigns a secondary IP address/IP subnet/broadcast address format to the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>ip-address</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> <p><i>mask</i> — The subnet mask in dotted decimal notation. When the IP prefix is not specified in CIDR notation, a space separates the <i>ip-address</i> from a traditional dotted decimal mask. The <i>mask</i> parameter indicates the complete mask that will be used in a logical ‘AND’ function to derive the local subnet of the IP address. Allowed values are dotted decimal addresses in the range 128.0.0.0 – 255.255.255.252. Note that a mask of 255.255.255.255 is reserved for system IP addresses.</p> <p><i>netmask</i> — Specifies a string of 0s and 1s that mask or screen out the network part of an IP address so that only the host computer part of the address remains.</p> <p><b>broadcast</b> — The optional <b>broadcast</b> parameter overrides the default broadcast address used by the IP interface when sourcing IP broadcasts on the IP interface. If no broadcast format is specified for the IP address, the default value is <b>host-ones</b> which indicates a subnet broadcast address. Use</p> |



this parameter to change the broadcast address to **all-ones** or revert back to a broadcast address of **host-ones**.

The broadcast format on an IP interface can be specified when the IP address is assigned or changed.

This parameter does not affect the type of broadcasts that can be received by the IP interface. A host sending either the local broadcast (**all-ones**) or the valid subnet broadcast address (**host-ones**) will be received by the IP interface. (Default: *host-ones*)

**all-ones** — The **all-ones** keyword following the **broadcast** parameter specifies the broadcast address used by the IP interface for this IP address will be 255.255.255.255, also known as the local broadcast.

**host-ones** — The **host-ones** keyword following the **broadcast** parameter specifies that the broadcast address used by the IP interface for this IP address will be the subnet broadcast address. This is an IP address that corresponds to the local subnet described by the *ip-address* and the *mask-length* or *mask* with all the host bits set to binary one. This is the default broadcast address used by an IP interface.

The **broadcast** parameter within the **address** command does not have a negate feature, which is usually used to revert a parameter to the default value. To change the **broadcast** type to **host-ones** after being changed to **all-ones**, the **address** command must be executed with the **broadcast** parameter defined.

**igp-inhibit** — The optional **igp-inhibit** parameter signals that the given secondary IP interface should not be recognized as a local interface by the running IGP. For OSPF and IS-IS, this means that the specified secondary IP interfaces will not be injected and used as passive interfaces and will not be advertised as internal IP interfaces into the IGP's link state database. For RIP, this means that these secondary IP interfaces will not source RIP updates.

## static-arp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static-arp</b> <i>ip-address ieee-mac-address</i><br><b>no static-arp</b> <i>ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>ies>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures a static address resolution protocol (ARP) entry associating a subscriber IP address with a MAC address for the core router instance. This static ARP appears in the core routing ARP table. A static ARP can only be configured if it exists on the network attached to the IP interface.</p> <p>If an entry for a particular IP address already exists and a new MAC address is configured for the IP address, the existing MAC address will be replaced with the new MAC address.</p> <p>The <b>no</b> form of the command removes a static ARP entry.</p> |
| <b>Default</b>     | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <p><i>ip-address</i> — Specifies the IP address for the static ARP in IP address dotted decimal notation.</p> <p><i>ieee-mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee and ff are hexadecimal numbers.</p>                                                                                                                                                                                                                                                                           |

Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

## tos-marking-state

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tos-marking-state {trusted   untrusted}</b><br><b>no tos-marking-state</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>ies>interface<br>config>service>ies>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command is used to change the default trusted state to a non-trusted state. When unset or reverted to the trusted default, the ToS field will not be remarked by egress network IP interfaces unless the egress network IP interface has the remark-trusted state set, in which case the egress network interface treats all IES and network IP interface as untrusted.</p> <p>When the ingress interface is set to untrusted, all egress network IP interfaces will remark IP packets received on the network interface according to the egress marking definitions on each network interface. The egress network remarking rules also apply to the ToS field of IP packets routed using IGP shortcuts (tunneled to a remote next-hop). However, the tunnel QoS markings are always derived from the egress network QoS definitions.</p> <p>Egress marking and remarking is based on the internal forwarding class and profile state of the packet once it reaches the egress interface. The forwarding class is derived from ingress classification functions. The profile of a packet is either derived from ingress classification or ingress policing.</p> <p>The default marking state for network IP interfaces is trusted. This is equivalent to declaring no tos-marking-state on the network IP interface. When undefined or set to tos-marking-state trusted, the trusted state of the interface will not be displayed when using show config or show info unless the detail parameter is given. The <b>save config</b> command will not store the default tos-marking-state trusted state for network IP interfaces unless the detail parameter is also specified.</p> <p>The <b>no</b> tos-marking-state command is used to restore the trusted state to a network IP interface. This is equivalent to executing the tos-marking-state trusted command.</p> |
| <b>Default</b>     | <b>untrusted</b> for config>service>ies context<br><b>trusted</b> for config>service>ies>sub-if>grp-if context                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><b>trusted</b> — The default prevents the ToS field to not be remarked by egress network IP interfaces unless the egress network IP interface has the remark-trusted state set</p> <p><b>untrusted</b> — Specifies that all egress network IP interfaces will remark IP packets received on the network interface according to the egress marking definitions on each network interface.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## unnumbered

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>unnumbered [ip-int-name   ip-address]</b><br><b>no unnumbered</b>                         |
| <b>Context</b>     | config>service>ies>interface                                                                 |
| <b>Description</b> | This command configures the interface as an unnumbered interface. Unnumbered IP interface is |

supported on a Sonet/SDH access port with the PPP, ATM, or Frame Relay encapsulation. It is not supported on a TDM port or channel.

**Parameters** *ip-int-name* — Specifies the name of an IP interface. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.  
*ip-address* — Specifies an IP address.

## urpf-check

**Syntax** **[no] urpf-check**

**Context** config>service>ies>interface

**Description** This command enables unicast RPF (uRPF) Check on this interface.  
 The **no** form of the command disables unicast RPF (uRPF) Check on this interface.

**Default** disabled

## mode

**Syntax** **mode {strict | loose}**  
**no mode**

**Context** config>service>ies>interface>urfp-check

**Description** This command specifies the mode of unicast RPF check.  
 The **no** form of the command reverts to the default (strict) mode.

**Default** strict

**Parameters** **strict** — When specified, uRPF checks whether incoming packet has a source address that matches a prefix in the routing table, and whether the interface expects to receive a packet with this source address prefix.  
**loose** — In **loose** mode, uRPF checks whether incoming packet has source address with a corresponding prefix in the routing table. However, the loose mode does not check whether the interface expects to receive a packet with a specific source address prefix. This object is valid only when **urpf-check** is enabled.

## proxy-arp-policy

**Syntax** **[no] proxy-arp** *policy-name* [*policy-name...*(up to 5 max)]

**Context** config>service>ies>interface  
 config>service>ies>sub-if>grp-if

**Description** This command configures a proxy ARP policy for the interface.  
 The **no** form of this command disables the proxy ARP capability.

|                   |                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no proxy-arp                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b> | <i>policy-name</i> — The export route policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. The specified name(s) must already be defined. |

### remote-proxy-arp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>service>ies>interface<br>config>service>ies>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command enables remote proxy ARP on the interface.<br><br>Remote proxy ARP is similar to proxy ARP. It allows the router to answer an ARP request on an interface for a subnet that is not provisioned on that interface. This allows the router to forward to the other subnet on behalf of the requester. To distinguish remote proxy ARP from local proxy ARP, local proxy ARP performs a similar function but only when the requested IP is on the receiving interface. |
| <b>Default</b>     | no remote-proxy-arp                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

### ipv6

|                    |                                                                             |
|--------------------|-----------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] ipv6                                                                   |
| <b>Context</b>     | config>services>ies>sub-if                                                  |
| <b>Description</b> | This command enables IPv6 forwarding on the specified subscriber-interface. |
| <b>Default</b>     | no ipv6                                                                     |

### subscriber-prefixes

|                    |                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] subscriber-prefixes                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>services>ies>sub-if>ipv6                                                                                                                                                                                                                           |
| <b>Description</b> | This command specifies aggregate off-link subscriber prefixes associated with this subscriber interface. Individual prefixes are specified under the prefix context list aggregate routes in which the next-hop is indirect via the subscriber interface. |

### prefix

|                |                                                                                                                       |
|----------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>prefix</b> <i>ipv6-address/prefix-length</i> [pd] [wan-host]<br><b>no prefix</b> <i>ipv6-address/prefix-length</i> |
| <b>Context</b> | config>services>ies>sub-if>ipv6>sub-prefixes                                                                          |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command allows a list of prefixes(using the prefix command multiple times) to be routed to hosts associated with this subscriber interface. Each prefix will be represented in the associated FIB with a reference to the subscriber interface. Prefixes are defined as being for prefix delegation (pd) or use on a WAN interface or host (wan-host).                                                                                                                                                          |
| <b>Parameters</b>  | <p><i>ipv6-address</i> — Specifies the 128-bit IPv6 address.</p> <p><b>Values</b> 128-bit hexadecimal IPv6 address in compressed form.</p> <p><i>prefix-length</i> — Specifies the length of any associated aggregate prefix.</p> <p><b>Values</b> 32-63</p> <p><b>pd</b> — Specifies that this aggregate is used by IPv6 ESM hosts for DHCPv6 prefix-delegation.</p> <p><b>wan-host</b> — Specifies that this aggregate is used by IPv6 ESM hosts for local addressing or by a routing gateway's WAN interface.</p> |

## delegated-prefix-length

|                    |                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] delegated-prefix-length</b> <i>prefix-length</i>                                                                                     |
| <b>Context</b>     | config>services>ies>sub-if>ipv6                                                                                                              |
| <b>Description</b> | This command defines the prefix-length used for all DHCPv6 prefix delegations on this subscriber interface.                                  |
| <b>Parameters</b>  | <p><i>prefix-length</i> — Specifies the prefix length in use on this subscriber interface for DHCPv6 IA_PD.</p> <p><b>Values</b> 48 — 64</p> |
| <b>Default</b>     | 64                                                                                                                                           |

## redundant-interface

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>redundant-interface</b> <i>red-ip-int-name</i><br><b>no redundant-interface</b> |
| <b>Context</b>     | config>service>ies<br>config>service>ies>sub-if>grp-if                             |
| <b>Description</b> | This command configures a redundant interface used for dual homing.                |
| <b>Parameters</b>  | <i>red-ip-int-name</i> — Specifies the redundant IP interface name.                |

## arp-host

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-host</b>                                                    |
| <b>Context</b>     | config>service>ies>sub-if>grp-if                                   |
| <b>Description</b> | This command enables the context to configure ARP host parameters. |

## host-limit

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host-limit</b> <i>max-num-hosts</i><br><b>no host-limit</b>                               |
| <b>Context</b>     | config>service>ies>sub-if>grp-if                                                             |
| <b>Description</b> | This command configures the maximum number of ARP hosts.                                     |
| <b>Parameters</b>  | <i>max-num-hosts</i> — Specifies the maximum number of ARP hosts.<br><b>Values</b> 1 — 32767 |

## min-auth-interval

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>min-auth-interval</b> <i>min-auth-interval</i><br><b>no min-auth-interval</b>                    |
| <b>Context</b>     | config>service>ies>sub-if>grp-if                                                                    |
| <b>Description</b> | This command configures the minimum authentication interval.                                        |
| <b>Parameters</b>  | <i>min-auth-interval</i> — Specifies the minimum authentication interval.<br><b>Values</b> 1 — 6000 |

## sap-host-limit

|                    |                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap-host-limit</b> <i>max-num-hosts-sap</i><br><b>no sap-host-limit</b>                                                             |
| <b>Context</b>     | config>service>ies>sub-if>grp-if                                                                                                       |
| <b>Description</b> | This command configures the maximum number of ARP hosts per SAP.                                                                       |
| <b>Parameters</b>  | <i>max-num-hosts-sap</i> — Specifies the maximum number of ARP hosts per SAP allowed on this IES interface.<br><b>Values</b> 1 — 32767 |

## arp-populate

|                    |                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] arp-populate</b>                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>ies>interface<br>config>service>ies>sub-if>grp-if                                                                                                                                                                                                               |
| <b>Description</b> | This command, when enabled, disables dynamic learning of ARP entries. Instead, the ARP table is populated with dynamic entries from the DHCP Lease State Table (enabled with <b>lease-populate</b> ), and optionally with static entries entered with the <b>host</b> command. |

Enabling the **arp-populate** command will remove any dynamic ARP entries learned on this interface from the ARP cache.

The **arp-populate** command will fail if an existing static ARP entry exists for this interface. The **arp-populate** command will fail if an existing static subscriber host on the SAP does not have both MAC and IP addresses specified.

Once **arp-populate** is enabled, creating a static subscriber host on the SAP without both an IP address and MAC address will fail.

When **arp-populate** is enabled, the system will not send out ARP requests for hosts that are not in the ARP cache. Only statically configured and DHCP learned hosts are reachable through an IP interface with **arp-populate** enabled. The **arp-populate** command can only be enabled on IES and VPRN interfaces supporting Ethernet encapsulation.

Use the **no** form of the command to disable ARP cache population functions for static and dynamic hosts on the interface. All static and dynamic host information for this interface will be removed from the system's ARP cache.

**Default** not enabled

## frame-relay

**Syntax** **frame-relay**

**Context** config>service>ies>interface>sap

This command allows access to the context to configure the Frame Relay Local Management Interface (LMI) operational parameters for a SONET/SDH PoS link, a DS-0 channel group, or a DS-3/E-3 port or channel.

The port's **mode** must be set to **access** in **config>port>sonet-sdh>path>mode access** context.

The port's encapsulation type must be set to **frame-relay** in the **config>port>sonet-sdh>path>encap-type frame-relay** context.

The **no** form of this command removes the Frame Relay LMI operational parameters.

## frf-12

**Syntax** [no] **frf-12**

**Context** config>service>ies>interface>sap>frame-relay  
 config>service>vprn>interface>sap>frame-relay  
 config>service>epipe>sap>frame-relay  
 config>service>ipipe>sap>frame-relay  
 config>service>vpls>sap>frame-relay

**Description** This command defines the context to configure the parameters of FRF.12 Frame Relay fragmentation.

## ete-fragment-threshold

|                    |                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ete-fragment-threshold</b> <i>fragment-threshold</i><br><b>no ete-fragment-threshold</b>                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>interface>sap>frame-relay>frf.12<br>config>service>vprn>interface>sap>frame-relay>frf.12<br>config>service>epipe>sap>frame-relay>frf.12<br>config>service>ipipe>sap>frame-relay>frf.12<br>config>service>vpls>sap>frame-relay>frf.12 |
| <b>Description</b> | This command sets the maximum length, in bytes, of a fragment transmitted across a Frame Relay SAP with the FRF.12 end-to-end fragmentation enabled.<br><br>The no form of this command resets the fragment threshold back to the default value.        |
| <b>Default</b>     | 128                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>fragment-threshold</i> — Specifies the maximum fragment length, in bytes, to be transmitted across the FR SAP.<br><br><b>Values</b> 128 — 512 bytes                                                                                                  |

## interleave

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interleave</b><br><b>no interleave</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>interface>sap>frame-relay>frf.12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command enables interleaving of high priority frames and low-priority frame fragments within a FR SAP using FRF.12 end-to-end fragmentation.<br><br>When this option is enabled, only frames of the FR SAP non expedited forwarding class queues are subject to fragmentation. The frames of the FR SAP expedited queues are interleaved, with no fragmentation header, among the fragmented frames. In effect, this provides a behavior like in MLPPP Link Fragment Interleaving (LFI).<br><br>When this option is disabled, frames of all the FR SAP forwarding class queues are subject to fragmentation. The fragmentation header is however not included when the frame size is smaller than the user configured fragmentation size. In this mode, the SAP transmits all fragments of a frame before sending the next full or fragmented frame.<br><br>The receive direction of the FR SAP supports both modes of operation concurrently, with and without fragment interleaving.<br><br>The <b>no</b> form of this command restores the default mode of operation. |
| <b>Default</b>     | no interleave                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



## scheduling-class

|                    |                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] scheduling-class</b> <i>class-id</i>                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>ies>interface>sap>frame-relay<br>config>service>vprn>interface>sap>frame-relay<br>config>service>epipe>sap>frame-relay<br>config>service>ipipe>sap>frame-relay<br>config>service>fpipe>sap>frame-relay<br>config>service>vpls>sap>frame-relay |
| <b>Description</b> | This command assigns a Frame Relay scheduling class for a Frame Relay SAP. The scheduling class dictates which queue the frame or frame fragments are stored in FRF.12 end-to-end fragmentation, FRF.12 UNI/NNI link fragmentation and MLFR applications.    |
| <b>Default</b>     | 3                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>class-id</i> — Specifies the Frame Relay scheduling class number.                                                                                                                                                                                         |
| <b>Values</b>      | 0 — 3                                                                                                                                                                                                                                                        |

## host

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] host ip</b> <i>ip-address</i> [ <b>mac</b> <i>ieee-address</i> ]] [ <b>subscriber</b> <i>sub-ident-string</i> ] [ <b>sub-profile</b> <i>sub-profile-name</i> ] [ <b>sla-profile</b> <i>sla-profile-name</i> ] [ <b>ancp-string</b> <i>ancp-string</i> ]<br><b>no host</b> {[ <b>ip</b> <i>ip-address</i> ] [ <b>mac</b> <i>ieee-address</i> ]}<br><b>no host all</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>if>sap<br>config>service>ies>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command creates a static subscriber host for the SAP. Static subscriber hosts may be used by the system for various purposes. Applications within the system that make use of static host entries include anti-spoof filters and ARP cache population.</p> <p>Multiple static hosts may be defined on the SAP. Each host is identified by either a source IP address, a source MAC address or both a source IP and source MAC address. Every static host definition must have at least one address defined, IP or MAC.</p> <p>Static hosts can exist on the SAP even with anti-spoof and ARP populate features disabled. When enabled, each feature has different requirements for static hosts.</p> <p><b>anti-spoof</b> — When enabled, this feature uses static and dynamic host information to populate entries into an anti-spoof filter table. The anti-spoof filter entries generated will be of the same type as specified in the anti-spoof type parameter. If the SAP anti-spoof filter is defined as <b>ip</b>, each static host definition must specify an IP address. If the SAP anti-spoof filter is defined as <b>ip-mac</b>, each static host definition must specify both an IP address and MAC address. If definition of a static host is attempted without the appropriate addresses specified for the enabled anti-spoof filter, the static host definition will fail.</p> <p><b>arp-populate</b> — When enabled, this feature uses static and dynamic host information to populate entries in the system ARP cache.</p> <p>Attempting to define a static subscriber host that conflicts with an existing DHCP Lease State Table</p> |

entry will fail.

Use the **no** form of the command to remove a static entry from the system. The specified *ip-address* and *mac-address* must match the host's exact IP and MAC addresses as defined when it was created. When a static host is removed from the SAP, the corresponding anti-spoof entry and/or ARP cache entry is also removed.

**Default** none

**Parameters** **ip** *ip-address* — Specify this optional parameter when defining a static host. The IP address must be specified for **anti-spoof ip**, **anti-spoof ip-mac** and **arp-populate**. Only one static host may be configured on the SAP with a given IP address.

**mac** *mac-address* — Specify this optional parameter when defining a static host. The MAC address must be specified for **anti-spoof ip-mac** and **arp-populate**. Multiple static hosts may be configured with the same MAC address given that each definition is distinguished by a unique IP address.

**subscriber** *sub-ident-string* — Specify this optional parameter to specify an existing subscriber identification profile to be associated with the static subscriber host. The subscriber identification profile is configured in the **config>subscr-mgmt>sub-ident-policy** context. The subscriber information is used by the SAP arp-reply-agent to determine the proper handling of received ARP requests from subscribers.

- For VPRN SAPs with **arp-reply-agent** enabled with the optional *sub-ident* parameter, the static subscriber host's *sub-ident-string* is used to determine whether an ARP request received on the SAP is sourced from a host belonging to the same subscriber as the destination host. When both the destination and source hosts from the ARP request are known on the SAP and the subscriber identifications do not match, the ARP request may be forwarded to the rest of the VPRN destinations.

If the static subscriber host's *sub-ident* string is not defined, the host is not considered to belong to the same subscriber as another host on the SAP.

If source or destination host is unknown, the hosts are not considered to belong to the same subscriber. ARP messages from unknown hosts are subject to anti-spoof filtering rules applied at the SAP.

If *sub-ident* is not enabled on the SAP arp-reply-agent, subscriber identification matching is not performed on ARP requests received on the SAP.

ARP requests are never forwarded back to the same SAP or within the receiving SAP's split horizon group.

**sub-profile** *sub-profile-name* — Specify this optional parameter to specify an existing subscriber profile name to be associated with the static subscriber host. The subscriber profile is configured in the **config>subscr-mgmt>sub-profile** context.

**sla-profile** *sla-profile-name* — Specify this optional parameter to specify an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the **config>subscr-mgmt>sla-profile** context.

**ancc-string** *ancc-string* — Specifies the ASCII string of the DSLAM circuit ID name.

## IES Interface DHCP Commands

### dhcp

|                    |                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b><br>config>service>ies>interface<br>config>service>ies>sub-if<br>config>service>ies>sub-if>grp-if |
| <b>Description</b> | This command enables the context to configure DHCP parameters.                                               |

### client-applications

|                    |                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>client-applications dhcp</b><br><b>client-applications pppoe</b><br><b>client-applications dhcp pppoe</b><br><b>no client-applications</b>                                                                                              |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>dhcp                                                                                                                                                                                                      |
| <b>Description</b> | This command enables the clients that will try to contact the DHCP server(s).<br>The <b>no</b> form of the command removes the server client type from the configuration.                                                                  |
| <b>Parameters</b>  | <b>dhcp</b> — Specifies that the DHCP relay will forward requests to the DHCP server(s).<br><b>pppoe</b> — Specifies that PPPoE will attempt to request an IP address for a PPPoE client from the DHCP server(s)ly assigned to PPPoE node. |

### action

|                    |                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>action {replace   drop   keep}</b><br><b>no action</b>                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>ies>if>dhcp>option<br>config>service>ies>sub-if>grp-if>dhcp>option                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command configures the Relay Agent Information Option (Option 82) processing.<br>The <b>no</b> form of this command returns the system to the default value.                                                                                                                                                                                                                               |
| <b>Default</b>     | The default is to keep the existing information intact.                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <b>replace</b> — In the upstream direction (from the user), the Option 82 field from the router is inserted in the packet (overwriting any existing Option 82 field). In the downstream direction (towards the user) the Option 82 field is stripped (in accordance with RFC 3046).<br><b>drop</b> — The DHCP packet is dropped if an Option 82 field is present, and a counter is incremented. |

**keep** — The existing information is kept in the packet and the router does not add any additional information. In the downstream direction the Option 82 field is not stripped and is forwarded towards the client.

The behavior is slightly different in case of Vendor Specific Options (VSOs). When the keep parameter is specified, the router will insert his own VSO into the Option 82 field. This will only be done when the incoming message has already an Option 82 field.

If no Option 82 field is present, the router will not create the Option 82 field. In this in that case, no VSO will be added to the message.

## circuit-id

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>circuit-id</b> [ascii-tuple   ifindex   sap-id   vlan-ascii-tuple]<br><b>no circuit-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>ies>if>dhcp>option<br>config>service>ies>sub-if>grp-if>dhcp>option                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | When enabled, the router sends either an ASCII tuple, or the interface index (If Index), on the specified SAP ID in the <b>circuit-id</b> suboption of the DHCP packet.<br><br>If disabled, the <b>circuit-id</b> suboption of the DHCP packet will be left empty.<br><br>The <b>no</b> form of this command returns the system to the default.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Default</b>     | circuit-id ascii-tuple                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <b>ascii-tuple</b> — Specifies that the ASCII-encoded concatenated tuple will be used which consists of the access-node-identifier, service-id, and interface-name, separated by “ ”.<br><br><b>ifindex</b> — Specifies that the interface index will be used. The If Index of a router interface can be displayed using the command <code>show&gt;router&gt;interface&gt;detail</code> .<br><br><b>sap-id</b> — Specifies that the SAP ID will be used.<br><br><b>vlan-ascii-tuple</b> — Specifies that the format will include VLAN ID, dot1p bits in addition to what is included in ascii-tuple already. The format is supported on dot1q and qinq ports only. Thus, when the Option 82 bits are stripped, dot1p bits will be copied to the Ethernet header of an outgoing packet. |

## match-circuit-id

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] match-circuit-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command enables Option 82 circuit ID on relayed DHCP packet matching.<br><br>For Routed CO, the group interface DHCP relay process is stateful. When packets are relayed to the server the virtual router ID, transaction ID, SAP ID, and client hardware MAC address of the relayed packet are tracked. When a response is received from the server the virtual router ID, transaction ID, and client HW MAC address must be matched to determine the SAP on which to send the packet out. In some cases, the virtual router ID, transaction ID, and client hardware MAC address are not |

guaranteed to be unique.

When the **match-circuit-id** command is enabled, it is used as part of the key to guarantee correctness in our lookup. This is really only needed when we are dealing with an IP aware DSLAM that proxies the client HW mac address.

**Default** no match-circuit-id

## option

**Syntax** [no] option

**Context** config>service>ies>if>dhcp  
config>service>ies>sub-if>grp-if>dhcp

**Description** This command enables DHCP Option 82 (Relay Agent Information Option) parameters processing and enters the context for configuring Option 82 sub-options.

The **no** form of this command returns the system to the default.

**Default** no option

## remote-id

**Syntax** remote-id [mac | string *string*]  
no remote-id

**Context** config>service>ies>if>dhcp>option  
config>service>ies>sub-if>grp-if>dhcp>option

**Description** When enabled, the router sends the MAC address of the remote end (typically the DHCP client) in the **remote-id** suboption of the DHCP packet. This command identifies the host at the other end of the circuit.

If disabled, the **remote-id** suboption of the DHCP packet will be left empty.

The **no** form of this command returns the system to the default.

**Default** remote-id

**Parameters** **mac** — This keyword specifies the MAC address of the remote end is encoded in the suboption.  
**string** *string* — Specifies the remote-id.

## vendor-specific-option

**Syntax** [no] vendor-specific-option

**Context** config>service>ies>if>dhcp>option  
config>service>ies>sub-if>grp-if>dhcp>option

**Description** This command configures the vendor specific suboption of the DHCP relay packet.

## client-mac-address

|                    |                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] client-mac-address</b>                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>if>dhcp>option>vendor<br>config>service>ies>sub-if>grp-if>dhcp>option>vendor                                                                                                                                                            |
| <b>Description</b> | This command enables the sending of the MAC address in the vendor specific suboption of the DHCP relay packet.<br><br>The <b>no</b> form of the command disables the sending of the MAC address in the vendor specific suboption of the DHCP relay packet. |

## sap-id

|                    |                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap-id</b>                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>ies>if>dhcp>option>vendor<br>config>service>ies>sub-if>grp-if>dhcp>option>vendor                                                                                                                                                  |
| <b>Description</b> | This command enables the sending of the SAP ID in the vendor specific suboption of the DHCP relay packet.<br><br>The <b>no</b> form of the command disables the sending of the SAP ID in the vendor specific suboption of the DHCP relay packet. |

## service-id

|                    |                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] service-id</b>                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>ies>if>dhcp>option>vendor                                                                                                                                                                                                                 |
| <b>Description</b> | This command enables the sending of the service ID in the vendor specific suboption of the DHCP relay packet.<br><br>The <b>no</b> form of the command disables the sending of the service ID in the vendor specific suboption of the DHCP relay packet. |

## string

|                    |                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] string <i>text</i></b>                                                                                                                                                           |
| <b>Context</b>     | config>service>ies>if>dhcp>option>vendor<br>config>service>ies>sub-if>grp-if>dhcp>option>vendor                                                                                          |
| <b>Description</b> | This command specifies the string in the vendor specific suboption of the DHCP relay packet.<br><br>The <b>no</b> form of the command returns the default value.                         |
| <b>Parameters</b>  | <i>text</i> — The string can be any combination of ASCII characters up to 32 characters in length. If spaces are used in the string, enclose the entire string in quotation marks (“ ”). |

## system-id

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] system-id</b>                                                                                   |
| <b>Context</b>     | config>service>ies>if>dhcp>option>vendor<br>config>service>ies>sub-if>grp-if>dhcp>option>vendor         |
| <b>Description</b> | This command specifies whether the system-id is encoded in the vendor specific sub-option of Option 82. |

## proxy-server

|                    |                                                                     |
|--------------------|---------------------------------------------------------------------|
| <b>Syntax</b>      | <b>proxy-server</b>                                                 |
| <b>Context</b>     | config>service>ies>if>dhcp<br>config>service>ies>sub-if>grp-if>dhcp |
| <b>Description</b> | This command configures the DHCP proxy server.                      |

## emulated-server

|                    |                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>emulated-server <i>ip-address</i></b><br><b>no emulated-server</b>                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>ies>if>dhcp>proxy-server<br>config>service>ies>sub-if>grp-if>dhcp>proxy-server                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command configures the IP address which will be used as the DHCP server address in the context of this SAP. Typically, the configured address should be in the context of the subnet represented by service.<br><br>The <b>no</b> form of this command reverts to the default setting. The local proxy server will not become operational without the emulated-server address being specified. |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the emulated server address.                                                                                                                                                                                                                                                                                                                                          |

## lease-time

|                    |                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-time [<i>days days</i>] [<i>hrs hours</i>] [<i>min minutes</i>] [<i>sec seconds</i>] [<i>radius-override</i>]</b><br><b>no lease-time</b>                                                                                                                                                                                |
| <b>Context</b>     | config>service>ies>if>dhcp>proxy-server<br>config>service>ies>sub-if>grp-if>dhcp>proxy-server                                                                                                                                                                                                                                     |
| <b>Description</b> | This command defines the length of lease-time that will be provided to DHCP clients. By default the local-proxy-server will always make use of the lease-time information provide by either a RADIUS or DHCP server.<br><br>The <b>no</b> form of this command disables the use of the lease-time command. The local-proxy-server |

will use the lease-time offered by either a RADIUS or DHCP server.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | 7 days 0 hours 0 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b> | <p><b>radius-override</b> — Specifies that the local-proxy-server will use the configured lease-time information to provide DHCP clients.</p> <p><i>days</i> — Specifies the number of days that the given IP address is valid.</p> <p><b>Values</b> 0 — 3650</p> <p><i>hours</i> — Specifies the number of hours that the given IP address is valid.</p> <p><b>Values</b> 0 — 23</p> <p><i>minutes</i> — Specifies the number of minutes that the given IP address is valid.</p> <p><b>Values</b> 0 — 59</p> <p><i>seconds</i> — Specifies the number of seconds that the given IP address is valid.</p> <p><b>Values</b> 0 — 59</p> |

## server

|                    |                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>server</b> <i>server1</i> [ <i>server2</i> ...(up to 8 max)]                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>if>dhcp<br>config>service>ies>sub-if>grp-if>dhcp                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command specifies a list of servers where requests will be forwarded. The list of servers can be entered as either IP addresses or fully qualified domain names. There must be at least one server specified for DHCP relay to work. If there are multiple servers then the request is forwarded to all of the servers in the list.</p> <p>There can be a maximum of 8 DHCP servers configured.</p> |
| <b>Default</b>     | no server                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>server</i> — Specify the DHCP server IP address.                                                                                                                                                                                                                                                                                                                                                         |

## trusted

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] trusted</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>ies>if>dhcp<br>config>service>ies>sub-if>grp-if>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>According to RFC 3046, <i>DHCP Relay Agent Information Option</i>, a DHCP request where the giaddr is 0.0.0.0 and which contains a Option 82 field in the packet, should be discarded, unless it arrives on a "trusted" circuit. If trusted mode is enabled on an IP interface, the Relay Agent (the router) will modify the request's giaddr to be equal to the ingress interface and forward the request.</p> <p>Note that this behavior only applies when the action in the Relay Agent Information Option is "keep". In the case where the Option 82 field is being replaced by the Relay Agent (action = "replace"), the</p> |



original Option 82 information is lost anyway, and there is thus no reason for enabling the trusted option.

The **no** form of this command returns the system to the default.

**Default** not enabled

## user-db

**Syntax** **user-db** *local-user-db-name*  
**no user-db**

**Context** config>service>ies>sub-if>grp-if>dhcp

**Description** This command configures the local user database to use for authentication.  
The **no** form of the command removes the value from the configuration.

**Default** no user-db

**Parameters** *local-user-db-name* — Specifies the local user database to use for authentication.

## gi-address

**Syntax** **gi-address** *ip-address* [*src-ip-addr*]  
**no gi-address**

**Context** config>service>ies>if>dhcp  
config>service>ies>sub-if>grp-if>dhcp

**Description** This command configures the gateway interface address for the DHCP relay. A subscriber interface can include multiple group interfaces with multiple SAPs. The GI address is needed, when the router functions as a DHCP relay, to distinguish between different interfaces.  
  
By default, the GI address used in the relayed DHCP packet is the primary IP address of a normal IES interface. Specifying the GI address allows the user to choose a secondary address. For group interfaces a GI address must be specified under the group interface DHCP context or subscriber-interface DHCP context in order for DHCP to function.

**Default** no gi-address

**Parameters** *ip-address* — Specifies the host IP address to be used for DHCP relay packets.  
*src-ip-address* — Specifies that this GI address is to be the source IP address for DHCP relay packets.

## lease-populate

**Syntax** **lease-populate** [*number-of-entries*]  
**no lease-populate**

**Context** config>service>ies>if>dhcp

config>service>ies>sub-if>grp-if>dhcp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | <p>This command enables dynamic host lease state management for IES IP interfaces. Lease state information is extracted from snooped or relayed DHCP ACK messages to populate lease state table entries for the IP interface.</p> <p>If lease state population is enabled and an entry cannot be added to the table, the system will prevent the far-end host from receiving the DHCP ACK message.</p> <p>The retained lease state information representing dynamic hosts may be used to populate a SAP based anti-spoof filter table to provide dynamic anti-spoof filtering and/or ARP cache population.</p> |
| <b>Default</b>     | <p>ies&gt;if&gt;dhcp: no lease-populate</p> <p>ies&gt;sub-if&gt;grp-if&gt;dhcp: 1</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <p><i>number-of-entries</i> — This optional parameter defines the number of lease state table entries allowed for this IP interface. If <i>number-of-entries</i> is not specified, only a single entry is allowed. Once the maximum number of entries has been reached, subsequent lease state entries are not allowed.</p>                                                                                                                                                                                                                                                                                    |
| <b>Values</b>      | <p>1 — 32767</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## PPPoE Commands

### pppoe

|                    |                                                                 |
|--------------------|-----------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] pppoe</b>                                               |
| <b>Context</b>     | config>service>ies>sub-if>grp-if                                |
| <b>Description</b> | This command enables the context to configure PPPoE parameters. |

### dhcp-client

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp-client</b>                                                       |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>pppoe                                   |
| <b>Description</b> | This command enables the context to configure the PPPoE-to-DHCP options. |

### ccag-use-origin-sap

|                    |                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ccag-use-origin-sap</b>                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>pppoe>dhcp-client                                                                                                                                                                                                |
| <b>Description</b> | <p>This command enables the original VPLS SAP to be included in the circuit-id option to send to the DHCP server (in case this interface is connected to a VPLS by a CCA MDA).</p> <p>The <b>no</b> form of the command disables the feature.</p> |
| <b>Default</b>     | no ccag-use-origin-sap                                                                                                                                                                                                                            |

### pap-chap-user-db

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pap-chap-user-db</b> <i>local-user-db-name</i><br><b>no pap-chap-user-db</b>                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>pppoe                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command configures the local user database to use for PPP Challenge-Handshake Authentication Protocol/Password Authentication Protocol (PAP/CHAP) authentication.</p> <p>If an authentication policy is also configured, <b>pppoe-access-method</b> must be set to none in this authentication policy to use the local user database (in that case RADIUS authentication will not be used for PPPoE hosts).</p> |
| <b>Parameters</b>  | <i>local-user-db-name</i> — Specifies the local user database to use for authentication.                                                                                                                                                                                                                                                                                                                                |

## pppoe-policy

|                    |                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pppoe-policy</b> <i>pppoe-policy-name</i><br><b>no pppoe-policy</b>                                 |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>pppoe                                                                 |
| <b>Description</b> | This command associates a PPPoE policy on this interface.                                              |
| <b>Default</b>     | default                                                                                                |
| <b>Parameters</b>  | <i>pppoe-policy-name</i> — Specifies a a PPPoE policy up to 32 characters in length on this interface. |

## sap-session-limit

|                    |                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap-session-limit</b> <i>sap-session-limit</i><br><b>no sap-session-limit</b>           |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>pppoe                                                     |
| <b>Description</b> | This command specifies the number of PPPoE hosts per SAP allowed for this group-interface. |
| <b>Default</b>     | 1                                                                                          |
| <b>Parameters</b>  | <i>sap-session-limit</i> — Specifies the number of PPPoE hosts per SAP allowed.            |
| <b>Values</b>      | 1 — 20000                                                                                  |

## session-limit

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>session-limit</b> <i>session-limit</i><br><b>no session-limit</b>               |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>pppoe                                             |
| <b>Description</b> | This command specifies the number of PPPoE hosts allowed for this group interface. |
| <b>Default</b>     | 1                                                                                  |
| <b>Parameters</b>  | <i>session-limit</i> — Specifies the number of PPPoE hosts allowed                 |
| <b>Values</b>      | 1 — 20000                                                                          |

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## IES Interface ICMP Commands

### icmp

|                    |                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>icmp</b>                                                                                                         |
| <b>Context</b>     | config>service>ies>interface<br>config>service>ies>sub-if>grp-if                                                    |
| <b>Description</b> | This command enables the context to configure Internet Control Message Protocol (ICMP) parameters on an IES service |

### mask-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mask-reply</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>ies>if>icmp<br>config>service>ies>sub-if>grp-if>icmp                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command enables responses to Internet Control Message Protocol (ICMP) mask requests on the router interface.</p> <p>If a local node sends an ICMP mask request to the router interface, the <b>mask-reply</b> command configures the router interface to reply to the request.</p> <p>By default, the router instance will reply to mask requests.</p> <p>The <b>no</b> form of this command disables replies to ICMP mask requests on the router interface.</p> |
| <b>Default</b>     | <b>mask-reply</b> — Reply to ICMP mask requests.                                                                                                                                                                                                                                                                                                                                                                                                                         |

### redirects

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>redirects</b> [ <i>number seconds</i> ]<br><b>no redirects</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>ies>if>icmp<br>config>service>ies>sub-if>grp-if>icmp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command configures the rate for Internet Control Message Protocol (ICMP) redirect messages issued on the router interface.</p> <p>When routes are not optimal on this router and another router on the same subnetwork has a better route, the router can issue an ICMP redirect to alert the sending node that a better route is available.</p> <p>The <b>redirects</b> command enables the generation of ICMP redirects on the router interface. The rate at which ICMP redirects is issued can be controlled with the optional <i>number</i> and <i>seconds</i> parameters by indicating the maximum number of redirect messages that can be issued on the interface for a given time interval.</p> |

By default, generation of ICMP redirect messages is enabled at a maximum rate of 100 per 10 second time interval. (*Default: redirects 100 10*)

The **no** form of this command disables the generation of icmp redirects on the router interface.

|                   |                                                                                                                                                                                                                                                                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>redirects 100 10</b> — Maximum of 100 redirect messages in 10 seconds                                                                                                                                                                                                                                                                    |
| <b>Parameters</b> | <p><i>number</i> — The maximum number of ICMP redirect messages to send. This parameter must be specified with the <i>seconds</i> parameter.</p> <p><b>Values</b> 10 — 1000</p> <p><i>seconds</i> — The time frame in seconds used to limit the <i>number</i> of ICMP redirect messages that can be issued.</p> <p><b>Values</b> 1 — 60</p> |

## ttl-expired

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ttl-expired <i>number seconds</i></b><br><b>no ttl-expired</b>                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>ies>if>icmp<br>config>service>ies>sub-if>grp-if>icmp                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command configures the rate Internet Control Message Protocol (ICMP) TTL expired messages are issued by the IP interface.</p> <p>By default, generation of ICMP TTL expired messages is enabled at a maximum rate of 100 per 10 second time interval.</p> <p>The <b>no</b> form of this command disables the limiting the rate of TTL expired messages on the router interface.</p>                       |
| <b>Default</b>     | ttl-expired 100 10                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>number</i> — The maximum number of ICMP TTL expired messages to send, expressed as a decimal integer. This parameter must be specified with the <i>seconds</i> parameter.</p> <p><b>Values</b> 10 — 1000</p> <p><i>seconds</i> — The time frame in seconds used to limit the <i>number</i> of ICMP TTL expired messages that can be issued, expressed as a decimal integer.</p> <p><b>Values</b> 1 — 60</p> |

## unreachables

|                    |                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>unreachables [<i>number seconds</i>]</b><br><b>no unreachables</b>                       |
| <b>Context</b>     | config>service>ies>if>icmp<br>config>service>ies>sub-if>grp-if>icmp                         |
| <b>Description</b> | This command configures the rate for ICMP host and network destination unreachable messages |

issued on the router interface.

The **unreachables** command enables the generation of ICMP destination unreachables on the router interface. The rate at which ICMP unreachables is issued can be controlled with the optional *number* and *time* parameters by indicating the maximum number of destination unreachable messages which can be issued on the interface for a given time interval.

By default, generation of ICMP destination unreachable messages is enabled at a maximum rate of 10 per 60 second time interval.

The **no** form of this command disables the generation of icmp destination unreachable messages on the router interface.

|                   |                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>unreachables 100 10</b>                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b> | <p><i>number</i> — The maximum number of ICMP unreachable messages to send. This parameter must be specified with the <i>seconds</i> parameter.</p> <p><b>Values</b>      10 — 1000</p> <p><i>seconds</i> — The time frame in seconds used to limit the <i>number</i> of ICMP unreachable messages that can be issued.</p> <p><b>Values</b>      1 — 60</p> |

---

## IES Interface IPv6 Commands

### ipv6

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ipv6</b>                                                         |
| <b>Context</b>     | config>service>ies>interface                                             |
| <b>Description</b> | This command enables the context to configure IPv6 for an IES interface. |

### address

|                    |                                                                                                                                                                                                                                                                                                                                                             |                                   |                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>address</b> <i>ipv6-address/prefix-length</i> [ <b>eui-64</b> ]<br><b>no address</b> <i>ipv6-address/prefix-length</i>                                                                                                                                                                                                                                   |                                   |                                                                                                                       |
| <b>Context</b>     | config>service>ies>if>ipv6                                                                                                                                                                                                                                                                                                                                  |                                   |                                                                                                                       |
| <b>Description</b> | This command assigns an IPv6 address to the IES interface.                                                                                                                                                                                                                                                                                                  |                                   |                                                                                                                       |
| <b>Parameters</b>  | <i>ipv6-address/prefix-length</i> — Specify the IPv6 address on the interface.                                                                                                                                                                                                                                                                              |                                   |                                                                                                                       |
|                    | <b>Values</b>                                                                                                                                                                                                                                                                                                                                               | ipv6-address/prefix: ipv6-address | x:x:x:x:x:x:x (eight 16-bit pieces)<br>x:x:x:x:x:d.d.d.d<br>x [0 — FFFF]H<br>d [0 — 255]D<br>prefix-length<br>1 — 128 |
|                    | <b>eui-64</b> — When the <b>eui-64</b> keyword is specified, a complete IPv6 address from the supplied prefix and 64-bit interface identifier is formed. The 64-bit interface identifier is derived from MAC address on Ethernet interfaces. For interfaces without a MAC address, for example ATM interfaces, the Base MAC address of the chassis is used. |                                   |                                                                                                                       |

### dhcp6-relay

|                    |                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dhcp6-relay</b>                                                                                                                               |
| <b>Context</b>     | config>service>ies>if>ipv6                                                                                                                            |
| <b>Description</b> | This command enables the context to configure DHCPv6 relay parameters for the IES interface. The <b>no</b> form of the command disables DHCPv6 relay. |



## lease-populate

|                    |                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-populate</b> [ <i>nbr-of-entries</i> ]<br><b>no lease-populate</b>                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>ies>if>ipv6>dhcp-relay                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command specifies the maximum number of DHCPv6 lease states allocated by the DHCPv6 DHCP relay function, allowed on this interface.<br><br>The <b>no</b> form of the command disables dynamic host lease state management.                                                                                                                    |
| <b>Default</b>     | no lease-populate                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>nbr-of-entries</i> — Defines the number lease state table entries allowed for this interface. If this parameter is omitted, only a single entry is allowed. Once the maximum number of entries has been reached, subsequent lease state entries are not allowed and subsequent DHCPv6 ACK messages are discarded.<br><br><b>Values</b> 1 — 8000 |

## neighbor-resolution

|                    |                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] neighbor-resolution</b>                                                                                                    |
| <b>Context</b>     | config>service>ies>if>ipv6>dhcp6-relay                                                                                             |
| <b>Description</b> | This command enables neighbor resolution with DHCPv6 relay.<br><br>The <b>no</b> form of the command disables neighbor resolution. |

## option

|                    |                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] option</b>                                                                                                                                                  |
| <b>Context</b>     | config>service>ies>if>ipv6>dhcp6-relay                                                                                                                              |
| <b>Description</b> | This command enables the context to configure DHCPv6 relay information options.<br><br>The <b>no</b> form of the command disables DHCPv6 relay information options. |

## interface-id

|                |                                                                                                                                                                             |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>interface-id</b><br><b>interface-id ascii-tuple</b><br><b>interface-id ifindex</b><br><b>interface-id sap-id</b><br><b>interface-id string</b><br><b>no interface-id</b> |
| <b>Context</b> | config>service>ies>if>ipv6>dhcp6>option                                                                                                                                     |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command enables the sending of interface ID options in the DHCPv6 relay packet.<br>The <b>no</b> form of the command disables the sending of interface ID options in the DHCPv6 relay packet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><b>ascii-tuple</b> — Specifies that the ASCII-encoded concatenated tuple will be used which consists of the access-node-identifier, service-id, and interface-name, separated by “ ”.</p> <p><b>ifindex</b> — Specifies that the interface index will be used. (The If Index of a router interface can be displayed using the command <code>show&gt;router&gt;interface&gt;detail</code>)</p> <p><b>sap-id</b> — Specifies that the SAP identifier will be used.</p> <p><b>string</b> — Specifies a string of up to 32 characters long, composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> |

### remote-id

|                    |                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] remote-id</b>                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>ies>if>ipv6>dhcp6>option                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command enables the sending of remote ID option in the DHCPv6 relay packet.</p> <p>The client DHCP Unique Identifier (DUID) is used as the remote ID.</p> <p>The <b>no</b> form of the command disables the sending of remote ID option in the DHCPv6 relay packet.</p> |

### server

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                                     |  |                   |  |                |  |               |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------------|--|-------------------|--|----------------|--|---------------|
| <b>Syntax</b>      | <b>server ipv6z-address [ipv6z-address...(up to 8 max)]</b>                                                                                                                                                                                                                                                                                                                                                          |               |                                     |  |                   |  |                |  |               |
| <b>Context</b>     | config>service>ies>if>ipv6>dhcp6                                                                                                                                                                                                                                                                                                                                                                                     |               |                                     |  |                   |  |                |  |               |
| <b>Description</b> | This command specifies a list of servers where DHCPv6 requests will be forwarded. The list of servers can entered as either IP addresses or fully qualified domain names. There must be at least one server specified for DHCPv6 relay to work. If there are multiple servers then the request is forwarded to all of the servers in the list. There can be a maximum of 8 DHCPv6 servers configured.                |               |                                     |  |                   |  |                |  |               |
| <b>Default</b>     | no server                                                                                                                                                                                                                                                                                                                                                                                                            |               |                                     |  |                   |  |                |  |               |
| <b>Parameters</b>  | <p><b>ipv6-address</b> — Specifies the IPv6 addresses of the DHCP servers where the DHCPv6 requests will be forwarded. Up to 8 addresses can be specified.</p> <p><b>Values</b></p> <table> <tr> <td>ipv6-address:</td><td>x:x:x:x:x:x:x (eight 16-bit pieces)</td></tr> <tr> <td></td><td>x:x:x:x:x:d.d.d.d</td></tr> <tr> <td></td><td>x: [0 — FFFF]H</td></tr> <tr> <td></td><td>d: [0 — 255]D</td></tr> </table> | ipv6-address: | x:x:x:x:x:x:x (eight 16-bit pieces) |  | x:x:x:x:x:d.d.d.d |  | x: [0 — FFFF]H |  | d: [0 — 255]D |
| ipv6-address:      | x:x:x:x:x:x:x (eight 16-bit pieces)                                                                                                                                                                                                                                                                                                                                                                                  |               |                                     |  |                   |  |                |  |               |
|                    | x:x:x:x:x:d.d.d.d                                                                                                                                                                                                                                                                                                                                                                                                    |               |                                     |  |                   |  |                |  |               |
|                    | x: [0 — FFFF]H                                                                                                                                                                                                                                                                                                                                                                                                       |               |                                     |  |                   |  |                |  |               |
|                    | d: [0 — 255]D                                                                                                                                                                                                                                                                                                                                                                                                        |               |                                     |  |                   |  |                |  |               |

## source-address

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>source-address</b> <i>ipv6-address</i><br><b>no source-address</b>                                          |
| <b>Context</b>     | config>service>ies>if>ipv6>dhcp6                                                                               |
| <b>Description</b> | This command configures the source IPv6 address of the DHCPv6 relay messages.                                  |
| <b>Parameters</b>  | <i>ipv6-address</i> — Specifies the source IPv6 address of the DHCPv6 relay messages.                          |
| <b>Values</b>      | ipv6-address:    x:x:x:x:x:x:x (eight 16-bit pieces)<br>x:x:x:x:x:x:d.d.d.d<br>x: [0 — FFFF]H<br>d: [0 — 255]D |

## dhcp6-server

|                    |                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dhcp6-server</b>                                                                                                                                       |
| <b>Context</b>     | config>service>ies>if>ipv6                                                                                                                                     |
| <b>Description</b> | This command enables the context to configure DHCPv6 server parameters for the IES interface.<br>The <b>no</b> form of the command disables the DHCPv6 server. |

## max-nbr-of-leases

|                    |                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-nbr-of-leases</b> <i>max-nbr-of-leases</i><br><b>no max-nbr-of-leases</b>                                                                                                                     |
| <b>Context</b>     | config>service>ies>if>ipv6>dhcp6-server                                                                                                                                                              |
| <b>Description</b> | This command configures the maximum number of lease states installed by the DHCPv6 server function allowed on this interface.<br>The <b>no</b> form of the command returns the value to the default. |
| <b>Default</b>     | 8000                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>max-nbr-of-leases</i> — Specifies the maximum number of lease states installed by the DHCPv6 server function allowed on this interface.                                                           |
| <b>Values</b>      | 0 — 8000                                                                                                                                                                                             |

## prefix-delegation

|                |                                         |
|----------------|-----------------------------------------|
| <b>Syntax</b>  | <b>[no] prefix-delegation</b>           |
| <b>Context</b> | config>service>ies>if>ipv6>dhcp6-server |

**Description** This command configures prefix delegation options for delegating a long-lived prefix from a delegating router to a requesting router, where the delegating router does not require knowledge about the topology of the links in the network to which the prefixes will be assigned.

The **no** form of the command disables prefix-delegation.

## prefix

**Syntax** **[no] prefix** *ipv6-address/prefix-length*

**Context** config>service>ies>if>ipv6>dhcp6-server>pfx-delegate

**Description** This command specifies the IPv6 prefix that will be delegated by this system.

**Parameters** *ipv6-address/prefix-length* — Specify the IPv6 address on the interface.

|               |                                   |                                                                                           |
|---------------|-----------------------------------|-------------------------------------------------------------------------------------------|
| <b>Values</b> | ipv6-address/prefix: ipv6-address | x:x:x:x:x:x:x (eight 16-bit pieces)<br>x:x:x:x:x:x:d.d.d<br>x [0 — FFFF]H<br>d [0 — 255]D |
|               | prefix-length                     | 1 — 128                                                                                   |

## duid

**Syntax** **duid** *duid* [**iaid** *iaid*]  
**no duid**

**Context** config>service>ies>if>ipv6>dhcp6>pfx-delegate>prefix

**Description** This command configures the DHCP Unique Identifier (DUID) of the DHCP client.

**Parameters** *duid* — Specifies the ID of the requesting router. If set to a non zero value the prefix defined will only be delegated to this router. If set to zero, the prefix will be delegated to any requesting router.

**iaid** *iaid* — Specifies the identity association identification (IAID) from the requesting router that needs to match in order to delegate the prefix defined in this row.If set to 0 no match on the received IAID is done.

## preferred-lifetime

**Syntax** **preferred-lifetime** *seconds*  
**preferred-lifetime** *infinite*  
**no preferred-lifetime**

**Context** config>service>ies>if>ipv6>dhcp6>pfx-delegate>prefix

**Description** This command configures the IPv6 prefix/mask preferred life time. The preferred-lifetime value cannot be bigger than the valid-lifetime value.

The **no** form of the command reverts to the default value.

|                   |                                                                                      |
|-------------------|--------------------------------------------------------------------------------------|
| <b>Default</b>    | 604800 seconds (7 days)                                                              |
| <b>Parameters</b> | <i>seconds</i> — Specifies the time, in seconds, that this prefix remains preferred. |
|                   | <b>Values</b> 1 — 4294967294                                                         |
|                   | <b>infinite</b> — Specifies that this prefix remains preferred infinitely.           |

## valid-lifetime

|                    |                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>valid-lifetime</b> <i>seconds</i><br><b>valid-lifetime infinite</b><br><b>no valid-lifetime</b>                                                                                |
| <b>Context</b>     | config>service>ies>if>ipv6>dhcp6>pfx-delegate>prefix                                                                                                                              |
| <b>Description</b> | This command configures the time, in seconds, that the prefix is valid. 4,294,967,295 represents infinity.<br><br>The <b>no</b> form of the command reverts to the default value. |
| <b>Default</b>     | 2592000 seconds (30 days)                                                                                                                                                         |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the time, in seconds, that this prefix remains valid.                                                                                                  |
|                    | <b>Values</b> 1 — 4294967295                                                                                                                                                      |
|                    | <b>infinite</b> — Specifies that this prefix remains valid infinitely.                                                                                                            |

## icmp6

|                    |                                                                  |
|--------------------|------------------------------------------------------------------|
| <b>Syntax</b>      | <b>icmp6</b>                                                     |
| <b>Context</b>     | config>service>ies>if>ipv6                                       |
| <b>Description</b> | This command configures ICMPv6 parameters for the IES interface. |

## packet-too-big

|                    |                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>packet-too-big</b> [ <i>number seconds</i> ]<br><b>no packet-too-big</b>                                                                                                                                                                                        |
| <b>Context</b>     | config>service>ies>if>ipv6>icmp6                                                                                                                                                                                                                                   |
| <b>Description</b> | This command specifies whether “packet-too-big” ICMPv6 messages should be sent. When enabled, ICMPv6 “packet-too-big” messages are generated by this interface.<br><br>The <b>no</b> form of the command disables the sending of ICMPv6 “packet-too-big” messages. |
| <b>Default</b>     | 100 10                                                                                                                                                                                                                                                             |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><i>number</i> — Specifies the number of “packet-too-big” ICMPv6 messages to send in the time frame specified by the <i>seconds</i> parameter.</p> <p><b>Values</b> 10 — 1000</p> <p><b>Default</b> 100</p> <p><i>seconds</i> — Specifies the time frame in seconds that is used to limit the number of “packet-too-big” ICMPv6 messages issued.</p> <p><b>Values</b> 1 — 60</p> <p><b>Default</b> 10</p> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## param-problem

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>param-problem</b> [<i>number seconds</i>]</p> <p><b>no packet-too-big</b></p>                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>if>ipv6>icmp6                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command specifies whether “parameter-problem” ICMPv6 messages should be sent. When enabled, “parameter-problem” ICMPv6 messages are generated by this interface.</p> <p>The <b>no</b> form of the command disables the sending of “parameter-problem” ICMPv6 messages.</p>                                                                                                                                              |
| <b>Default</b>     | <p>100 10</p> <p><i>number</i> — Specifies the number of “parameter-problem” ICMPv6 messages to send in the time frame specified by the <i>seconds</i> parameter.</p> <p><b>Values</b> 10 — 1000</p> <p><b>Default</b> 100</p> <p><i>seconds</i> — Specifies the time frame in seconds that is used to limit the number of “parameter-problem” ICMPv6 messages issued.</p> <p><b>Values</b> 1 — 60</p> <p><b>Default</b> 10</p> |

## redirects

|                    |                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>redirects</b> [<i>number seconds</i>]</p> <p><b>no redirects</b></p>                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>ies>if>ipv6>icmp6                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures ICMPv6 redirect messages. When enabled, ICMPv6 redirects are generated when routes are not optimal on this router and another router on the same subnetwork has a better route in order to alert that node that a better route is available.</p> <p>When disabled, ICMPv6 redirects are not generated.</p> |
| <b>Default</b>     | 100 10                                                                                                                                                                                                                                                                                                                                |

*number* — Specifies the number of version 6 redirects are to be issued in the time frame specified by the *seconds* parameter.

**Values** 10 — 1000

**Default** 100

*seconds* — Specifies the time frame in seconds that is used to limit the number of version 6 redirects issued.

**Values** 1 — 60

**Default** 10

## time-exceeded

**Syntax** **time-exceeded** [*number seconds*]  
**no time-exceeded**

**Context** config>service>ies>if>ipv6>icmp6

**Description** This command specifies whether “time-exceeded” ICMPv6 messages should be sent. When enabled, ICMPv6 “time-exceeded” messages are generated by this interface.

When disabled, ICMPv6 “time-exceeded” messages are not sent.

**Default** 100 10

*number* — Specifies the number of “time-exceeded” ICMPv6 messages are to be issued in the time frame specified by the *seconds* parameter.

**Values** 10 — 1000

**Default** 100

*seconds* — Specifies the time frame in seconds that is used to limit the number of “time-exceeded” ICMPv6 message to be issued.

**Values** 1 — 60

**Default** 10

## unreachables

**Syntax** **unreachables** [*number seconds*]  
**no unreachables**

**Context** config>service>ies>if>ipv6>icmp6

**Description** This command specifies that ICMPv6 host and network unreachable messages are generated by this interface.

When disabled, ICMPv6 host and network unreachable messages are not sent.

**Default** 100 10

*number* — Specifies the number of destination unreachable ICMPv6 messages are issued in the time frame specified by the *seconds* parameter.

**Values** 10 — 1000

**Default** 100

*seconds* — Specifies the time frame in seconds that is used to limit the number of destination unreachable ICMPv6 messages to be issued.

**Values** 1 — 60

**Default** 10

### local-proxy-nd

**Syntax** **[no] local-proxy-nd**

**Context** config>service>ies>if>ipv6

**Description** This command enables local proxy neighbor discovery on the interface.  
The **no** form of the command disables local proxy neighbor discovery.

### proxy-nd-policy

**Syntax** **proxy-nd-policy** *policy-name* [*policy-name...*(up to 5 max)]  
**no proxy-nd-policy**

**Context** config>service>ies>if>ipv6

**Description** This command applies a proxy neighbor discovery policy for the interface.

**Parameters** *policy-name* — Specifies an existing neighbor discovery policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. The specified policy name(s) must already be defined.

### neighbor

**Syntax** **neighbor** *ipv6-address* *mac-address*  
**no neighbor** *ipv6-address*

**Context** config>service>ies>if>ipv6

**Description** This command configures IPv6-to-MAC address mapping on the IES interface.

**Default** none

**Parameters** *ipv6-address* — The IPv6 address of the interface for which to display information.



**Values**      x:x:x:x:x:x:x (eight 16-bit pieces)  
                  x:x:x:x:x:x:d.d.d.d  
                  x: [0 — FFFF]H  
                  d: [0 — 255]D  
                  prefix-length [1..128]

*mac-address* — Specifies the 48-bit MAC address for the IPv6-to-MAC address mapping in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

## backup

**Syntax**      [no] **backup** *ip-address*  
**Context**      config>service>ies>if>ipv6>vrrp  
**Description**      This command configures virtual router IP addresses for the interface.

## init-delay

**Syntax**      **init-delay** *seconds*  
                  **no init-delay**  
**Context**      config>service>ies>if>ipv6>vrrp  
**Description**      This command configures a VRRP initialization delay timer.  
**Default**      no init-delay  
**Parameters**      *seconds* — Specifies the initialization delay timer for VRRP, in seconds.  
                  **Values**      1 — 65535

## mac

**Syntax**      **mac** *mac-address*  
                  **no mac**  
**Context**      config>service>ies>if>ipv6>vrrp  
**Description**      This command assigns a specific MAC address to an IES IP interface.  
                  The **no** form of the command returns the MAC address of the IP interface to the default value.  
**Default**      The physical MAC address associated with the Ethernet interface that the SAP is configured on (the default MAC address assigned to the interface, assigned by the system).  
**Parameters**      *mac-address* — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

## master-int-inherit

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] master-int-inherit</b>                                                                     |
| <b>Context</b>     | config>service>ies>if>ipv6>vrrp                                                                    |
| <b>Description</b> | This command allows the master instance to dictate the master down timer (non-owner context only). |
| <b>Default</b>     | no master-int-inherit                                                                              |

## message-interval

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>message-interval</b> {[seconds] [milliseconds milliseconds]}<br><b>no message-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>if>ipv6>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command sets the advertisement timer and indirectly sets the master down timer on the virtual router instance. The message-interval setting must be the same for all virtual routers participating as a virtual router. Any VRRP advertisement message received with an Advertisement Interval field different than the virtual router instance configured message-interval value will be silently discarded.</p> <p>The message-interval command is available in both non-owner and owner <b>vrrp</b> <i>virtual-router-id</i> nodal contexts. If the message-interval command is not executed, the default message interval of 1 second will be used.</p> <p>The <b>no</b> form of this command restores the default message interval value of 1 second to the virtual router instance.</p> |
| <b>Parameters</b>  | <p><i>seconds</i> — The number of seconds that will transpire before the advertisement timer expires.</p> <p><b>Values</b> 1 — 255</p> <p><b>Default</b> 1</p> <p><i>milliseconds milliseconds</i> — Specifies the time interval, in milliseconds, between sending advertisement messages. This parameter is not supported on the 7750 SR-1.</p> <p><b>Values</b> 100 — 900</p>                                                                                                                                                                                                                                                                                                                                                                                                                       |

## ping-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ping-reply</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>ies>if>ipv6>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command enables the non-owner master to reply to ICMP echo requests directed at the virtual router instances IP addresses. The ping request can be received on any routed interface.</p> <p>Ping must not have been disabled at the management security level (either on the parental Ip interface or based on the ping source host address). when ping-reply is not enabled, icmp Echo Requests to non-owner master virtual IP addresses are silently discarded.</p> <p>Non-owner backup virtual routers never respond to ICMP echo requests regardless of the setting of</p> |

ping-reply configuration.

The ping-reply command is only available in non-owner **vrrp** *virtual-router-id* nodal context. If the ping-reply command is not executed, ICMP echo requests to the virtual router instance IP addresses will be silently discarded.

The **no** form of this command restores the default operation of discarding all ICMP echo request messages destined to the non-owner virtual router instance IP addresses.

**Default** no ping-reply

## policy

**Syntax** **policy** *vrrp-policy-id*  
**no policy**

**Context** config>service>ies>if>ipv6>vrrp

**Description** This command creates VRRP control policies. The VRRP policy ID must be created by the policy command prior to association with the virtual router instance.

The policy command provides the ability to associate a VRRP priority control policy to a virtual router instance. The policy may be associated with more than one virtual router instance. The priority events within the policy either override or diminish the base-priority dynamically affecting the in-use priority. As priority events clear in the policy, the in-use priority may eventually be restored to the base-priority value.

The policy command is only available in the non-owner **vrrp** *virtual-router-id* nodal context. The priority of owner virtual router instances is permanently set to 255 and cannot be changed by VRRP priority control policies. For non-owner virtual router instances, if the policy command is not executed, the base-priority will be used as the in-use priority.

The **no** form of this command removes any existing VRRP priority control policy association from the virtual router instance. All such associations must be removed prior to the policy being deleted from the system.

**Default** None

**Parameters** *vrrp-policy-id* — The vrrp-policy-id parameter associated the corresponding VRRP priority control policy-id with the virtual router instance. The vrrp-policy-id must already exist in the system for the policy command to be successful.

**Values** 1 to 9999

## preempt

**Syntax** [**no**] preempt

**Context** config>service>ies>if>ipv6>vrrp

**Description** The preempt command provides the ability of overriding an existing non-owner master to the virtual router instance. Enabling preempt mode is almost required for proper operation of the base-priority and vrrp-policy-id definitions on the virtual router instance. If the virtual router cannot preempt an

existing non-owner master, the affect of the dynamic changing of the in-use priority is greatly diminished.

The preempt command is only available in the non-owner vrrp virtual-router-id nodal context. The owner may not be preempted due to the fact that the priority of non-owners can never be higher than the owner. The owner will always preempt all other virtual routers when it is available.

Non-owner virtual router instances will only preempt when preempt is set and the current master has an in-use message priority value less than the virtual router instances in-use priority.

A master non-owner virtual router will only allow itself to be preempted when the incoming VRRP Advertisement message Priority field value is one of the following:

- Greater than the virtual router in-use priority value
- Equal to the in-use priority value and the source IP address (primary IP address) is greater than the virtual router instance primary IP address

The **no** form of this command prevents a non-owner virtual router instance from preempting another, less desirable virtual router. Use the preempt command to restore the default mode.

**Default** preempt

priority

**Syntax** **priority** *base-priority*  
**no priority**

**Context** config>service>ies>if>ipv6>vrrp

**Description** The priority command provides the ability to configure a specific priority value to the virtual router instance. In conjunction with an optional policy command, the base-priority is used to derive the in-use priority of the virtual router instance.

The priority command is only available in the non-owner vrrp virtual-router-id nodal context. The priority of owner virtual router instances is permanently set to 255 and cannot be changed. For non-owner virtual router instances, if the priority command is not executed, the base-priority will be set to 100.

The **no** form of this command restores the default value of 100 to base-priority.

**Parameters** *base-priority* — The base-priority parameter configures the base priority used by the virtual router instance. If a VRRP Priority Control policy is not also defined, the base-priority will be the in-use priority for the virtual router instance.

**Values** 1 — 254  
**Default** 100

standby-forwarding

**Syntax** [**no**] **standby-forwarding**

**Context** config>service>ies>if>ipv6>vrrp

**Description** This command allows the forwarding of packets by a standby router.

The **no** form of the command specifies that a standby router should not forward traffic sent to virtual router's MAC address. However, the standby router should forward traffic sent to the standby router's real MAC address.

**Default** no standby-forwarding

## telnet-reply

**Syntax** [no] telnet-reply

**Context** config>service>ies>if>ipv6>vrrp

**Description** This command enables the non-owner master to reply to TCP port 23 Telnet requests directed at the virtual router instances IP addresses. The Telnet request can be received on any routed interface. Telnet must not have been disabled at the management security level (either on the parental IP interface or based on the Telnet source host address). Proper login and CLI command authentication is still enforced.

When telnet-reply is not enabled, TCP port 23 Telnet packets to non-owner master virtual IP addresses are silently discarded.

Non-owner backup virtual routers never respond to Telnet requests regardless of the telnet-reply configuration.

The telnet-reply command is only available in non-owner VRRP nodal context. If the telnet-reply command is not executed, Telnet packets to the virtual router instance IP addresses will be silently discarded.

The **no** form of this command restores the default operation of discarding all Telnet packets destined to the non-owner virtual router instance IP addresses.

**Default** no telnet-reply

## traceroute-reply

**Syntax** [no] traceroute-reply

**Context** config>service>ies>if>ipv6>vrrp

**Description** This command is valid only if the VRRP virtual router instance associated with this entry is a non-owner.

When this command is enabled, a non-owner master can reply to traceroute requests directed to the virtual router instance IP addresses.

A non-owner backup virtual router never responds to such traceroute requests regardless of the **traceroute-reply** status.

**Default** no traceroute-reply

## IES Spoke SDP Commands

### spoke-sdp

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>[no] spoke-sdp</b> <i>sdp-id</i> [: <i>vc-id</i> ] [ <i>vc-type</i> { <b>ether</b>   <b>ipipe</b> }] [ <b>create</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>       | config>service>ies>interface<br>config>service>ies>redundant-interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>   | <p>This command binds a service to an existing Service Distribution Point (SDP).</p> <p>A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received.</p> <p>The SDP has an operational state which determines the operational state of the SDP within the service. For example, if the SDP is administratively or operationally down, the SDP for the service will be down.</p> <p>The SDP must already be defined in the <b>config&gt;service&gt;sdp</b> context in order to associate an SDP with an IES service. If the <b>sdp</b> <i>sdp-id</i> is not already configured, an error message is generated. If the <i>sdp-id</i> does exist, a binding between that <i>sdp-id</i> and the service is created.</p> <p>SDPs must be explicitly associated and bound to a service. If an SDP is not bound to a service, no far-end devices can participate in the service.</p> <p>The <b>no</b> form of this command removes the SDP binding from the service. The SDP configuration is not affected; only the binding of the SDP to a service. Once removed, no packets are forwarded to the far-end router. The spoke SDP must be shut down first before it can be deleted from the configuration.</p> |
| <b>Default</b>       | No <i>sdp-id</i> is bound to a service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Special Cases</b> | <b>IES</b> — At most, only one <i>sdp-id</i> can be bound to an IES service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>    | <p><i>sdp-id</i> — The SDP identifier. Allowed values are integers in the range of 1 and 17407 for existing SDPs.</p> <p><i>vc-id</i> — The virtual circuit identifier.</p> <p><b>Values</b>      1 — 4294967295</p> <p><i>vc-type</i> — The encapsulation and pseudowire type for the spoke-sdp.</p> <p><b>Values</b>      ether : Specifies Ethernet pseudowire as the type of virtual circuit (VC) associated with the SDP binding .</p> <p>                 ipipe : Specifies Ipipe pseudowire as the type of virtual circuit (VC) associated with the SDP binding .</p> <p><b>Default</b>      ether</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## egress

|                    |                                                                                      |
|--------------------|--------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress</b>                                                                        |
| <b>Context</b>     | config>service>ies>>if>spoke-sdp<br>config>service>ies>redundant-interface>spoke-sdp |
| <b>Description</b> | This command configures the egress SDP context.                                      |

## vc-label

|                    |                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] vc-label</b> <i>egress-vc-label</i>                                                                                              |
| <b>Context</b>     | config>service>ies>if>spoke-sdp>egress<br>config>service>ies>redundant-interface>spoke-sdp>egress                                        |
| <b>Description</b> | This command configures the static MPLS VC label used by this device to send packets to the far-end device in this service via this SDP. |
| <b>Parameters</b>  | <i>egress-vc-label</i> — A VC egress value that indicates a specific connection.                                                         |
| <b>Values</b>      | 16 — 1048575                                                                                                                             |

## hash-label

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] hash-label</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>ies>interface>spoke-sdp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command enables the use of the hash label on a VLL, VPLS, or VPRN service bound to LDP or RSVP SDP as well as to a VPRN service using the autobind mode with the with the ldp, rsvp-te, or mpls options. This feature is not supported on a service bound to a GRE SDP or for a VPRN service using the autobind mode with the gre option..</p> <p>When this feature is enabled, the ingress data path is modified such that the result of the hash on the packet header is communicated to the egress data path for use as the value of the label field of the hash label. The egress data path appends the hash label at the bottom of the stack (BoS) and sets the S-bit to 1 to indicate that.</p> <p>In order to allow for applications whereby the egress LER infers the presence of the hash label implicitly from the value of the label, the Most Significant Bit (MSB) of the result of the hash is set before copying into the hash label. This means that the value of the hash label will always be in the range [524,288 — 1,048,575] and will not overlap with the signaled/static LSP and signaled/static service label ranges. This also guarantees that the hash label will not match a value in the reserved label range.</p> <p>The (unmodified) result of the hash continues to be used for the purpose of ECMP and LAG spraying of packets locally on the ingress LER. Note however that for VLL services, the result of the hash is overwritten and the ECMP and LAG spraying will be based on service-id when ingress SAP shared queuing is not enabled. However, the hash label will still reflect the result of the hash such that an LSR can use it to perform fine grained load balancing of VLL pseudowire packets.</p> |

Packets that are generated in CPM and forwarded labeled within the context of a service (for example, OAM packets) must also include a hash label at the BoS and set the S-bit accordingly.

The TTL of the hash label is set to a value of 1.

The **no** form of this command disables the use of the hash label.

**Default**      no hash-label

ingress

**Syntax**        **ingress**

**Context**        config>service>ies>if>spoke-sdp  
                  config>service>ies>redundant-interface>spoke-sdp>egress

**Description**    This command configures the ingress SDP context.

vc-label

**Syntax**        [**no**] **vc-label** *ingress-vc-label*

**Context**        config>service>ies>if>spoke-sdp>ingress  
                  config>service>ies>redundant-interface>spoke-sdp>ingress

**Description**    This command configures the static MPLS VC label used by the far-end device to send packets to this device in this service via this SDP.

**Parameters**    *ingress-vc-label* — A VC ingress value that indicates a specific connection.

**Values**        2048 — 18431

accounting-policy

**Syntax**        **accounting-policy** *acct-policy-id*  
                  **no accounting-policy**

**Context**        config>service>ies>interface>spoke-sdp

**Description**    This command configures an accounting-policy.

**Parameters**    *acct-policy-id* — Specifies an accounting policy ID.

**Values**        1..99



## app-profile

|                    |                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>app-profile</b> <i>app-profile-name</i><br><b>no app-profile</b>                             |
| <b>Context</b>     | config>service>ies>interface>spoke-sdp                                                          |
| <b>Description</b> | This command configures the application profile name.                                           |
| <b>Parameters</b>  | <i>app-profile-name</i> — Specifies the application profile name.<br><b>Values</b> 32 chars max |

## collect-stats

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] collect-stats</b>                               |
| <b>Context</b>     | config>service>ies>interface>spoke-sdp                  |
| <b>Description</b> | This command enables or disables statistics collection. |

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## IES SAP Commands

### sap

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>sap</b> <i>sap-id</i> [ <b>create</b> ]<br><b>no sap</b> <i>sap-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>       | config>service>ies>interface<br>config>service>ies>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>   | <p>This command creates a Service Access Point (SAP) within a service. A SAP is a combination of port and encapsulation parameters which identifies the service access point on the interface and within the router. Each SAP must be unique.</p> <p>All SAPs must be explicitly created. If no SAPs are created within a service or on an IP interface, a SAP will not exist on that object.</p> <p>Enter an existing SAP without the <b>create</b> keyword to edit SAP parameters. The SAP is owned by the service in which it was created.</p> <p>A SAP can only be associated with a single service. A SAP can only be defined on a port that has been configured as an access port using the <code>access</code> command. Channelized TDM ports are always access ports.</p> <p>If a port is shutdown, all SAPs on that port become operationally down. When a service is shutdown, SAPs for the service are not displayed as operationally down although all traffic traversing the service will be discarded. The operational state of a SAP is relative to the operational state of the port on which the SAP is defined.</p> <p>Note that you can configure an IES interface as a loopback interface by issuing the <b>loopback</b> command instead of the <b>sap sap-id</b> command. The loopback flag cannot be set on an interface where a SAP is already defined and a SAP cannot be defined on a loopback interface.</p> <p>The <b>no</b> form of this command deletes the SAP with the specified port. When a SAP is deleted, all configuration parameters for the SAP will also be deleted. For Internet Enhanced Service (IES), the IP interface must be shutdown before the SAP on that interface may be removed.</p> |
| <b>Default</b>       | No SAPs are defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Special Cases</b> | <p><b>IES</b> — An IES SAP can be defined with Ethernet ports, SONET/SDH or TDM channels. A SAP is defined within the context of an IP routed interface. Each IP interface is limited to a single SAP definition. Group interfaces allow more than one SAP. Attempts to create a second SAP on an IP interface will fail and generate an error; the original SAP will not be affected.</p> <p>Command syntax: <b>sap ipsec-id.private public:tag</b> associates an IPSec group SAP with this interface. This is the public side for an IPSec tunnel. Tunnels referencing this IPSec group in the private side may be created if their local IP is in the subnet of the interface subnet and the routing context specified matches with the one of the interface.</p> <p>This context will provide a SAP to the tunnel. The operator may associate an ingress and egress QoS policies as well as filters and virtual scheduling contexts. Internally this creates an Ethernet SAP that will be used to send and receive encrypted traffic to and from the MDA. Multiple tunnels can be associated with this SAP. The “tag” will be a dot1q value. The operator may see it as an identifier. The range is limited to 1 — 4095.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.</p> <p><i>port-id</i> — Specifies the physical port ID in the <i>slot/mda/port</i> format.</p> <p>If the card in the slot has Media Dependent Adapters (MDAs) installed, the <i>port-id</i> must be in the <i>slot_number/MDA_number/port_number</i> format. For example 1/1/1 specifies port 1 on MDA 1 in slot 1.</p> <p>The <i>port-id</i> must reference a valid port type. When the <i>port-id</i> parameter represents SONET/SDH and TDM channels, the port ID must include the channel ID. A period “.” separates the physical port from the <i>channel-id</i>. The port must be configured as an access port.</p> <p>If the SONET/SDH port is configured as clear-channel then only the port is specified.</p> <p><b>create</b> — Keyword used to create a SAP instance. The <b>create</b> keyword requirement can be enabled/disabled in the <b>environment&gt;create</b> context.</p> |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## multi-service-site

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>multi-service-site</b> <i>customer-site-name</i></p> <p><b>no multi-service-site</b> <i>customer-site-name</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | <p>config&gt;service&gt;ies&gt;if&gt;sap</p> <p>config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command creates a new customer site or edits an existing customer site with the <i>customer-site-name</i> parameter. A customer site is an anchor point to create an ingress and egress virtual scheduler hierarchy. When a site is created, it must be assigned to a chassis slot or port with the exception of the 7750 SR-1 in which the slot is set to 1. When scheduler policies are defined for ingress and egress, the scheduler names contained in each policy are created according to the parameters defined in the policy. Multi-service customer sites exist for the sole purpose of creating a virtual scheduler hierarchy and making it available to queues on multiple Service Access Points (SAPs).</p> <p>The scheduler policy association with the customer site normally prevents the scheduler policy from being deleted until after the scheduler policy is removed from the customer site. The multi-service-site object will generate a log message indicating that the association was deleted due to scheduler policy removal.</p> <p>When the multi-service customer site is created, an ingress and egress scheduler policy association does not exist. This does not prevent the site from being assigned to a chassis slot or prevent service SAP assignment. After the site has been created, the ingress and egress scheduler policy associations can be assigned or removed at any time.</p> |
| <b>Default</b>     | None — Each customer site must be explicitly created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>customer-site-name</i>: — Each customer site must have a unique name within the context of the customer. If <i>customer-site-name</i> already exists for the customer ID, the CLI context changes to that site name for the purpose of editing the site scheduler policies or assignment. Any modifications made to an existing site will affect all SAPs associated with the site. Changing a scheduler policy association may cause new schedulers to be created and existing queues on the SAPs to no longer be orphaned. Existing schedulers on the site may cease to exist, causing queues relying on that scheduler to be orphaned.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

If the *customer-site-name* does not exist, it is assumed that an attempt is being made to create a site of that name in the customer ID context. The success of the command execution depends on the following:

- The maximum number of customer sites defined for the chassis has not been met.
- The *customer-site-name* is valid.
- The **create** keyword is included in the command line syntax (if the system requires it).

When the maximum number of customer sites has been exceeded a configuration error occurs; the command will not execute and the CLI context will not change.

If the *customer-site-name* is invalid, a syntax error occurs; the command will not execute and the CLI context will not change.

**Values** Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

## static-host

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static-host ip</b> <i>ip/did-address</i> [ <b>mac</b> <i>ieee-address</i> ] [ <b>create</b> ]<br><b>static-host mac</b> <i>ieee-address</i> [ <b>create</b> ]<br><b>no static-host</b> [ <b>ip</b> <i>ip-address</i> >] <b>mac</b> <i>ieee-address</i> ><br><b>no static-host all</b> [ <b>force</b> ]<br><b>no static-host ip</b> <i>ip-address</i>                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>ies>if>sap<br>config>service>ies>subscriber-inf>group-inf>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command configures a static host on this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <p><b>ip</b> <i>ip-address</i> — Specifies the IPv4 unicast address.</p> <p><b>mac</b> <i>ieee-address</i> — Specify this optional parameter when defining a static host. Every static host definition must have at least one address defined, IP or MAC.</p> <p><b>force</b> — Specifies the forced removal of the static host addresses.</p> <p><b>sla-profile</b> <i>sla-profile-name</i> — This optional parameter is used to specify an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the <b>config&gt;subscr-mgmt&gt;sla-profile</b> context.</p> |

## ancp-string

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ancp-string</b> <i>ancp-string</i><br><b>no ancp-string</b>                                       |
| <b>Context</b>     | config>service>ies>if>sap>static-host<br>config>service>ies>subscriber-inf>group-inf>sap>static-host |
| <b>Description</b> | This command specifies the ANCP string associated to this SAP host.                                  |

**Parameters**     *ancp-string* — Specifies the ANCP string up to 63 characters in length.

## app-profile

**Syntax**     **app-profile** *app-profile-name*  
**no app-profile**

**Context**     config>service>ies>if>sap>static-host  
 config>service>ies>subscriber-inf>group-inf>sap>static-host

**Description**     This command specifies an application profile name.

**Parameters**     *app-profile-name* — Specifies the application profile name up to 32 characters in length.

## inter-dest-id

**Syntax**     **inter-dest-id** *intermediate-destination-id*  
**no inter-dest-id**

**Context**     config>service>ies>if>sap>static-host  
 config>service>ies>subscriber-inf>group-inf>sap>static-host

**Description**     Specifies to which intermediate destination (for example, a DSLAM) this host belongs.

**Parameters**     *intermediate-destination-id* — Specifies the intermediate destination identifier, up to 32 characters in length.

## managed-routes

**Syntax**     **managed-routes**

**Context**     config>service>ies>sub-if>grp-if>sap>static-host>managed-routes

**Description**     This command configures managed routes.

## route

**Syntax**     **route** *{ip-prefix/length|ip-prefix netmask}* [**create**]  
**no route** *{ip-prefix/length|ip-prefix netmask}*

**Context**     config>service>ies>sub-if>grp-if>sap>static-host>managed-routes

**Description**     This command assigns managed-route to a given subscriber-host. As a consequence, a static-route pointing subscriber-host ip address as a next hop will be installed in FIB. Up to 16 managed routes per subscriber-host can be configured.

The **no** form of the command removes the respective route. Per default, there are no managed-routes configured.

## sla-profile

|                    |                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sla-profile</b> <i>sla-profile-name</i><br><b>no sla-profile</b>                                                                                                                             |
| <b>Context</b>     | config>service>ies>if>sap>static-host<br>config>service>ies>subscriber-inf>group-inf>sap>static-host                                                                                            |
| <b>Description</b> | This command specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the <b>config&gt;subscr-mgmt&gt;sla-profile</b> context. |
| <b>Parameters</b>  | <i>sla-profile-name</i> — Specifies the SLA profile name.                                                                                                                                       |

## sub-profile

|                    |                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sub-profile</b> <i>sub-profile-name</i><br><b>no sub-profile</b>                                          |
| <b>Context</b>     | config>service>ies>if>sap>static-host<br>config>service>ies>subscriber-inf>group-inf>sap>static-host         |
| <b>Description</b> | This command specifies an existing subscriber profile name to be associated with the static subscriber host. |
| <b>Parameters</b>  | <i>sub-profile-name</i> — Specifies the sub-profile name.                                                    |

## subscriber

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subscriber</b> <i>sub-ident</i><br><b>no subscriber</b>                                                             |
| <b>Context</b>     | config>service>ies>if>sap>static-host<br>config>service>ies>subscriber-inf>group-inf>sap>static-host                   |
| <b>Description</b> | This command specifies an existing subscriber identification profile to be associated with the static subscriber host. |
| <b>Parameters</b>  | <i>sub-ident</i> — Specifies the subscriber identification/                                                            |

## subscriber-sap-id

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] subscriber-sap-id</b>                                                                        |
| <b>Context</b>     | config>service>ies>if>sap>static-host<br>config>service>ies>subscriber-inf>group-inf>sap>static-host |
| <b>Description</b> | This command enables using the SAP ID as subscriber id.                                              |
| <b>Parameters</b>  | <b>subscriber-sap-id</b> — Specifies to use the sap-id as the subscriber-id.                         |

## tod-suite

|                    |                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tod-suite</b> <i>tod-suite-name</i><br><b>no tod-suite</b>                                                                                                                                |
| <b>Context</b>     | config>service>ies>if>sap<br>config>service>ies>sub-if>grp-if>sap                                                                                                                            |
| <b>Description</b> | This command applies a time-based policy (filter or QoS policy) to the service SAP. The suite name must already exist in the <b>config&gt;cron</b> context.                                  |
| <b>Default</b>     | no tod-suite                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>tod-suite-name</i> — Specifies collection of policies (ACLs, QoS) including time-ranges that define the full or partial behavior of a SAP. The suite can be applied to more than one SAP. |

## host-connectivity-verify

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host-connectivity-verify</b> [source {vrrp   interface}] [interval <i>interval</i> ] [action {remove   alarm}]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>if<br>config>service>ies>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command enables subscriber host connectivity verification for all hosts on this interface. This tool will periodically scan all known hosts (from dhcp-state) and perform a UC ARP request. The subscriber host connectivity verification will maintain state (connected vs. not-connected) for all hosts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Default</b>     | no host-connectivity-verify                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><b>source {interface}</b> — Specifies the source to be used for generation of subscriber host connectivity verification packets. The <b>interface</b> keyword forces the use of the interface mac and ip addresses. Note that there are up to 16 possible subnets on a given interface, therefore subscriber host connectivity verification tool will use always an address of the subnet to which the given host is pertaining. In case of group-interfaces. one of the parent subscriber-interface subnets (depending on host's address) will be used.</p> <p><b>interval <i>interval</i></b> — The interval, in minutes, which specifies the time interval which all known sources should be verified. The actual rate is then dependent on number of known hosts and interval.</p> <p><b>Values</b> 1 — 6000<br/>Note that a zero value can be used by the SNMP agent to disable host-connectivity-verify.</p> <p><b>action {remove   alarm}</b> — Defines the action taken on a subscriber host connectivity verification failure for a given host. The <b>remove</b> keyword raises an alarm and removes DHCP state and releases all allocated resources (queues, table entries and etc.). DHCP release will be signaled to corresponding DHCP server. Static host will never be removed. The <b>alarm</b> keyword raises an alarm indicating that the host is disconnected.</p> |

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## SAP Subscriber Management Commands

### sub-sla-mgmt

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sub-sla-mgmt</b>                                                                     |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap                                                         |
| <b>Description</b> | This command enables the context to configure subscriber management parameters for this SAP. |
| <b>Default</b>     | no sub-sla-mgmt                                                                              |

### def-sla-profile

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>def-sla-profile</b> <i>default-sla-profile-name</i><br><b>no def-sla-profile</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap>sub-sla-mgmt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command specifies a default SLA profile for this SAP. The SLA profile must be defined prior to associating the profile with a SAP in the <b>config&gt;subscriber-mgmt&gt;sla-profile</b> context.</p> <p>An SLA profile is a named group of QoS parameters used to define per service QoS for all subscriber hosts common to the same subscriber within a provider service offering. A single SLA profile may define the QoS parameters for multiple subscriber hosts. SLA profiles are maintained in two locations, the subscriber identification policy and the subscriber profile templates. After a subscriber host is associated with an SLA profile name, either the subscriber identification policy used to identify the subscriber or the subscriber profile associated with the subscriber host must contain an SLA profile with that name. If both the subscriber identification policy and the subscriber profile contain the SLA profile name, the SLA profile in the subscriber profile is used.</p> <p>The <b>no</b> form of the command removes the default SLA profile from the SAP configuration.</p> |
| <b>Default</b>     | no def-sla-profile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>default-sla-profile-name</i> — Specifies a default SLA profile for this SAP. The SLA profile must be defined prior to associating the profile with a SAP in the <b>config&gt;subscriber-mgmt&gt;sla-profile</b> context.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### def-sub-profile

|                    |                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>def-sub-profile</b> <i>default-subscriber-profile-name</i>                                                                                                                                                        |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap>sub-sla-mgmt                                                                                                                                                                    |
| <b>Description</b> | This command specifies a default subscriber profile for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the <b>config&gt;subscriber-mgmt&gt;sub-profile</b> context. |



A subscriber profile defines the aggregate QoS for all hosts within a subscriber context. This is done through the definition of the egress and ingress scheduler policies that govern the aggregate SLA for subscriber using the subscriber profile. Subscriber profiles also allow for specific SLA profile definitions when the default definitions from the subscriber identification policy must be overridden.

The **no** form of the command removes the default SLA profile from the SAP configuration.

**Parameters** *default-sub-profile* — Specifies a default subscriber profile for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the **config>subscriber-mgmt>sub-profile** context.

## sub-ident-policy

**Syntax** **sub-ident-policy** *sub-ident-policy-name*

**Context** config>service>ies>sub-if>grp-if>sap>sub-sla-mgmt

**Description** This command associates a subscriber identification policy to this SAP. The subscriber identification policy must be defined prior to associating the profile with a SAP in the **config>subscriber-mgmt>sub-ident-policy** context.

Subscribers are managed by the system through the use of subscriber identification strings. A subscriber identification string uniquely identifies a subscriber. For static hosts, the subscriber identification string is explicitly defined with each static subscriber host.

For dynamic hosts, the subscriber identification string must be derived from the DHCP ACK message sent to the subscriber host. The default value for the string is the content of Option 82 CIRCUIT-ID and REMOTE-ID fields interpreted as an octet string. As an option, the DHCP ACK message may be processed by a subscriber identification policy which has the capability to parse the message into an alternative ASCII or octet string value.

When multiple hosts on the same port are associated with the same subscriber identification string they are considered to be host members of the same subscriber.

The **no** form of the command removes the default subscriber identification policy from the SAP configuration.

**Default** no sub-ident-policy

**Parameters** *sub-ident-policy-name* — Specifies a subscriber identification policy for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the **config>subscriber-mgmt>sub-ident-policy** context.

## multi-sub-sap

**Syntax** **multi-sub-sap** [*subscriber-limit*]  
**no multi-sub-sap**

**Context** config>service>ies>sub-if>grp-if>sap>sub-sla-mgmt

**Description** This command configures the maximum number of subscribers for this SAP.

The **no** form of this command returns the default value.

|                   |                                                                                     |
|-------------------|-------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>subscriber-limit</i> — Specifies the maximum number of subscribers for this SAP. |
| <b>Values</b>     | 2 — 8000                                                                            |

## single-sub-parameters

|                    |                                                                                          |
|--------------------|------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>single-sub-parameters</b>                                                             |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap>sub-sla-mgmt                                        |
| <b>Description</b> | This command enables the context to configure single subscriber parameters for this SAP. |

## non-sub-traffic

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>non-sub-traffic sub-profile</b> <i>sub-profile-name</i> <b>sla-profile</b> <i>sla-profile-name</i> [ <b>subscriber</b> <i>sub-ident-string</i> ]<br><b>no non-sub-traffic</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap>sub-sla-mgmt>single-sub                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command configures non-subscriber traffic profiles.<br>The <b>no</b> form of the command removes the profiles and disables the feature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><b>sub-profile</b> <i>sub-profile-name</i> — Specifies an existing subscriber profile name to be associated with the static subscriber host. The subscriber profile is configured in the <b>config&gt;subscr-mgmt&gt;sub-profile</b> context.</p> <p><b>sla-profile</b> <i>sla-profile-name</i> — Specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the <b>config&gt;subscr-mgmt&gt;sla-profile</b> context.</p> <p><b>subscriber</b> <i>sub-ident-string</i> — Specifies an existing subscriber identification profile to be associated with the static subscriber host. The subscriber identification profile is configured in the <b>config&gt;subscr-mgmt&gt;sub-ident-policy</b> context. The subscriber information is used by the VPRN SAP arp-reply-agent to determine the proper handling of received ARP requests from subscribers.</p> <ul style="list-style-type: none"> <li>For VPRN SAPs with <b>arp-reply-agent</b> enabled with the optional <i>sub-ident</i> parameter, the static subscriber host's <i>sub-ident-string</i> is used to determine whether an ARP request received on the SAP is sourced from a host belonging to the same subscriber as the destination host. When both the destination and source hosts from the ARP request are known on the SAP and the subscriber identifications do not match, the ARP request may be forwarded to the rest of the VPRN destinations.</li> </ul> <p>If the static subscriber host's <i>sub-ident</i> string is not defined, the host is not considered to belong to the same subscriber as another host on the SAP.</p> <p>If source or destination host is unknown, the hosts are not considered to belong to the same subscriber. ARP messages from unknown hosts are subject to anti-spoof filtering rules applied at the SAP.</p> |

If *sub-ident* is not enabled on the SAP arp-reply-agent, subscriber identification matching is not performed on ARP requests received on the SAP.

ARP requests are never forwarded back to the same SAP or within the receiving SAP's split horizon group.

## profiled-traffic-only

|                    |                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] profiled-traffic-only</b>                                                                                   |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap>sub-sla-mgmt>single-sub                                                        |
| <b>Description</b> | This command enables profiled traffic only for this SAP.<br>The <b>no</b> form of the command disables the command. |

## accounting-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>accounting-policy acct-policy-id</b><br><b>no accounting-policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>if>sap<br>config>service>ies>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command creates the accounting policy context that can be applied to a SAP.<br>An accounting policy must be defined before it can be associated with a SAP.<br>If the <i>policy-id</i> does not exist, an error message is generated.<br>A maximum of one accounting policy can be associated with a SAP at one time. Accounting policies are configured in the <b>config&gt;log</b> context.<br>The <b>no</b> form of this command removes the accounting policy association from the SAP, and the accounting policy reverts to the default. |
| <b>Default</b>     | Default accounting policy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>acct-policy-id</i> — Enter the accounting <i>policy-id</i> as configured in the <b>config&gt;log&gt;accounting-policy</b> context.<br><b>Values</b> 1 to 99                                                                                                                                                                                                                                                                                                                                                                                     |

## collect-stats

|                    |                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] collect-stats</b>                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>ies>if>sap<br>config>service>ies>sub-if>grp-if>sap                                                                                                                                                                                              |
| <b>Description</b> | This command enables accounting and statistical data collection for either the SAP, network port, or IP interface. When applying accounting policies the data, by default, is collected in the appropriate records and written to the designated billing file. |

When the **no collect-stats** command is issued the statistics are still accumulated by the IOM cards. However, the CPU will not obtain the results and write them to the billing file. If a subsequent **collect-stats** command is issued then the counters written to the billing file include all the traffic while the **no collect-stats** command was in effect.

**Default**    collect-stats

## ETH-CFM Service Commands

### eth-cfm

|                    |                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>eth-cfm</b>                                                                                    |
| <b>Context</b>     | config>service>ies>if>sap<br>config>service>ies>if>spoke-sdp<br>config>service>ies>sub-if>grp-if> |
| <b>Description</b> | This command enables the context to configure ETH-CFM parameters.                                 |

### mep

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mep</b> <i>mep-id</i> <b>domain</b> <i>md-index</i> <b>association</b> <i>ma-index</i> [ <b>direction</b> { <b>up</b>   <b>down</b> }]<br><b>no mep</b> <i>mep-id</i> <b>domain</b> <i>md-index</i> <b>association</b> <i>ma-index</i>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>ies>if>sap>eth-cfm<br>config>service>ies>if>spoke-sdp>eth-cfm<br>config>service>ies>sub-if>grp-if>sap>eth-cfm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command configures a SAP or spoke SDP ETH-CFM maintenance endpoint (MEP).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><i>mep-id</i> — Specifies the maintenance association end point identifier.</p> <p><b>Values</b> 1 — 8191</p> <p><i>md-index</i> — Specifies the maintenance domain (MD) index value.</p> <p><b>Values</b> 1 — 4294967295</p> <p><i>ma-index</i> — Specifies the MA index value.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>direction up down</b> — Indicates the direction in which the maintenance association (MEP or MIP) faces on the bridge port.</p> <p>down — Sends continuity check messages away from the MAC relay entity.</p> <p>up — Sends continuity check messages towards the MAC relay entity.</p> |

### ccm-enable

|                    |                                                                                      |
|--------------------|--------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ccm-enable</b>                                                               |
| <b>Context</b>     | config>service>ies>if>sap>eth-cfm>mep<br>config>service>ies>if>spoke-sdp>eth-cfm>mep |
| <b>Description</b> | This command enables the generation of CCM messages.                                 |

The **no** form of the command disables the generation of CCM messages.

## ccm-ltm-priority

|                    |                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ccm-ltm-priority</b> <i>priority</i><br><b>no ccm-ltm-priority</b>                                                                                                       |
| <b>Context</b>     | config>service>ies>if>sap>eth-cfm>mep<br>config>service>ies>if>spoke-sdp>eth-cfm>mep                                                                                        |
| <b>Description</b> | This command specifies the priority value for CCMs and LTMs transmitted by the MEP.<br>The <b>no</b> form of the command removes the priority value from the configuration. |
| <b>Default</b>     | The highest priority on the bridge-port.                                                                                                                                    |
| <b>Parameters</b>  | <i>priority</i> — Specifies the priority of CCM and LTM messages.                                                                                                           |
| <b>Values</b>      | 0 — 7                                                                                                                                                                       |

## fault-propagation-enable

|                    |                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fault-propagation-enable</b> { <i>use-if-tlv</i>   <i>suspend-ccm</i> }<br><b>no fault-propagation-enable</b>                         |
| <b>Context</b>     | config>service>ies>if>sap>eth-cfm>mep<br>config>service>ies>if>spoke-sdp>eth-cfm>mep<br>config>service>ies>sub-if>grp-if>sap>eth-cfm>mep |
| <b>Description</b> | This command configures the fault propagation for the MEP.                                                                               |
| <b>Parameters</b>  | <b>use-if-tlv</b> — Specifies to use the interface TLV.<br><b>suspend-ccm</b> — Specifies to suspend the continuity check messages.      |

## low-priority-defect

|                    |                                                                                                                                                                                                                                                                                                                  |        |                                                                    |               |                                                              |            |                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------|---------------|--------------------------------------------------------------|------------|------------------------------------------------|
| <b>Syntax</b>      | <b>low-priority-defect</b> { <i>allDef</i>   <i>macRemErrXcon</i>   <i>remErrXcon</i>   <i>errXcon</i>   <i>xcon</i>   <i>noXcon</i> }                                                                                                                                                                           |        |                                                                    |               |                                                              |            |                                                |
| <b>Context</b>     | config>service>ies>if>sap>eth-cfm>mep<br>config>service>ies>if>spoke-sdp>eth-cfm>mep                                                                                                                                                                                                                             |        |                                                                    |               |                                                              |            |                                                |
| <b>Description</b> | This command specifies the lowest priority defect that is allowed to generate a fault alarm.                                                                                                                                                                                                                     |        |                                                                    |               |                                                              |            |                                                |
| <b>Default</b>     | remErrXcon                                                                                                                                                                                                                                                                                                       |        |                                                                    |               |                                                              |            |                                                |
| <b>Values</b>      | <table> <tr> <td>allDef</td><td>DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>macRemErrXcon</td><td>Only DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>remErrXcon</td><td>Only DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> </table> | allDef | DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM | macRemErrXcon | Only DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM | remErrXcon | Only DefRemoteCCM, DefErrorCCM, and DefXconCCM |
| allDef             | DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM                                                                                                                                                                                                                                               |        |                                                                    |               |                                                              |            |                                                |
| macRemErrXcon      | Only DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM                                                                                                                                                                                                                                                     |        |                                                                    |               |                                                              |            |                                                |
| remErrXcon         | Only DefRemoteCCM, DefErrorCCM, and DefXconCCM                                                                                                                                                                                                                                                                   |        |                                                                    |               |                                                              |            |                                                |

|         |                                                |
|---------|------------------------------------------------|
| errXcon | Only DefErrorCCM and DefXconCCM                |
| xcon    | Only DefXconCCM; or                            |
| noXcon  | No defects DefXcon or lower are to be reported |

## mac-address

|                    |                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac-address</b> <i>mac-address</i><br><b>no mac-address</b>                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>ies>if>sap>eth-cfm>mep<br>config>service>ies>if>spoke-sdp>eth-cfm>mep                                                                                                                                                                            |
| <b>Description</b> | This command specifies the MAC address of the MEP.<br><br>The <b>no</b> form of this command reverts the MAC address of the MEP back to that of the port (if the MEP is on a SAP) or the bridge (if the MEP is on a spoke).                                     |
| <b>Parameters</b>  | <i>mac-address</i> — Specifies the MAC address of the MEP.<br><br><b>Values</b> 6-byte MAC address in the form of xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx of the MEP. Must be unicast. Using the all zeros address is equivalent to the no form of this command. |

## IES Filter and QoS Policy Commands

### filter

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <pre>filter ip ip-filter-id filter ipv6 ipv6-filter-id no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>       | <pre>config&gt;service&gt;ies&gt;if&gt;sap&gt;egress config&gt;service&gt;ies&gt;if&gt;sap&gt;ingress config&gt;service&gt;ies&gt;redundant-interface&gt;egress config&gt;service&gt;ies&gt;redundant-interface&gt;ingress config&gt;service&gt;ies&gt;redundant-interface&gt;egress config&gt;service&gt;ies&gt;redundant-interface&gt;ingress config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap&gt;egress config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap&gt;ingress</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>   | <p>This command associates a filter policy with an ingress or egress Service Access Point (SAP). Filter policies control the forwarding and dropping of packets based on the matching criteria.</p> <p>The <b>filter</b> command is used to associate a filter policy with a specified <i>ip-filter-id</i> or <i>ipv6-filter-id</i> with an ingress or egress SAP. The filter policy must already be defined before the <b>filter</b> command is executed. If the filter policy does not exist, the operation will fail and an error message returned.</p> <p>In general, filters applied to SAPs (ingress or egress) apply to all packets on the SAP. One exception is non-IP packets are not applied to the match criteria, so the default action in the filter policy applies to these packets.</p> <p>The <b>no</b> form of this command removes any configured filter ID association with the SAP. The filter ID itself is not removed from the system unless the scope of the created filter is set to local. To avoid deletion of the filter ID and only break the association with the service object, use <b>scope</b> command within the filter definition to change the scope to <b>local</b> or <b>global</b>. The default scope of a filter is <b>local</b>.</p> |
| <b>Special Cases</b> | <p><b>IES</b> — Only IP filters are supported on an IES IP interface, and the filters only apply to routed traffic.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>    | <p><b>ip</b> — Keyword indicating the filter policy is an IP filter.</p> <p><i>ip-filter-id</i> — Specifies the ID for the IP filter policy. Allowed values are an integer in the range of 1 and 65535 that corresponds to a previously created IP filter policy in the <b>configure&gt;filter&gt;ip-filter</b> context.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

### filter

|                |                                                                        |
|----------------|------------------------------------------------------------------------|
| <b>Syntax</b>  | <pre>filter ip ip-filter-id filter ipv6 ipv6-filter-id no filter</pre> |
| <b>Context</b> | <pre>config&gt;service&gt;ies&gt;if&gt;spoke-sdp&gt;egress</pre>       |



config>service>ies>if>spoke-sdp>ingress

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>   | <p>This command associates an IP filter policy filter policy with an ingress or egress spoke SDP. Filter policies control the forwarding and dropping of packets based on matching criteria. MAC filters are only allowed on Epipe and Virtual Private LAN Service (VPLS) SAPs.</p> <p>The <b>filter</b> command is used to associate a filter policy with a specified <i>ip-filter-id</i> with an ingress or egress spoke SDP. The <i>ip-filter-id</i> must already be defined in the <b>configure&gt;filter</b> context before the <b>filter</b> command is executed. If the filter policy does not exist, the operation will fail and an error message returned.</p> <p>In general, filters applied to SAPs or spoke SDPs (ingress or egress) apply to all packets on the SAP or spoke SDPs . One exception is non-IP packets are not applied to IP match criteria, so the default action in the filter policy applies to these packets.</p> <p>The <b>no</b> form of this command removes any configured filter ID association with the SAP or IP interface. The filter ID itself is not removed from the system unless the scope of the created filter is set to local. To avoid deletion of the filter ID and only break the association with the service object, use <b>scope</b> command within the filter definition to change the scope to <b>local</b> or <b>global</b>. The default scope of a filter is <b>local</b>.</p> |
| <b>Special Cases</b> | <b>IES</b> — Only IP filters are supported on IES IP interfaces, and the filters only apply to routed traffic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>    | <p><b>ip</b> — Keyword indicating the filter policy is an IP filter.</p> <p><i>ip-filter-id</i> — The filter name acts as the ID for the IP filter policy. Allowed values are an integer in the range of 1 and 65535 that corresponds to a previously created IP filter policy. The filter ID must already exist within the created IP filters.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## egress

|                    |                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress</b>                                                                                                                                                                                                                                       |
| <b>Context</b>     | <p>config&gt;service&gt;ies&gt;if&gt;sap</p> <p>config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap</p>                                                                                                                                             |
| <b>Description</b> | <p>This command enables the context to apply egress policies.</p> <p>If no sap-egress QoS policy is defined, the system default sap-egress QoS policy is used for egress processing. If no egress filter is defined, no filtering is performed.</p> |

## ingress

|                    |                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress</b>                                                                                                                                                                   |
| <b>Context</b>     | <p>config&gt;service&gt;ies&gt;if&gt;sap</p> <p>config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap</p>                                                                          |
| <b>Description</b> | <p>This command enables the context to apply ingress policies.</p> <p>If no sap-ingress QoS policy is defined, the system default sap-ingress QoS policy is used for ingress</p> |

processing. If no ingress filter is defined, no filtering is performed.

## hsmda-queue-override

|                    |                                                                       |
|--------------------|-----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] hsmda-queue-override</b>                                      |
| <b>Context</b>     | config>service>ies>if>sap>egress<br>config>service>ies>if>sap>ingress |
| <b>Description</b> | This command configures HSM DA egress and ingress queue overrides.    |

## packet-byte-offset

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>packet-byte-offset {add add-bytes   subtract sub-bytes}</b><br><b>no packet-byte-offset</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>if>sap>egress>hsm da-queue-over<br>config>service>ies>if>sap>ingress>hsm da-queue-over                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command adds or subtracts the specified number of bytes to the accounting function for each packet handled by the HSM DA queue. Normally, the accounting and leaky bucket functions are based on the Ethernet DLC header, payload and the 4-byte CRC (everything except the preamble and inter-frame gap). For example, this command can be used to add the frame encapsulation overhead (20 bytes) to the queues accounting functions.</p> <p>The accounting functions affected include:</p> <ul style="list-style-type: none"> <li>• Offered High Priority / In-Profile Octet Counter</li> <li>• Offered Low Priority / Out-of-Profile Octet Counter</li> <li>• Discarded High Priority / In-Profile Octet Counter</li> <li>• Discarded Low Priority / Out-of-Profile Octet Counter</li> <li>• Forwarded In-Profile Octet Counter</li> <li>• Forwarded Out-of-Profile Octet Counter</li> <li>• Peak Information Rate (PIR) Leaky Bucket Updates</li> <li>• Committed Information Rate (CIR) Leaky Bucket Updates</li> <li>• Queue Group Aggregate Rate Limit Leaky Bucket Updates</li> </ul> |

The secondary shaper leaky bucket, scheduler priority level leaky bucket and the port maximum rate updates are not affected by the configured packet-byte-offset. Each of these accounting functions are frame based and always include the preamble, DLC header, payload and the CRC regardless of the configured byte offset.

The packet-byte-offset command accepts either add or subtract as valid keywords which define whether bytes are being added or removed from each packet traversing the queue. Up to 20 bytes may be added to the packet and up to 43 bytes may be removed from the packet. An example use case for subtracting bytes from each packet is an IP based accounting function. Given a Dot1Q encapsulation, the command packet-byte-offset subtract 14 would remove the DLC header and the Dot1Q header

from the size of each packet for accounting functions only. The 14 bytes are not actually removed from the packet, only the accounting size of the packet is affected.

As mentioned above, the variable accounting size offered by the packet-byte-offset command is targeted at the queue and queue group level. When the queue group represents the last-mile bandwidth constraints for a subscriber, the offset allows the HSMDA queue group to provide an accurate accounting to prevent overrun and underrun conditions for the subscriber. The accounting size of the packet is ignored by the secondary shapers, the scheduling priority level shapers and the scheduler maximum rate. The actual on-the-wire frame size is used for these functions to allow an accurate representation of the behavior of the subscriber's packets on an Ethernet aggregation network.

The packet-byte-offset value can be overridden for the HSMDA queue at the SAP or subscriber profile level.

The **no** form of the command removes any accounting size changes to packets handled by the queue. The command does not effect overrides that may exist on SAPs or subscriber profiles associated with the queue.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><b>add</b> <i>add-bytes</i> — The <b>add</b> keyword is mutually exclusive with the subtract keyword. Either the add or subtract keyword must be specified. The add keyword is used to indicate that the following byte value should be added to the packet for queue and queue group level accounting functions. The corresponding byte value must be specified when executing the packet-byte-offset command.</p> <p><b>Values</b>      0 — 31</p> <p><b>subtract</b> <i>sub-bytes</i> — The <b>subtract</b> keyword is mutually exclusive with the add keyword. Either the add or subtract keyword must be specified. The subtract keyword is used to indicate that the following byte value should be subtracted from the packet for queue and queue group level accounting functions. The corresponding byte value must be specified when executing the packet-byte-offset command.</p> <p><b>Values</b>      1 — 32</p> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## queue

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>queue</b> <i>queue-id</i> [<b>create</b>]<br/> <b>no queue</b> <i>queue-id</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | <p>config&gt;service&gt;ies&gt;if&gt;sap&gt;egress&gt;hsmda-queue-over<br/> config&gt;service&gt;ies&gt;if&gt;sap&gt;ingress&gt;hsmda-queue-over</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command, within the QoS policy hsmda-queue context, is a container for the configuration parameters controlling the behavior of an HSMDA queue. Unlike the standard QoS policy queue command, this command is not used to actually create or dynamically assign the queue to the object which the policy is applied. The queue identified by queue-id always exists on the SAP or subscriber context whether the command is executed or not. In the case of HSMDA SAPs and subscribers, all eight queues exist at the moment the system allocates an HSMDA queue group to the object (both ingress and egress).</p> <p>Best-Effort, Expedited and Auto-Expedite Queue Behavior Based on Queue-ID</p> |

With standard service queues, the scheduling behavior relative to other queues is based on two items, the queues Best-Effort or Expedited nature and the dynamic rate of the queue relative to the defined CIR. HSMDA queues are handled differently. The create time auto-expedite and explicit expedite and best-effort qualifiers have been eliminated and instead the scheduling behavior is based solely on the queues identifier. Queues with a queue-id equal to 1 are placed in scheduling class 1. Queues with queue-id 2 are placed in scheduling class 2. And so on up to scheduling class 8. Each scheduling class is either mapped directly to a strict scheduling priority level based on the class ID, or the class may be placed into a weighted scheduling class group providing byte fair weighted round robin scheduling between the members of the group. Two weighted groups are supported and each may contain up to three consecutive scheduling classes. The weighed group assumes its highest member classis inherent strict scheduling level for scheduling purposes. Strict priority level 8 has the highest priority while strict level 1 has the lowest. When grouping of scheduling classes is defined, some of the strict levels will not be in use.

Single Type of HSMDA Queues

Another difference between HSMDA queues and standard service queues is the lack of Multipoint queues. At ingress, an HSMDA SAP or subscriber does not require Multipoint queues since all forwarding types (broadcast, multicast, unicast and unknown) forward to a single destination ñ the ingress forwarding plane on the IOM. Instead of a possible eight queues per forwarding type (for a total of up to 32) within the SAP ingress QoS policy, the hsmda-queues node supports a maximum of eight queues.

Every HSMDA Queue Supports Profile Mode Implicitly

Unlike standard service queues, the HSMDA queues do not need to be placed into the special mode profile at create time in order to support ingress color aware policing. Each queue may handle in-profile, out-of-profile and profile undefined packets simultaneously. As with standard queues, the explicit profile of a packet is dependant on ingress sub-forwarding class to which the packet is mapped.

The **no** form of the command restores the defined queue-id to its default parameters. All HSMDA queues having the queue-id and associated with the QoS policy are re-initialized to default parameters.

|                   |                                                                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>queue-id</i> — Specifies the HSMDA queue to use for packets in this forwarding class. This mapping is used when the SAP is on a HSMDA MDA. |
| <b>Values</b>     | 1 — 8                                                                                                                                         |

rate

|                    |                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rate</b> <i>pir-rate</i> [ <b>cir</b> <i>cir-rate</i> ]<br><b>no rate</b>                                                                                                                    |
| <b>Context</b>     | config>service>ies>if>sap>egress>hsmda-queue-over<br>config>service>ies>if>sap>ingress>hsmda-queue-over                                                                                         |
| <b>Description</b> | This command specifies the administrative PIR and CIR by the user.                                                                                                                              |
| <b>Parameters</b>  | <i>pir-rate</i> — Configures the administrative PIR specified by the user.<br><b>Values</b> 1 — 40000000, max<br><i>cir cir-rate</i> — Configures the administrative CIR specified by the user. |

**Values** 0 — 40000000, max

## slope-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>slope-policy</b> <i>hsmda-slope-policy-name</i><br><b>no slope-policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>ies>if>sap>egress>hsmda-queue-over<br>config>service>ies>if>sap>ingress>hsmda-queue-over                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command assigns an HSMDB slope policy to the SAP. The policy may be assigned to an ingress or egress HSMDB queue. The policy contains the Maximum Buffer Size (MBS) that will be applied to the queue and the high and low priority RED slope definitions. The function of the MBS and RED slopes is to provide congestion control for an HSMDB queue. The MBS parameter defines the maximum depth a queue may reach when accepting packets. The low and high priority RED slopes provides for random early detection of congestion and slope based discards based on queue depth.</p> <p>An HSMDB slope policy can be applied to queues defined in the SAP ingress and SAP egress QoS policy HSMDB queues context. Once an HSMDB slope policy is applied to a SAP QoS policy queue, it cannot be deleted. Any edits to the policy are updated to all HSMDB queues indirectly associated with the policy.</p> <p>Default HSMDB Slope Policy</p> <p>An HSMDB slope policy named “default” always exists on the system and does not need to be created. The default policy is automatically applied to all HSMDB queues unless another HSMDB slope policy is specified for the queue. The default policy cannot be modified or deleted. Attempting to execute the <b>no hsmdb-slope-policy default</b> command results in an error.</p> <p>The <b>no</b> form of the command removes the specified HSMDB slope policy from the configuration. If the HSMDB slope policy is currently associated with an HSMDB queue, the command will fail.</p> |
| <b>Parameters</b>  | <i>hsmdb-slope-policy-name</i> — Specifies a HSMDB slope policy up to 32 characters in length. The HSMDB slope policy must be exist prior to applying the policy name to an HSMDB queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## secondary-shaper

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>secondary-shaper</b> <i>secondary-shaper-name</i><br><b>no secondary-shaper</b>                      |
| <b>Context</b>     | config>service>ies>if>sap>egress>hsmdb-queue-over<br>config>service>ies>if>sap>ingress>hsmdb-queue-over |
| <b>Description</b> | This command configures an HSMDB egress secondary shaper.                                               |
| <b>Parameters</b>  | <i>secondary-shaper-name</i> — Specifies a secondary shaper name up to 32 characters in length.         |

## match-qinq-dot1p

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>match-qinq-dot1p {top   bottom}</b><br><b>no match-qinq-dot1p</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>ies>if>sap>ingress<br>config>service>ies>sub-if>grp-if>sap>ingress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command specifies which Dot1Q tag position Dot1P bits in a QinQ encapsulated packet should be used to evaluate Dot1P QoS classification.</p> <p>The <b>match-qinq-dot1p</b> command allows the top or bottom PBits to be used when evaluating the applied sap-ingress QoS policy's Dot1P entries. The <b>top</b> and <b>bottom</b> keywords specify which position should be evaluated for QinQ encapsulated packets.</p> <p>The <b>no</b> form of the command restores the default dot1p evaluation behavior for the SAP.</p> <p>By default, the bottom most service delineating Dot1Q tags Dot1P bits are used. <a href="#">Table 17</a> defines the default behavior for Dot1P evaluation when the <b>match-qinq-dot1p</b> command is not executed.</p> |

**Table 17: Default QinQ and TopQ SAP Dot1P Evaluation**

| Port / SAP Type | Existing Packet Tags          | PBits Used for Match |
|-----------------|-------------------------------|----------------------|
| Null            | None                          | None                 |
| Null            | Dot1P (VLAN-ID 0)             | Dot1P PBits          |
| Null            | Dot1Q                         | Dot1Q PBits          |
| Null            | TopQ BottomQ                  | TopQ PBits           |
| Null            | TopQ (No BottomQ)             | TopQ PBits           |
| Dot1Q           | None (Default SAP)            | None                 |
| Dot1Q           | Dot1P (Default SAP VLAN-ID 0) | Dot1P PBits          |
| Dot1Q           | Dot1Q                         | Dot1Q PBits          |
| QinQ / TopQ     | TopQ                          | TopQ PBits           |
| QinQ / TopQ     | TopQ BottomQ                  | TopQ PBits           |
| QinQ / QinQ     | TopQ BottomQ                  | BottomQ PBits        |

**Default** no match-qinq-dot1p — No filtering based on p-bits.  
top or bottom must be specified to override the default QinQ dot1p behavior.

**Parameters** **top** — The top parameter is mutually exclusive to the bottom parameter. When the top parameter is specified, the top most PBits are used (if existing) to match any dot1p dot1p-value entries. [Table 18](#) defines the dot1p evaluation behavior when the top parameter is specified.

**Table 18: Top Position QinQ and TopQ SAP Dot1P Evaluation**

| Port / SAP Type | Existing Packet Tags          | PBits Used for Match |
|-----------------|-------------------------------|----------------------|
| Null            | None                          | None                 |
| Null            | Dot1P (VLAN-ID 0)             | Dot1P PBits          |
| Null            | Dot1Q                         | Dot1Q PBits          |
| Null            | TopQ BottomQ                  | TopQ PBits           |
| Null            | TopQ (No BottomQ)             | TopQ PBits           |
| Dot1Q           | None (Default SAP)            | None                 |
| Dot1Q           | Dot1P (Default SAP VLAN-ID 0) | Dot1P PBits          |
| Dot1Q           | Dot1Q                         | Dot1Q PBits          |
| QinQ / TopQ     | TopQ                          | TopQ PBits           |
| QinQ / TopQ     | TopQ BottomQ                  | TopQ PBits           |
| QinQ / QinQ     | TopQ BottomQ                  | TopQ PBits           |

**bottom** — The bottom parameter is mutually exclusive to the top parameter. When the bottom parameter is specified, the bottom most PBits are used (if existing) to match any dot1p dot1p-value entries. [Table 19](#) defines the dot1p evaluation behavior when the bottom parameter is specified.

**Table 19: Bottom Position QinQ and TopQ SAP Dot1P Evaluation**

| Port / SAP Type | Existing Packet Tags          | PBits Used for Match |
|-----------------|-------------------------------|----------------------|
| Null            | None                          | None                 |
| Null            | Dot1P (VLAN-ID 0)             | Dot1P PBits          |
| Null            | Dot1Q                         | Dot1Q PBits          |
| Null            | TopQ BottomQ                  | BottomQ PBits        |
| Null            | TopQ (No BottomQ)             | TopQ PBits           |
| Dot1Q           | None (Default SAP)            | None                 |
| Dot1Q           | Dot1P (Default SAP VLAN-ID 0) | Dot1P PBits          |
| Dot1Q           | Dot1Q                         | Dot1Q PBits          |

**Table 19: Bottom Position QinQ and TopQ SAP Dot1P Evaluation (Continued)**

| Port / SAP Type | Existing Packet Tags | PBits Used for Match |
|-----------------|----------------------|----------------------|
| QinQ / TopQ     | TopQ                 | TopQ PBits           |
| QinQ / TopQ     | TopQ BottomQ         | BottomQ PBits        |
| QinQ / QinQ     | TopQ BottomQ         | BottomQ PBits        |

**Table 20: Default Dot1P Explicit Marking Actions**

| Egress SAP Type | Ingress Packet Preserved Dot1P State                  | Marked (or Remarked) PBits                                   |
|-----------------|-------------------------------------------------------|--------------------------------------------------------------|
| Null            | No preserved Dot1P bits                               | None                                                         |
| Null            | Preserved Dot1P bits                                  | Preserved tag PBits remarked using dot1p-value               |
| Dot1Q           | No preserved Dot1P bits                               | New PBits marked using dot1p-value                           |
| Dot1Q           | Preserved Dot1P bits                                  | Preserved tag PBits remarked using dot1p-value               |
| TopQ            | No preserved Dot1P bits                               | TopQ PBits marked using dot1p-value                          |
| TopQ            | Preserved Dot1P bits (used as TopQ and BottomQ PBits) | TopQ PBits marked using dot1p-value, BottomQ PBits preserved |
| QinQ            | No preserved Dot1P bits                               | TopQ PBits and BottomQ PBits marked using dot1p-value        |
| QinQ            | Preserved Dot1P bits (used as TopQ and BottomQ PBits) | TopQ PBits and BottomQ PBits marked using dot1p-value        |

**Table 21: QinQ Mark Top Only Explicit Marking Actions**

| Egress SAP Type | Ingress Packet Preserved Dot1P State | Marked (or Remarked) PBits                     |
|-----------------|--------------------------------------|------------------------------------------------|
| Null            | No preserved Dot1P bits              | None                                           |
| Null            | Preserved Dot1P bits                 | Preserved tag PBits remarked using dot1p-value |
| Dot1Q           | No preserved Dot1P bits              | New PBits marked using dot1p-value             |
| Dot1Q           | Preserved Dot1P bits                 | Preserved tag PBits remarked using dot1p-value |
| TopQ            | No preserved Dot1P bits              | TopQ PBits marked using dot1p-value            |



Table 21: QinQ Mark Top Only Explicit Marking Actions

| Egress SAP Type | Ingress Packet Preserved Dot1P State                  | Marked (or Remarked) PBits                                                      |
|-----------------|-------------------------------------------------------|---------------------------------------------------------------------------------|
| TopQ            | Preserved Dot1P bits (used as TopQ and BottomQ PBits) | TopQ PBits marked using dot1p-value, BottomQ PBits preserved                    |
| QinQ            | No preserved Dot1P bits                               | TopQ PBits marked using dot1p-value, BottomQ PBits marked with zero             |
| QinQ            | Preserved Dot1P bits (used as TopQ and BottomQ PBits) | TopQ PBits marked using dot1p-value, BottomQ PBits marked using preserved value |

The QinQ and TopQ SAP PBit marking follows the default behavior defined in the above tables when **qinq-mark-top-only** is not specified.

The dot1p dot1p-value command must be configured without the qinq-mark-top-only parameter to remove the TopQ PBits only marking restriction.

## agg-rate-limit

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>agg-rate-limit</b> <i>agg-rate</i> [ <b>queue-frame-based-accounting</b> ]<br><b>no agg-rate-limit</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>ies>if>sap>egress<br>config>service>ies>sub-if>grp-if>sap>egress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command defines a maximum total rate for all egress queues on a service SAP or multi-service site. The <b>agg-rate-limit</b> command is mutually exclusive with the egress scheduler policy. When an egress scheduler policy is defined, the <b>agg-rate-limit</b> command will fail. If the <b>agg-rate-limit</b> command is specified, an attempt to bind a <b>scheduler-policy</b> to the SAP or multi-service site will fail.</p> <p>A multi-service site must have a port scope defined that ensures all queues associated with the site are on the same port or channel. If the scope is not set to a port, the agg-rate-limit command will fail. Once an agg-rate-limit has been assigned to a multi-service site, the scope cannot be changed to card level.</p> <p>A port scheduler policy must be applied on the egress port or channel the SAP or multi-service site are bound to in order for the defined agg-rate-limit to take effect. The egress port scheduler enforces the aggregate queue rate as it distributes its bandwidth at the various port priority levels. The port scheduler stops offering bandwidth to member queues once it has detected that the aggregate rate limit has been reached.</p> <p>If a port scheduler is not defined on the egress port, the queues are allowed to operate based on their own bandwidth parameters.</p> <p>The <b>no</b> form of the command removes the aggregate rate limit from the SAP or multi-service site.</p> |
| <b>Parameters</b>  | <p><i>agg-rate</i> — Defines the rate, in kilobits-per-second, that the maximum aggregate rate that the queues on the SAP or MSS can operate.</p> <p><b>Values</b> 1 — 40000000, max</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**queue-frame-based-accounting** — This keyword enables frame based accounting on all queues associated with the SAP or Multi-Service Site. If frame based accounting is required when an aggregate limit is not necessary, the **max** keyword should precede the **queue-frame-based-accounting** keyword. If frame based accounting must be disabled, execute **agg-rate-limit** without the **queue-frame-based-accounting** keyword present.

**Default** Frame based accounting is disabled by default

## qinq-mark-top-only

|                    |                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] qinq-mark-top-only</b>                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>ies>if>sap>egress<br>config>service>ies>sub-if>grp-if>sap>egress                                                                                                                                                                                                                     |
| <b>Description</b> | When enabled (the encapsulation type of the access port where this SAP is defined as qinq), the <b>qinq-mark-top-only</b> command specifies which P-bits to mark during packet egress. When disabled, both set of P-bits are marked. When the enabled, only the P-bits in the top Q-tag are marked. |
| <b>Default</b>     | no qinq-mark-top-only                                                                                                                                                                                                                                                                               |

## qos

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>qos policy-id [shared-queuing   multipoint-shared]<br/>no qos</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>ies>if>sap>egress<br>config>service>ies>if>sap>ingress<br>config>service>ies>sub-if>grp-if>sap>egress<br>config>service>ies>sub-if>grp-if>sap>ingress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>Associates a Quality of Service (QoS) policy with an ingress or egress Service Access Point (SAP) or IP interface.</p> <p>QoS ingress and egress policies are important for the enforcement of SLA agreements. The policy ID must be defined prior to associating the policy with a SAP or IP interface. If the <i>policy-id</i> does not exist, an error will be returned.</p> <p>The <b>qos</b> command is used to associate both ingress and egress QoS policies. The <b>qos</b> command only allows ingress policies to be associated on SAP or IP interface ingress and egress policies on SAP or IP interface egress. Attempts to associate a QoS policy of the wrong type returns an error.</p> <p>Only one ingress and one egress QoS policy can be associated with a SAP or IP interface at one time. Attempts to associate a second QoS policy of a given type will return an error.</p> <p>When an ingress QoS policy is defined on IES ingress IP interface that is bound to a VPLS, the policy becomes associated with every SAP on the VPLS and augments the QoS policy that is defined on each SAP. Packets that are bridged will be processed using the policy defined on the VPLS SAP; packets that are routed will be processed using the policy defined in the IES IP interface-binding context.</p> <p>When an egress QoS policy is associated with an IES IP interface that has been bound to a VPLS, the</p> |

policy becomes associated with every SAP on the VPLS and augments the egress QoS policy that is defined on each SAP. Packets that are bridged will be processed using the policy defined on the VPLS SAP; packets that are routed will be processed using the policy defined in the IES IP interface-binding context.

By default, no specific QoS policy is associated with the SAP or IP interface for ingress or egress, so the default QoS policy is used.

The **no** form of this command removes the QoS policy association from the SAP or IP interface, and the QoS policy reverts to the default.

*policy-id* — The policy ID to associate with SAP or IP interface on ingress/egress. The policy ID must already exist.

**Values** 1 — 65535

**shared-queuing** — This keyword can only be specified on SAP ingress. Specify the ingress shared queue policy used by this SAP. When the value of this object is null it means that the SAP will use individual ingress QoS queues, instead of the shared ones.

**multipoint-shared** — This keyword specifies that this *queue-id* is for multipoint forwarded traffic only. This *queue-id* can only be explicitly mapped to the forwarding class multicast, broadcast, or unknown unicast ingress traffic. If you attempt to map forwarding class unicast traffic to a multipoint queue, an error is generated and no changes are made to the current unicast traffic queue mapping.

A queue must be created as multipoint. The **multipoint** designator cannot be defined after the queue is created. If an attempt is made to modify the command to include the **multipoint** keyword, an error is generated and the command will not execute.

The **multipoint** keyword can be entered in the command line on a pre-existing multipoint queue to edit *queue-id* parameters.

## queue-override

|                    |                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] queue-override</b>                                                                                                                                                                                       |
| <b>Context</b>     | config>service>ies>if>sap>egress<br>config>service>ies>if>sap>ingress                                                                                                                                            |
| <b>Description</b> | This command enables the context to configure override values for the specified SAP egress QoS queue. These values override the corresponding ones specified in the associated SAP egress or ingress QoS policy. |

## queue

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] queue <i>queue-id</i></b>                                                                   |
| <b>Context</b>     | config>service>ies>if>sap>egress>queue-override<br>config>service>ies>if>sap>ingress>queue-override |
| <b>Description</b> | This command specifies the ID of the queue whose parameters are to be overridden.                   |

**Parameters** *queue-id* — The queue ID whose parameters are to be overridden.

**Values** 1 — 32

## adaptation-rule

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>adaptation-rule</b> [ <b>pir</b> { <b>max</b>   <b>min</b>   <b>closest</b> }] [ <b>cir</b> { <b>max</b>   <b>min</b>   <b>closest</b> }]<br><b>no adaptation-rule</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>if>sap>egress>queue-override>queue<br>config>service>ies>if>sap>ingress>queue-override>queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified queue's adaptation rule parameters. The adaptation rule controls the method used by the system to derive the operational CIR and PIR settings when the queue is provisioned in hardware. For the CIR and PIR parameters individually, the system attempts to find the best operational rate depending on the defined constraint.</p> <p>The <b>no</b> form of the command removes any explicitly defined constraints used to derive the operational CIR and PIR created by the application of the policy. When a specific <b>adaptation-rule</b> is removed, the default constraints for <b>rate</b> and <b>cir</b> apply.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Default</b>     | no adaptation-rule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><b>pir</b> — The <b>pir</b> parameter defines the constraints enforced when adapting the PIR rate defined within the <b>queue queue-id rate</b> command. The <b>pir</b> parameter requires a qualifier that defines the constraint used when deriving the operational PIR for the queue. When the <b>rate</b> command is not specified, the default applies.</p> <p><b>max</b> — The <b>max</b> (maximum) option is mutually exclusive with the <b>min</b> and <b>closest</b> options. When <b>max</b> is defined, the operational PIR for the queue will be equal to or less than the administrative rate specified using the <b>rate</b> command.</p> <p><b>min</b> — The <b>min</b> (minimum) option is mutually exclusive with the <b>max</b> and <b>closest</b> options. When <b>min</b> is defined, the operational PIR for the queue will be equal to or greater than the administrative rate specified using the <b>rate</b> command.</p> <p><b>closest</b> — The <b>closest</b> parameter is mutually exclusive with the <b>min</b> and <b>max</b> parameter. When <b>closest</b> is defined, the operational PIR for the queue will be the rate closest to the rate specified using the <b>rate</b> command.</p> <p><b>cir</b> — The <b>cir</b> parameter defines the constraints enforced when adapting the CIR rate defined within the <b>queue queue-id rate</b> command. The <b>cir</b> parameter requires a qualifier that defines the constraint used when deriving the operational CIR for the queue. When the <b>cir</b> parameter is not specified, the default constraint applies.</p> |

## avg-frame-overhead

|                |                                                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>avg-frame-overhead</b> <i>percent</i><br><b>no avg-frame-overhead</b>                                  |
| <b>Context</b> | config>service>ies>if>sap>egress>queue-override<br>config>service>ies>if>sap>ingress>queue-override>queue |

**Description** This command configures the average frame overhead to define the average percentage that the offered load to a queue will expand during the frame encapsulation process before sending traffic on-the-wire. While the avg-frame-overhead value may be defined on any queue, it is only used by the system for queues that egress a Sonet or SDH port or channel. Queues operating on egress Ethernet ports automatically calculate the frame encapsulation overhead based on a 20 byte per packet rule (8 bytes for preamble and 12 bytes for inter-frame gap).

When calculating the frame encapsulation overhead for port scheduling purposes, the system determines the following values:

- **Offered-load** — The offered-load of a queue is calculated by starting with the queue depth in octets, adding the received octets at the queue and subtracting queue discard octets. The result is the number of octets the queue has available to transmit. This is the packet based offered-load.
- **Frame encapsulation overhead** — Using the avg-frame-overhead parameter, the frame encapsulation overhead is simply the queue's current offered-load (how much has been received by the queue) multiplied by the avg-frame-overhead. If a queue had an offered load of 10000 octets and the avg-frame-overhead equals 10%, the frame encapsulation overhead would be  $10000 \times 0.1$  or 1000 octets.

For egress Ethernet queues, the frame encapsulation overhead is calculated by multiplying the number of offered-packets for the queue by 20 bytes. If a queue was offered 50 packets then the frame encapsulation overhead would be  $50 \times 20$  or 1000 octets.

- **Frame based offered-load** — The frame based offered-load is calculated by adding the offered-load to the frame encapsulation overhead. If the offered-load is 10000 octets and the encapsulation overhead was 1000 octets, the frame based offered-load would equal 11000 octets.
  - **Packet to frame factor** — The packet to frame factor is calculated by dividing the frame encapsulation overhead by the queue's offered-load (packet based). If the frame encapsulation overhead is 1000 octets and the offered-load is 10000 octets then the packet to frame factor would be  $1000 / 10000$  or 0.1. When in use, the avg-frame-overhead will be the same as the packet to frame factor making this calculation unnecessary.
  - **Frame based CIR** — The frame based CIR is calculated by multiplying the packet to frame factor with the queue's configured CIR and then adding that result to that CIR. If the queue CIR is set at 500 octets and the packet to frame factor equals 0.1, the frame based CIR would be  $500 \times 1.1$  or 550 octets.
  - **Frame based within-cir offered-load** — The frame based within-cir offered-load is the portion of the frame based offered-load considered to be within the frame-based CIR. The frame based within-cir offered-load is the lesser of the frame based offered-load and the frame based CIR. If the frame based offered-load equaled 11000 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would be limited to 550 octets. If the frame based offered-load equaled 450 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would equal 450 octets (or the entire frame based offered-load).
- As a special case, when a queue or associated intermediate scheduler is configured with a CIR-weight equal to 0, the system automatically sets the queue's frame based within-cir offered-load to 0, preventing it from receiving bandwidth during the port scheduler's within-cir pass.
- **Frame based PIR** — The frame based PIR is calculated by multiplying the packet to frame factor with the queue's configured PIR and then adding the result to that PIR. If the queue PIR is set to 7500 octets and the packet to frame factor equals 0.1, the frame based PIR would be  $7500 \times 1.1$  or 8250 octets.

- **Frame based within-pir offered-load** — The frame based within-pir offered-load is the portion of the frame based offered-load considered to be within the frame based PIR. The frame based within-pir offered-load is the lesser of the frame based offered-load and the frame based PIR. If the frame based offered-load equaled 11000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered-load would be limited to 8250 octets. If the frame based offered-load equaled 7000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered load would equal 7000 octets.

**Port scheduler operation using frame transformed rates** — The port scheduler uses the frame based rates to determine the maximum rates that each queue may receive during the within-cir and above-cir bandwidth allocation passes. During the within-cir pass, a queue may receive up to its frame based within-cir offered-load. The maximum it may receive during the above-cir pass is the difference between the frame based within-pir offered load and the amount of actual bandwidth allocated during the within-cir pass.

**SAP and subscriber SLA-profile average frame overhead override** — The average frame overhead parameter on a sap-egress may be overridden at an individual egress queue basis. On each SAP and within the sla-profile policy used by subscribers an avg-frame-overhead command may be defined under the queue-override context for each queue. When overridden, the queue instance will use its local value for the average frame overhead instead of the sap-egress defined overhead.

The **no** form of this command restores the average frame overhead parameter for the queue to the default value of 0 percent. When set to 0, the system uses the packet based queue statistics for calculating port scheduler priority bandwidth allocation. If the no avg-frame-overhead command is executed in a queue-override queue id context, the avg-frame-overhead setting for the queue within the sap-egress QoS policy takes effect.

**Default** 0

**Parameters** *percent* — This parameter sets the average amount of packet-to-frame encapsulation overhead expected for the queue. This value is not used by the system for egress Ethernet queues.

**Values** 0 — 100

cbs

**Syntax** **cbs** *size-in-kbytes*  
**no cbs**

**Context** config>service>ies>if>sap>egress>queue-override>queue  
config>service>ies>if>sap>ingress>queue-override>queue

**Description** This command can be used to override specific attributes of the specified queue’s CBS parameters. It is permissible, and possibly desirable, to oversubscribe the total CBS reserved buffers for a given access port egress buffer pool. Oversubscription may be desirable due to the potential large number of service queues and the economy of statistical multiplexing the individual queue’s CBS setting into the defined reserved total.

When oversubscribing the reserved total, it is possible for a queue depth to be lower than its CBS setting and still not receive a buffer from the buffer pool for an ingress frame. As more queues are using their CBS buffers and the total in use exceeds the defined reserved total, essentially the buffers are being removed from the shared portion of the pool without the shared in use average and total counts being decremented. This can affect the operation of the high and low priority RED slopes on

the pool, causing them to miscalculate when to start randomly drop packets.

If the CBS value is larger than the MBS value, an error will occur, preventing the CBS change.

The **no** form of this command returns the CBS size to the default value.

|                   |                                                                                                                                                                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no cbs                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b> | <i>size-in-kbytes</i> — The size parameter is an integer expression of the number of kilobytes reserved for the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that no reserved buffers are required by the queue (a minimal reserved size can still be applied for scheduling purposes). |
| <b>Values</b>     | 0 — 131072, default                                                                                                                                                                                                                                                                                                             |

## high-prio-only

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>high-prio-only</b> <i>percent</i><br><b>no high-prio-only</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>ies>if>sap>egress>queue-override>queue<br>config>service>ies>if>sap>ingress>queue-override>queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified queue's high-prio-only parameters. The <b>high-prio-only</b> command configures the percentage of buffer space for the queue, used exclusively by high priority packets.</p> <p>The priority of a packet can only be set in the SAP ingress QoS policy and is only applicable on the ingress queues for a SAP. The <b>high-prio-only</b> parameter is used to override the default value derived from the <b>network-queue</b> command.</p> <p>The defined <b>high-prio-only</b> value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the <b>high-prio-only</b> value larger than the current MBS size will also result in an error and fail execution.</p> <p>The <b>no</b> form of this command restores the default high priority reserved size.</p> |
| <b>Parameters</b>  | <i>percent</i> — The <i>percent</i> parameter is the percentage reserved for high priority traffic on the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that none of the MBS of the queue will be reserved for high priority traffic. This does not affect RED slope operation for packets attempting to be queued.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Values</b>      | 0 — 100, default                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## mbs

|                    |                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mbs</b> { <i>size-in-kbytes</i>   <b>default</b> }<br><b>no mbs</b>                                          |
| <b>Context</b>     | config>service>ies>if>sap>egress>queue-override>queue<br>config>service>ies>if>sap>ingress>queue-override>queue |
| <b>Description</b> | This command can be used to override specific attributes of the specified queue's MBS parameters.               |

The MBS is a mechanism to override the default maximum size for the queue.

The sum of the MBS for all queues on an egress access port can oversubscribe the total amount of buffering available. When congestion occurs and buffers become scarce, access to buffers is controlled by the RED slope a packet is associated with. A queue that has not exceeded its MBS size is not guaranteed that a buffer will be available when needed or that the packet's RED slope will not force the discard of the packet. Setting proper CBS parameters and controlling CBS oversubscription is one major safeguard to queue starvation (when a queue does not receive its fair share of buffers). Another is properly setting the RED slope parameters for the needs of services on this port or channel.

If the CBS value is larger than the MBS value, an error will occur, preventing the MBS change.

The **no** form of this command returns the MBS size assigned to the queue.

|                   |                                                                                                                                                                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | default                                                                                                                                                                                                                                        |
| <b>Parameters</b> | <i>size-in-kbytes</i> — The size parameter is an integer expression of the maximum number of kilobytes of buffering allowed for the queue. For a value of 100 kbps, enter the value 100. A value of 0 causes the queue to discard all packets. |
| <b>Values</b>     | 0 — 131072 or default                                                                                                                                                                                                                          |

## rate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rate</b> <i>pir-rate</i> [ <i>cir cir-rate</i> ]<br><b>no rate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>ies>if>sap>egress>queue-override>queue<br>config>service>ies>if>sap>ingress>queue-override>queue<br>config>service>ies>if>sap>egress>sched-override>scheduler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified queue's Peak Information Rate (PIR) and the Committed Information Rate (CIR) parameters.</p> <p>The PIR defines the maximum rate that the queue can transmit packets out an egress interface (for SAP egress queues). Defining a PIR does not necessarily guarantee that the queue can transmit at the intended rate. The actual rate sustained by the queue can be limited by oversubscription factors or available egress bandwidth.</p> <p>The CIR defines the rate at which the system prioritizes the queue over other queues competing for the same bandwidth. In-profile packets are preferentially queued by the system at egress and at subsequent next hop nodes where the packet can traverse. To be properly handled as in- or out-of-profile throughout the network, the packets must be marked accordingly for profiling at each hop.</p> <p>The CIR can be used by the queue's parent commands <i>cir-level</i> and <i>cir-weight</i> parameters to define the amount of bandwidth considered to be committed for the child queue during bandwidth allocation by the parent scheduler.</p> <p>The <b>rate</b> command can be executed at any time, altering the PIR and CIR rates for all queues created through the association of the SAP egress QoS policy with the <i>queue-id</i>.</p> <p>The <b>no</b> form of the command returns all queues created with the <i>queue-id</i> by association with the QoS policy to the default PIR and CIR parameters (<b>max</b>, 0).</p> |
| <b>Default</b>     | <b>rate max cir 0</b> — The <b>max</b> default specifies the amount of bandwidth in kilobits per second (thousand bits per second). The <b>max</b> value is mutually exclusive to the <b>pir-rate</b> value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



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|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><i>pir-rate</i> — Defines the administrative PIR rate, in kilobits, for the queue. When the <b>rate</b> command is executed, a valid PIR setting must be explicitly defined. When the <b>rate</b> command has not been executed, the default PIR of <b>max</b> is assumed.</p> <p>Fractional values are not allowed and must be given as a positive integer.</p> <p>The actual PIR rate is dependent on the queue's <b>adaptation-rule</b> parameters and the actual hardware where the queue is provisioned.</p> <p><b>Values</b>      1 — 100000000</p> <p><b>Default</b>      max</p> <p><b>cir</b> <i>cir-rate</i> — The <b>cir</b> parameter overrides the default administrative CIR used by the queue. When the <b>rate</b> command is executed, a CIR setting is optional. When the <b>rate</b> command has not been executed or the <b>cir</b> parameter is not explicitly specified, the default CIR (0) is assumed.</p> <p>Fractional values are not allowed and must be given as a positive integer. The <b>sum</b> keyword specifies that the CIR be used as the summed CIR values of the children schedulers or queues.</p> <p><b>Values</b>      0 — 100000000, <b>max</b>, <b>sum</b></p> <p><b>Default</b>      0</p> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## scheduler-override

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|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] scheduler-override</b>                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>ies>if>sap>egress<br>config>service>ies>if>sap>ingress                                                                                                                                                                                         |
| <b>Description</b> | This command specifies the set of attributes whose values have been overridden via management on this virtual scheduler. Clearing a given flag will return the corresponding overridden attribute to the value defined on the SAP's ingress scheduler policy. |

## scheduler

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] scheduler scheduler-name</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>ies>if>sap>egress>sched-override<br>config>service>ies>if>sap>ingress>sched-override                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified scheduler name.</p> <p>A scheduler defines a bandwidth controls that limit each child (other schedulers and queues) associated with the scheduler. Scheduler objects are created within the hierarchical tiers of the policy. It is assumed that each scheduler created will have queues or other schedulers defined as child associations. The scheduler can be a child (take bandwidth from a scheduler in a higher tier, except for schedulers created in tier 1). A total of 32 schedulers can be created within a single scheduler policy with no restriction on the distribution between the tiers.</p> <p>Each scheduler must have a unique name within the context of the scheduler policy; however the same name can be reused in multiple scheduler policies. If <i>scheduler-name</i> already exists within the policy tier level (regardless of the inclusion of the keyword create), the context changes to that scheduler name for the purpose of editing the scheduler parameters. Modifications made to an</p> |

existing scheduler are executed on all instantiated schedulers created through association with the policy of the edited scheduler. This can cause queues or schedulers to become orphaned (invalid parent association) and adversely affect the ability of the system to enforce service level agreements (SLAs).

If the *scheduler-name* exists within the policy on a different tier (regardless of the inclusion of the keyword *create*), an error occurs and the current CLI context will not change.

If the *scheduler-name* does not exist in this or another tier within the scheduler policy, it is assumed that an attempt is being made to create a scheduler of that name. The success of the command execution is dependent on the following:

- 1. The maximum number of schedulers has not been configured.
- 2. The provided *scheduler-name* is valid.
- 3. The **create** keyword is entered with the command if the system is configured to require it (enabled in the **environment create** command).

When the maximum number of schedulers has been exceeded on the policy, a configuration error occurs and the command will not execute, nor will the CLI context change.

If the provided scheduler-name is invalid according to the criteria below, a name syntax error will occur, the command will not execute, and the CLI context will not change.

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameters | <i>scheduler-name</i> — The name of the scheduler.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Values     | Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                                                                                                                                                 |
| Default    | None. Each scheduler must be explicitly created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|            | <i>create</i> — This optional keyword explicitly specifies that it is acceptable to create a scheduler with the given <i>scheduler-name</i> . If the <b>create</b> keyword is omitted, <b>scheduler-name</b> is not created when the system environment variable <i>create</i> is set to true. This safeguard is meant to avoid accidental creation of system objects (such as schedulers) while attempting to edit an object with a mistyped name or ID. The keyword has no effect when the object already exists. |

rate

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>rate</b> <i>pir-rate</i> [ <i>cir cir-rate</i> ]<br><b>no rate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Context     | config>service>ies>if>sap>egress>sched-override>scheduler<br>config>service>ies>if>sap>ingress>sched-override>scheduler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Description | This command can be used to override specific attributes of the specified scheduler rate. The <b>rate</b> command defines the maximum bandwidth that the scheduler can offer its child queues or schedulers. The maximum rate is limited to the amount of bandwidth the scheduler can receive from its parent scheduler. If the scheduler has no parent, the maximum rate is assumed to be the amount available to the scheduler. When a parent is associated with the scheduler, the CIR parameter provides the amount of bandwidth to be considered during the parent scheduler’s ‘within CIR’ distribution phase.<br><br>The actual operating rate of the scheduler is limited by bandwidth constraints other than its maximum rate. The scheduler’s parent scheduler may not have the available bandwidth to meet the scheduler’s |

needs or the bandwidth available to the parent scheduler could be allocated to other child schedulers or child queues on the parent based on higher priority. The children of the scheduler may not need the maximum rate available to the scheduler due to insufficient offered load or limits to their own maximum rates.

When a scheduler is defined without specifying a rate, the default rate is **max**. If the scheduler is a root scheduler (no parent defined), the default maximum rate must be changed to an explicit value. Without this explicit value, the scheduler will assume that an infinite amount of bandwidth is available and allow all child queues and schedulers to operate at their maximum rates.

The **no** form of this command returns all queues created with this *queue-id* by association with the QoS policy to the default PIR and CIR parameters.

#### Parameters

*pir-rate* — The **pir** parameter accepts a step multiplier value that specifies the multiplier used to determine the PIR rate at which the queue will operate. A value of 0 to 100000000 or the keyword **max** is accepted. Any other value will result in an error without modifying the current PIR rate.

To calculate the actual PIR rate, the rate described by the queue's **rate** is multiplied by the *pir-rate*.

The SAP ingress context for PIR is independent of the defined forwarding class (fc) for the queue. The default **pir** and definable range is identical for each class. The PIR in effect for a queue defines the maximum rate at which the queue will be allowed to forward packets in a given second, thus shaping the queue's output.

The PIR parameter for SAP ingress queues do not have a negate (**no**) function. To return the queue's PIR rate to the default value, that value must be specified as the PIR value.

**Values** 1 — 100000000, **max**

**Default** max

**cir** *cir-rate* — This parameter accepts a step-multiplier value that specifies the multiplier used to determine the CIR rate at which the queue will operate. A value of 0 — 100000000 or the keyword **max** or **sum** is accepted. Any other value will result in an error without modifying the current CIR rate.

To calculate the actual CIR rate, the rate described by the **rate pir pir-rate** is multiplied by the *cir-rate*. If the **cir** is set to max, then the CIR rate is set to infinity.

The SAP ingress context for CIR is dependent on the defined forwarding class (fc) for the queue. The default CIR and definable range is different for each class. The CIR in effect for a queue defines both its profile (in or out) marking level as well as the relative importance compared to other queues for scheduling purposes during congestion periods. The **sum** keyword specifies that the CIR be used as the summed CIR values of the children schedulers or queues.

**Values** 0 — 100000000, **max**, **sum**

**Default** sum

## scheduler-policy

**Syntax** **scheduler-policy** *scheduler-policy-name*  
no scheduler-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | <pre> config&gt;service&gt;ies&gt;sap&gt;ingress config&gt;service&gt;ies&gt;sap&gt;egress config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap&gt;egress config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap&gt;ingress config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap&gt;egress config&gt;service&gt;ies&gt;sub-if&gt;grp-if&gt;sap&gt;ingress </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command applies an existing scheduler policy to an ingress or egress scheduler used by SAP queues associated with this multi-service customer site. The schedulers defined in the scheduler policy can only be created once the customer site has been appropriately assigned to a chassis port, channel or slot. Scheduler policies are defined in the <b>config&gt;qos&gt;scheduler-policy scheduler-policy-name</b> context.</p> <p>The <b>no</b> form of this command removes the configured ingress or egress scheduler policy from the multi-service customer site. When the policy is removed, the schedulers created due to the policy are removed also making them unavailable for the ingress SAP queues associated with the customer site. Queues that lose their parent scheduler association are deemed to be orphaned and are no longer subject to a virtual scheduler. The SAPs that have ingress queues reliant on the removed schedulers enter into an operational state depicting the orphaned status of one or more queues. When the <b>no scheduler-policy</b> command is executed, the customer site ingress or egress node will not contain an applied scheduler policy.</p> <p><i>scheduler-policy-name:</i> — The <i>scheduler-policy-name</i> parameter applies an existing scheduler policy that was created in the <b>config&gt;qos&gt;scheduler-policy scheduler-policy-name</b> context to create the hierarchy of ingress or egress virtual schedulers. The scheduler names defined within the policy are created and made available to any ingress or egress queues created on associated SAPs.</p> <p><b>Values</b> Any existing valid scheduler policy name.</p> |

## ATM Commands

### atm

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>atm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command enables access to the context to configure ATM-related attributes. This command can only be used when a given context (for example, a channel or SAP) supports ATM functionality such as:</p> <ul style="list-style-type: none"> <li>• Configuring ATM port or ATM port-related functionality on MDAs supporting ATM functionality</li> <li>• Configuring ATM-related configuration for ATM-based SAPs that exist on MDAs supporting ATM functionality.</li> </ul> <p>If ATM functionality is not supported for a given context, the command returns an error.</p> |

### egress

|                    |                                                                                  |
|--------------------|----------------------------------------------------------------------------------|
|                    | <b>egress</b>                                                                    |
| <b>Context</b>     | config>service>ies>if>sap>atm                                                    |
| <b>Description</b> | This command enables the context to configure egress ATM attributes for the SAP. |

### encapsulation

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                                                                                                                                                                                                                        |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encapsulation</b> <i>atm-encap-type</i>                                                                                                                                                                                                                                                                                                                                                                              |               |                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>ies>if>sap>atm                                                                                                                                                                                                                                                                                                                                                                                           |               |                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command configures RFC 2684, <i>Multiprotocol Encapsulation over ATM Adaptation Layer 5</i>, encapsulation for an ATM PVCC delimited SAP.</p> <p>This command specifies the data encapsulation for an ATM PVCC delimited SAP. The definition references RFC 2684 and to the ATM Forum LAN Emulation specification.</p> <p>Ingress traffic that does not match the configured encapsulation will be dropped.</p> |               |                                                                                                                                                                                                                                                        |
| <b>Default</b>     | <p>The encapsulation is driven by the services for which the SAP is configured.</p> <p>For IES service SAPs, the default is <b>aal5snap-routed</b>.</p>                                                                                                                                                                                                                                                                 |               |                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><i>atm-encap-type</i> — Specify the encapsulation type.</p> <table> <tr> <td><b>Values</b></td><td> <p><b>aal5snap-routed</b> — Routed encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684.</p> <p><b>aal5mux-ip</b> — Routed IP encapsulation for VC multiplexed circuit as defined in RFC 2684.</p> </td></tr> </table>                                       | <b>Values</b> | <p><b>aal5snap-routed</b> — Routed encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684.</p> <p><b>aal5mux-ip</b> — Routed IP encapsulation for VC multiplexed circuit as defined in RFC 2684.</p> |
| <b>Values</b>      | <p><b>aal5snap-routed</b> — Routed encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684.</p> <p><b>aal5mux-ip</b> — Routed IP encapsulation for VC multiplexed circuit as defined in RFC 2684.</p>                                                                                                                                                                  |               |                                                                                                                                                                                                                                                        |

**aal5snap-bridged** — Bridged encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684.  
**aal5mux-bridged-eth-nofcs** — Bridged IP encapsulation for VC multiplexed circuit as defined in RFC 2684.

## ingress

|                    |                                                             |
|--------------------|-------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress</b>                                              |
| <b>Context</b>     | config>service>ies>if>sap>atm                               |
| <b>Description</b> | This command configures ingress ATM attributes for the SAP. |

## traffic-desc

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>traffic-desc</b> <i>traffic-desc-profile-id</i><br><b>no traffic-desc</b>                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>ies>if>sap>atm>egress<br>config>service>ies>if>sap>atm>ingress                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command assigns an ATM traffic descriptor profile to a given context (for example, a SAP).<br>When configured under the ingress context, the specified traffic descriptor profile defines the traffic contract in the forward direction.<br>When configured under the egress context, the specified traffic descriptor profile defines the traffic contract in the backward direction.<br>The <b>no</b> form of the command reverts the traffic descriptor to the default traffic descriptor profile. |
| <b>Default</b>     | The default traffic descriptor (trafficDescProfileId. = 1) is associated with newly created PVCC-delimited SAPs.                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>traffic-desc-profile-id</i> — Specify a defined traffic descriptor profile (see the QoS atm-td-profile command).                                                                                                                                                                                                                                                                                                                                                                                        |

## oam

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>oam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>if >sap>atm                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command enables the context to configure OAM functionality for a PVCC delimiting a SAP.<br>The ATM-capable MDAs support F5 end-to-end OAM functionality (AIS, RDI, Loopback): <ul style="list-style-type: none"> <li>ITU-T Recommendation I.610 - B-ISDN Operation and Maintenance Principles and Functions version 11/95</li> <li>GR-1248-CORE - Generic Requirements for Operations of ATM Network Elements (NEs). Issue 3 June 1996</li> </ul> |

- GR-1113-CORE - Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994

## alarm-cells

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] alarm-cells</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>if >sap>atm>oam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures AIS/RDI fault management on a PVCC. Fault management allows PVCC termination to monitor and report the status of their connection by propagating fault information through the network and by driving PVCC's operational status.</p> <p>When alarm-cells functionality is enabled, a PVCC's operational status is affected when a PVCC goes into an AIS or RDI state because of an AIS/RDI processing (assuming nothing else affects PVCC's operational status, for example, if the PVCC goes DOWN, or enters a fault state and comes back UP, or exits that fault state). RDI cells are generated when PVCC is operationally DOWN. No OAM-specific SNMP trap is raised whenever an endpoint enters/exits an AIS or RDI state, however, if as result of an OAM state change, the PVCC changes operational status, then a trap is expected from an entity the PVCC is associated with (for example a SAP).</p> <p>The <b>no</b> command disables alarm-cells functionality for a PVCC. When alarm-cells functionality is disabled, a PVCC's operational status is no longer affected by a PVCC's OAM state changes due to AIS/RDI processing (note that when alarm-cells is disabled, a PVCC will change operational status to UP due to alarm-cell processing) and RDI cells are not generated as result of the PVCC going into AIS or RDI state. The PVCC's OAM status, however, will record OAM faults as described above.</p> |
| <b>Default</b>     | Enabled for PVCCs delimiting IES SAPs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## periodic-loopback

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] periodic-loopback</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>ies>if >sap>atm>oam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command enables periodic OAM loopbacks on this SAP. This command is only configurable on IES and VPRN SAPs. When enabled, an ATM OAM loopback cell is transmitted every period as configured in the config&gt;system&gt;atm&gt;oam&gt;loopback-period <i>period</i> context.</p> <p>If a response is not received and consecutive retry-down retries also result in failure, the endpoint will transition to an alarm indication signal/loss of clock state. Then, an ATM OAM loopback cell will be transmitted every period as configured in the loopback-period <i>period</i>. If a response is received for the periodic loopback and consecutive retry-up retries also each receive a response, the endpoint will transition back to the up state.</p> <p>The <b>no</b> form of the command sets the value back to the default.</p> |
| <b>Default</b>     | no periodic-loopback                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## calling-station-id

|                    |                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>calling-station-id</b> <i>calling-station-id</i><br><b>no calling-station-id</b>                                                                                                                                                                           |
| <b>Context</b>     | config>service>ies>sub-if>grp-if>sap                                                                                                                                                                                                                          |
| <b>Description</b> | This command enables the inclusion of the <b>calling-station-id</b> attribute in RADIUS authentication requests and RADIUS accounting messages. The value inserted is set at the SAP level. If no value is set at the SAP level, an empty string is included. |
| <b>Default</b>     | This attribute is not sent by default.                                                                                                                                                                                                                        |



## IES Interface VRRP Commands

### vrrp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vrrp</b> <i>virtual-router-id</i> [ <b>owner</b> ]<br><b>no vrrp</b> <i>virtual-router-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>ies>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command creates or edits a Virtual Router ID (VRID) on the service IP interface. A VRID is internally represented in conjunction with the IP interface name. This allows the VRID to be used on multiple IP interfaces while representing different virtual router instances.</p> <p>Two VRRP nodes can be defined on an IP interface. One, both, or none may be defined as owner. The nodal context of <b>vrrp</b> <i>virtual-router-id</i> is used to define the configuration parameters for the VRID.</p> <p>The <b>no</b> form of this command removes the specified VRID from the IP interface. This terminates VRRP participation for the virtual router and deletes all references to the vrid. The VRID does not need to be shutdown in order to remove the virtual router instance.</p> |
| <b>Default</b>     | No default                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>virtual-router-id</i> — The virtual-router-id parameter specifies a new virtual router ID or one that can be modified on the IP interface.</p> <p><b>Values</b>      1 — 255</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### authentication-key

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-key</b> [ <i>authentication-key</i>   <i>hash-key</i> ] [ <b>hash</b>   <b>hash2</b> ]<br><b>no authentication-key</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>The <b>authentication-key</b> command, within the <b>vrrp</b> <i>virtual-router-id</i> context, is used to assign a simple text password authentication key to generate master VRRP advertisement messages and validating received VRRP advertisement messages.</p> <p>The authentication-key command is one of the few commands not affected by the presence of the owner keyword. If simple text password authentication is not required, the authentication-key command is not required. If the command is re-executed with a different password key defined, the new key will be used immediately. If a no authentication-key command is executed, the password authentication key is restored to the default value. The authentication-key command may be executed at any time, altering the simple text password used when authentication-type password authentication method is used by the virtual router instance. The authentication-type password command does not need to be executed prior to defining the authentication-key command.</p> <p>To change the current in-use password key on multiple virtual router instances:</p> <ul style="list-style-type: none"> <li>• Identify the current master</li> <li>• Shutdown the virtual router instance on all backups</li> </ul> |

- Execute the authentication-key command on the master to change the password key
- Execute the authentication-key command and no shutdown command on each backup key

The **no** form of this command restores the default null string to the value of key.

**Default** No default. The authentication data field contains the value 0 in all 16 octets.

**Parameters** *authentication-key* — The *key* parameter identifies the simple text password used when VRRP Authentication Type 1 is enabled on the virtual router instance. Type 1 uses a string eight octets long that is inserted into all transmitted VRRP advertisement messages and compared against all received VRRP advertisement messages. The authentication data fields are used to transmit the key.

The *key* parameter is expressed as a string consisting up to eight alpha-numeric characters. Spaces must be contained in quotation marks ( " " ). The quotation marks are not considered part of the string.

The string is case sensitive and is left-justified in the VRRP advertisement message authentication data fields. The first field contains the first four characters with the first octet (starting with IETF RFC bit position 0) containing the first character. The second field holds the fifth through eighth characters. Any unspecified portion of the authentication data field is padded with the value 0 in the corresponding octet.

**Values** Any 7-bit printable ASCII character.

|             |                    |          |
|-------------|--------------------|----------|
| Exceptions: | Double quote ( " ) | ASCII 34 |
|             | Carriage Return    | ASCII 13 |
|             | Line Feed          | ASCII 10 |
|             | Tab                | ASCII 9  |
|             | Backspace          | ASCII 8  |

*hash-key* — The hash key. The key can be any combination of ASCII characters up to 22 characters in length (encrypted). If spaces are used in the string, enclose the entire string in quotation marks ( " " ).

This is useful when a user must configure the parameter, but, for security purposes, the actual unencrypted key value is not provided.

**hash** — Specifies the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** parameter specified.

**hash2** — Specifies the key is entered in a more complex encrypted form. If the **hash2** parameter is not used, the less encrypted **hash** form is assumed.

## authentication-type

**Syntax** **authentication-type** {*password* | *message-digest*}  
**no authentication-type**

**Context** config>service>ies>if>vrrp

**Description** The **authentication-type** command, within the **vrrp** *virtual-router-id* context, is used to assign the authentication method to generate master VRRP advertisement messages and validate received VRRP advertisement messages.

**NOTE:** The authentication management for VRRP closely follows the authentication management format used for IS-IS.

The **authentication-type** command is one of the commands not affected by the presence of the owner keyword. If authentication is not required, the authentication-type command must not be executed. If the command is re-executed with a different authentication type defined, the new type will be used. If the no authentication-type command is executed, authentication is removed and no authentication is performed. The authentication-type command may be executed at any time, altering the authentication method used by the virtual router instance.

The **no** form of this command removes authentication from the virtual router instance. All VRRP Advertisement messages sent will have the Authentication Type field set to 0 and the Authentication Data fields will contain 0 in all octets. VRRP Advertisement messages received with Authentication Type fields containing a value other than 0 will be discarded.

*password* — The password keyword identifies VRRP Authentication Type 1. Type 1 requires the definition of a string of eight octets long using the authentication-key command. All transmitted VRRP Advertisement messages must have the Authentication Type field set to 1 and the Authentication Data fields must contain the authentication-key password.

All received VRRP advertisement messages must contain a value of 1 in the Authentication Type field and the Authentication Data fields must match the defined authentication-key. All other received messages will be silently discarded.

*message-digest* — The message-digest keyword identifies VRRP Authentication Type 2. Type 2 defines a lower IP layer MD5 authentication mechanism using HMAC and IP authentication header standards. An MD5 key must be defined using the message-digest-key command. All transmitted VRRP advertisement messages must have the Authentication Type field set to 2 and the Authentication Data fields must contain 0 in all octets. The message-digest key is used in the hashing process when populating the IP Authentication Header fields. A sequential incrementing counter (set to zero when the message-digest-key is set) is incremented and then used in the IP Authentication Header to prevent replay attacks on authorized participating virtual router instances.

All received VRRP advertisement messages must contain a value of 2 in the Authentication Type field and the Authentication Data fields are ignored. The message must have been authorized by the lower layer IP Authentication Header process with the sequential counter field and the source IP address presented to the virtual router instance. To track the validity of the received counter, the virtual router instance maintains a master counter table containing up to 32 source IP addresses and the last received counter value. Populate the table as follows:

1. Check to see if source IP address exists in table.

**Output** If non-existent, create an entry if available.

- If no entry is available, delete the oldest and create an entry. The new entry should have a counter value of zero.
- 2. Compare the message counter value to the entry value (0 if new entry or equal to the previous message counter from the source IP address).
  - If the message counter is not greater than the entry counter value, silently discard the packet.
  - If the message counter is greater than the entry counter value, accept the message for further checking and replace the entry counter value with the message counter value and time stamp the entry.

## backup

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] backup</b> <i>ip-address</i>                                   |
| <b>Context</b>     | config>service>ies>if>vrrp                                             |
| <b>Description</b> | This command configures virtual router IP addresses for the interface. |

## bfd-enable

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bfd-enable</b> [ <b>base</b>   <i>service-id</i> ] <b>interface</b> <i>interface-name</i> <b>dst-ip</b> <i>ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This commands assigns a bi-directional forwarding (BFD) session providing heart-beat mechanism for the given VRRP/SRRP instance. There can be only one BFD session assigned to any given VRRP/SRRP instance, but there can be multiple SRRP/VRRP sessions using the same BFD session.</p> <p>BFD control the state of the associated interface. By enabling BFD on a given protocol interface, the state of the protocol interface is tied to the state of the BFD session between the local node and the remote node. The parameters used for the BFD are set via the BFD command under the IP interface. The specified interface may not be configured with BFD; however, when it is, the virtual router will then initiate the BFD session.</p> <p>The <b>no</b> form of this command removes BFD from the configuration.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>service-id</i> — Specifies the service ID of the interface running BFD.</p> <p><b>Values</b>      <i>service-id</i>: 1 — 2147483648</p> <p><b>Values</b>      No service ID indicates a network interface.</p> <p><b>interface</b> <i>interface-name</i> — Specifies the name of the interface running BFD.</p> <p><b>dst-ip</b> <i>ip-address</i> — Specifies the destination address to be used for the BFD session.</p>                                                                                                                                                                                                                                                                                                                                                                                                    |

## init-delay

|                    |                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>init-delay</b> <i>seconds</i><br><b>no init-delay</b>                                                                   |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                 |
| <b>Description</b> | This command configures a VRRP initialization delay timer.                                                                 |
| <b>Default</b>     | no init-delay                                                                                                              |
| <b>Parameters</b>  | <p><i>seconds</i> — Specifies the initialization delay timer for VRRP, in seconds.</p> <p><b>Values</b>      1 — 65535</p> |

## mac

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac</b> <i>mac-address</i><br><b>no mac</b>                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command assigns a specific MAC address to an IES IP interface.<br>The <b>no</b> form of the command returns the MAC address of the IP interface to the default value.                                                                                                         |
| <b>Default</b>     | The physical MAC address associated with the Ethernet interface that the SAP is configured on (the default MAC address assigned to the interface, assigned by the system).                                                                                                         |
| <b>Parameters</b>  | <i>mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses. |

## master-int-inherit

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] master-int-inherit</b>                                                                     |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                         |
| <b>Description</b> | This command allows the master instance to dictate the master down timer (non-owner context only). |
| <b>Default</b>     | no master-int-inherit                                                                              |

## message-interval

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>message-interval</b> {[ <i>seconds</i> ] [ <b>milliseconds</b> <i>milliseconds</i> ]}<br><b>no message-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command sets the advertisement timer and indirectly sets the master down timer on the virtual router instance. The message-interval setting must be the same for all virtual routers participating as a virtual router. Any VRRP advertisement message received with an Advertisement Interval field different than the virtual router instance configured message-interval value will be silently discarded.<br><br>The message-interval command is available in both non-owner and owner <b>vrrp</b> <i>virtual-router-id</i> nodal contexts. If the message-interval command is not executed, the default message interval of 1 second will be used.<br><br>The <b>no</b> form of this command restores the default message interval value of 1 second to the virtual router instance. |
| <b>Parameters</b>  | <i>seconds</i> — The number of seconds that will transpire before the advertisement timer expires.<br><br><b>Values</b> 1 — 255<br><br><b>Default</b> 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**milliseconds** *milliseconds* — Specifies the time interval, in milliseconds, between sending advertisement messages. This parameter is not supported on non-redundant chassis.

**Values** 100 — 900

## ping-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ping-reply</b><br><b>no ping-reply</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command enables the non-owner master to reply to ICMP Echo Requests directed at the virtual router instances IP addresses. The ping request can be received on any routed interface.</p> <p>Ping must not have been disabled at the management security level (either on the parental IP interface or based on the Ping source host address). When ping-reply is not enabled, ICMP Echo Requests to non-owner master virtual IP addresses are silently discarded.</p> <p>Non-owner backup virtual routers never respond to ICMP Echo Requests regardless of the setting of ping-reply configuration.</p> <p>The ping-reply command is only available in non-owner <b>vrrp</b> <i>virtual-router-id</i> nodal context. If the ping-reply command is not executed, ICMP Echo Requests to the virtual router instance IP addresses will be silently discarded.</p> <p>The <b>no</b> form of this command restores the default operation of discarding all ICMP Echo Request messages destined to the non-owner virtual router instance IP addresses.</p> |
| <b>Default</b>     | no ping-reply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>policy</b> <i>vrrp-policy-id</i><br><b>no policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command creates VRRP control policies. The VRRP policy ID must be created by the policy command prior to association with the virtual router instance.</p> <p>The policy command provides the ability to associate a VRRP priority control policy to a virtual router instance. The policy may be associated with more than one virtual router instance. The priority events within the policy either override or diminish the base-priority dynamically affecting the in-use priority. As priority events clear in the policy, the in-use priority may eventually be restored to the base-priority value.</p> <p>The policy command is only available in the non-owner <b>vrrp</b> <i>virtual-router-id</i> nodal context. The priority of owner virtual router instances is permanently set to 255 and cannot be changed by VRRP priority control policies. For non-owner virtual router instances, if the policy command is not executed, the base-priority will be used as the in-use priority.</p> <p>The <b>no</b> form of this command removes any existing VRRP priority control policy association from the virtual router instance. All such associations must be removed prior to the policy being deleted</p> |

from the system.

|                   |                                                                                                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | None                                                                                                                                                                                                                                            |
| <b>Parameters</b> | <i>vrp-policy-id</i> — The vrrp-policy-id parameter associated the corresponding VRRP priority control policy-id with the virtual router instance. The vrrp-policy-id must already exist in the system for the policy command to be successful. |
| <b>Values</b>     | 1 to 9999                                                                                                                                                                                                                                       |

## preempt

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>preempt</b><br><b>no preempt</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>The preempt command provides the ability of overriding an existing non-owner master to the virtual router instance. Enabling preempt mode is almost required for proper operation of the base-priority and vrrp-policy-id definitions on the virtual router instance. If the virtual router cannot preempt an existing non-owner master, the affect of the dynamic changing of the in-use priority is greatly diminished.</p> <p>The preempt command is only available in the non-owner vrrp virtual-router-id nodal context. The owner may not be preempted due to the fact that the priority of non-owners can never be higher than the owner. The owner will always preempt all other virtual routers when it is available.</p> <p>Non-owner virtual router instances will only preempt when preempt is set and the current master has an in-use message priority value less than the virtual router instances in-use priority.</p> <p>A master non-owner virtual router will only allow itself to be preempted when the incoming VRRP Advertisement message Priority field value is one of the following:</p> <ul style="list-style-type: none"> <li>• Greater than the virtual router in-use priority value</li> <li>• Equal to the in-use priority value and the source IP address (primary IP address) is greater than the virtual router instance primary IP address</li> </ul> <p>The <b>no</b> form of this command prevents a non-owner virtual router instance from preempting another, less desirable virtual router. Use the preempt command to restore the default mode.</p> |
| <b>Default</b>     | preempt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## priority

|                    |                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>priority</b> <i>base-priority</i><br><b>no priority</b>                                                                                                                                                                                               |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                               |
| <b>Description</b> | The priority command provides the ability to configure a specific priority value to the virtual router instance. In conjunction with an optional policy command, the base-priority is used to derive the in-use priority of the virtual router instance. |

The priority command is only available in the non-owner vrrp virtual-router-id nodal context. The priority of owner virtual router instances is permanently set to 255 and cannot be changed. For non-owner virtual router instances, if the priority command is not executed, the base-priority will be set to 100.

The **no** form of this command restores the default value of 100 to base-priority.

**Parameters**     *base-priority* — The base-priority parameter configures the base priority used by the virtual router instance. If a VRRP Priority Control policy is not also defined, the base-priority will be the in-use priority for the virtual router instance.

**Values**            1 — 254

**Default**            100

standby-forwarding

**Syntax**            **[no] standby-forwarding**

**Context**            config>service>ies>if>vrrp

**Description**        This command allows the forwarding of packets by a standby router.

                         The **no** form of the command specifies that a standby router should not forward traffic sent to virtual router's MAC address. However, the standby router should forward traffic sent to the standby router's real MAC address.

**Default**            no standby-forwarding

ssh-reply

**Syntax**            **[no] ssh-reply**

**Context**            config>service>ies>if>vrrp

**Description**        This command enables the non-owner master to reply to SSH Requests directed at the virtual router instances IP addresses. The SSH request can be received on any routed interface. SSH must not have been disabled at the management security level (either on the parental IP interface or based on the SSH source host address). Proper login and CLI command authentication is still enforced.

                         When ssh-reply is not enabled, SSH packets to non-owner master virtual IP addresses are silently discarded.

                         Non-owner backup virtual routers never respond to SSH regardless of the ssh-reply configuration.

                         The ssh-reply command is only available in non-owner vrrp virtual-router-id nodal context. If the ssh-reply command is not executed, SSH packets to the virtual router instance IP addresses will be silently discarded.

                         The **no** form of this command restores the default operation of discarding all SSH packets destined to the non-owner virtual router instance IP addresses.

**Default**            no ssh-reply



## telnet-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] telnet-reply</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>The telnet-reply command enables the non-owner master to reply to TCP port 23 Telnet Requests directed at the virtual router instances IP addresses. The Telnet request can be received on any routed interface. Telnet must not have been disabled at the management security level (either on the parental IP interface or based on the Telnet source host address). Proper login and CLI command authentication is still enforced.</p> <p>When telnet-reply is not enabled, TCP port 23 Telnet packets to non-owner master virtual IP addresses are silently discarded.</p> <p>Non-owner backup virtual routers never respond to Telnet Requests regardless of the telnet-reply configuration.</p> <p>The telnet-reply command is only available in non-owner VRRP nodal context. If the telnet-reply command is not executed, Telnet packets to the virtual router instance IP addresses will be silently discarded.</p> <p>The <b>no</b> form of this command restores the default operation of discarding all Telnet packets destined to the non-owner virtual router instance IP addresses.</p> |
| <b>Default</b>     | no telnet-reply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## traceroute-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] traceroute-reply</b>                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>ies>if>vrrp                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command is valid only if the VRRP virtual router instance associated with this entry is a non-owner.</p> <p>When this command is enabled, a non-owner master can reply to traceroute requests directed to the virtual router instance IP addresses.</p> <p>A non-owner backup virtual router never responds to such traceroute requests regardless of the <b>trace-route-reply</b> status.</p> |
| <b>Default</b>     | no traceroute-reply                                                                                                                                                                                                                                                                                                                                                                                    |

---

## IPSec Gateway Commands

### ipsec-gw

|                    |                                           |
|--------------------|-------------------------------------------|
| <b>Syntax</b>      | <b>[no] ipsec-gw</b>                      |
| <b>Context</b>     | config>service>ies>if>sap                 |
| <b>Description</b> | This command configures an IPSec gateway. |

### default-secure-service

|                    |                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>default-secure-service</b> <i>service-id</i> <b>ipsec-interface</b> <i>ip-int-name</i><br><b>no default-secure-service</b>                                                                |
| <b>Context</b>     | config>service>ies>if>sap>ipsec-gateway                                                                                                                                                      |
| <b>Description</b> | This command specifies a service ID or service name of the default security service used by this SAP IPSec gateway.                                                                          |
| <b>Parameters</b>  | <i>service-id</i> — Specifies a default secure service.<br><br><b>Values</b> <i>service-id</i> : 1 — 2147483648<br><i>svc-name</i> : An existing service name up to 64 characters in length. |

### default-tunnel-template

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>default-tunnel-template</b> <i>ipsec template identifier</i><br><b>no default-tunnel-template</b> |
| <b>Context</b>     | config>service>ies>if>sap>ipsec-gateway                                                              |
| <b>Description</b> | This command configures a default tunnel policy template for the gateway.                            |

### local-gateway-address

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-gateway-address</b> <i>ip-address</i><br><b>no local-gateway-address</b> |
| <b>Context</b>     | config>service>ies>if>sap>ipsec-gateway                                           |
| <b>Description</b> | This command configures an ipsec-gateway local address.                           |

## pre-shared-key

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pre-shared-key</b> <i>key</i><br><b>no pre-shared-key</b>                       |
| <b>Context</b>     | config>service>ies>if>sap>ipsec-gateway                                            |
| <b>Description</b> | This command specifies the shared secret between the two peers forming the tunnel. |
| <b>Parameters</b>  | <i>key</i> — Specifies a pre-shared-key for dynamic-keying.                        |



# Virtual Private Routed Network Service

---

## In This Chapter

This chapter provides information about the Virtual Private Routed Network (VPN) service and implementation notes.

Topics in this chapter include:

- [VPRN Service Overview on page 1050](#)
- [VPRN Features on page 1058](#)
  - [Subscriber Routed Redundancy Protocol \(SRRP\) on page 1060](#)
  - [SAPs on page 1072](#)
  - [QoS Policies on page 1073](#)
  - [Filter Policies on page 1073](#)
  - [DSCP Marking on page 1074](#)
  - [CE to PE Routing Protocols on page 1077](#)
  - [PE to PE Tunneling Mechanisms on page 1077](#)
  - [Per VRF Route Limiting on page 1077](#)
  - [Spoke SDPs on page 1078](#)
  - [Multicast in IP-VPN Applications on page 1083](#)
  - [Traffic Leaking to GRT on page 1095](#)
  - [IPv6 VPRN on page 1096](#)
- [Configuring a VPRN Service with CLI on page 1099](#)
- [Common Configuration Tasks on page 1102](#)
- [Service Management Tasks on page 1118](#)

## VPRN Service Overview

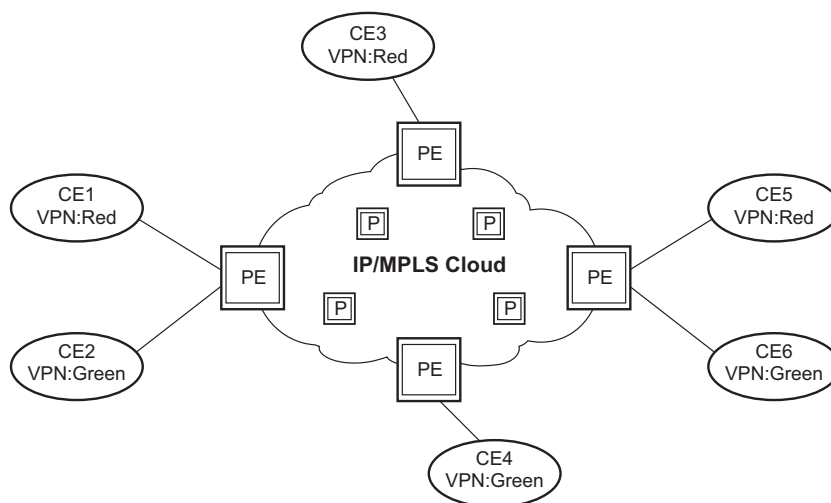
RFC2547bis is an extension to the original RFC 2547, which details a method of distributing routing information and forwarding data to provide a Layer 3 Virtual Private Network (VPN) service to end customers.

Each Virtual Private Routed Network (VPRN) consists of a set of customer sites connected to one or more PE routers. Each associated PE router maintains a separate IP forwarding table for each VPRN. Additionally, the PE routers exchange the routing information configured or learned from all customer sites via MP-BGP peering. Each route exchanged via the MP-BGP protocol includes a Route Distinguisher (RD), which identifies the VPRN association.

The service provider uses BGP to exchange the routes of a particular VPN among the PE routers that are attached to that VPN. This is done in a way which ensures that routes from different VPNs remain distinct and separate, even if two VPNs have an overlapping address space. The PE routers distribute routes from other CE routers in that VPN to the CE routers in a particular VPN. Since the CE routers do not peer with each other there is no overlay visible to the VPN's routing algorithm.

When BGP distributes a VPN route, it also distributes an MPLS label for that route. On a SR-Series, a single label is assigned to all routes in a VPN.

Before a customer data packet travels across the service provider's backbone, it is encapsulated with the MPLS label that corresponds, in the customer's VPN, to the route which best matches the packet's destination address. The MPLS packet is further encapsulated with either another MPLS label or GRE tunnel header, so that it gets tunneled across the backbone to the proper PE router. Each route exchanged by the MP-BGP protocol includes a route distinguisher (RD), which identifies the VPRN association. Thus the backbone core routers do not need to know the VPN routes. [Figure 125](#) displays a VPRN network diagram example.



OSSG024

**Figure 125: Virtual Private Routed Network**

## Routing Prerequisites

RFC2547bis requires the following features:

- Multi-protocol extensions
- LDP support
- Extended BGP community support
- BGP capability negotiation
- Parameters defined in RFC 2918, *BGP Route Refresh* and RFC 2796, *Route Reflector*
- 4-byte autonomous system (AS) number

Tunneling protocol requirements are as follows:

- RFC2547, *BGP/MPLS VPNs*, recommends implementing Label Distribution Protocol (LDP) to set up a full mesh of LSPs based on the IGP
- MPLS RSVP-TE tunnels can be used instead of LDP
- Generic Router Encapsulation (GRE) tunnels can also be alternatively used

## BGP Support

BGP is used with BGP extensions mentioned in [Routing Prerequisites on page 1051](#) to distribute VPRN routing information across the service provider's network.

BGP was initially designed to distribute IPv4 routing information. Therefore, multi-protocol extensions and the use of a VPN-IPv4 address were created to extend BGP's ability to carry overlapping routing information. A VPN-IPv4 address is a 12-byte value consisting of the 8-byte route distinguisher (RD) and the 4-byte IPv4 IP address prefix. The RD must be unique within the scope of the VPRN. This allows the IP address prefixes within different VRFs to overlap.

---

## eiBGP Load Balancing

eiBGP load balancing allows a route to have multiple nexthops of different types, using both IPv4 nexthops and MPLS LSPs simultaneously.

[Figure 126](#) displays a basic topology that could use eiBGP load balancing. In this topology CE1 is dual homed and thus reachable by two separate PE routers. CE 2 (a site in the same VPRN) is also attached to PE1. With eiBGP load balancing, PE1 will utilize its own local IPv4 nexthop as well as the route advertised by MP-BGP, by PE2.

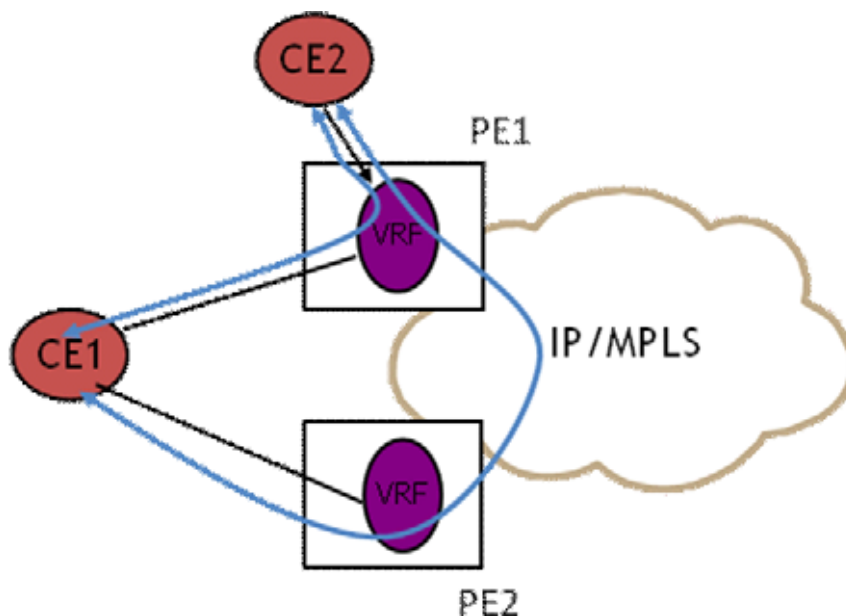


Figure 126: Basic eiBGP Topology



Another use case displayed in [Figure 127](#) shows an extra net VPRN (VRF). The traffic ingressing the PE that should be load balanced is part of a second VPRN and the route over which the load balancing is to occur is part of a separate VPRN instance and are leaked into the second VPRN by route policies.

Here, both routes can have a source protocol of VPN-IPv4 but one will still have an IPv4 nexthop and the other can have a VPN-IPv4 nexthop pointing out a network interface. Traffic will still be load balanced (if eiBGP is enabled) as if only a single VRF was involved.

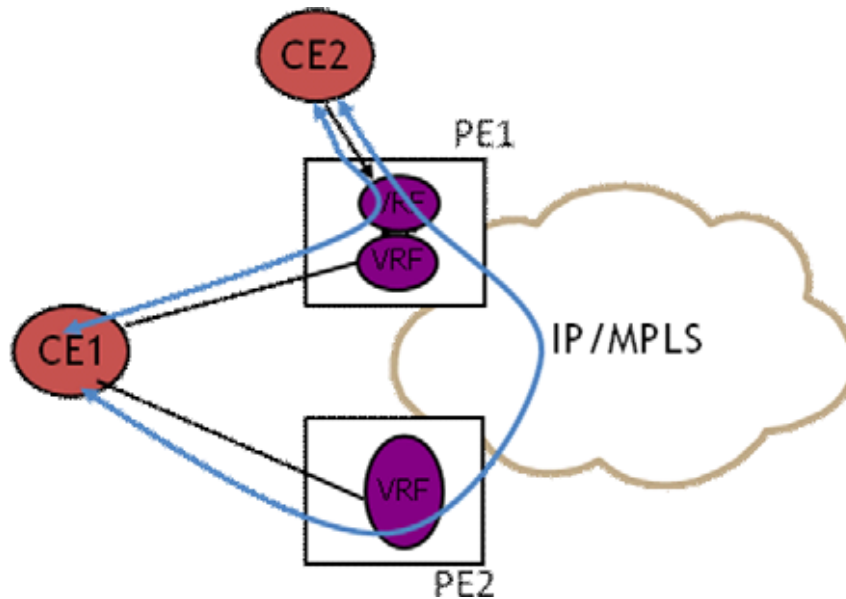


**Figure 127: Extranet Load Balancing**

Traffic will be load balanced across both the IPv4 and VPN-IPv4 nexthops. This helps to use all available bandwidth to reach a dual-homed VPRN.

# Route Distinguishers

The route distinguisher (RD) is an 8-byte value consisting of 2 major fields, the Type field and value field. The type field determines how the value field should be interpreted. The 7750 SR OS implementation supports the three (3) type values as defined in the internet draft.



Figure 128: Route Distinguisher

The three Type values are:

- Type 0: Value Field — Administrator subfield (2 bytes)  
Assigned number subfield (4 bytes)  
  
The administrator field must contain an AS number (using private AS numbers is discouraged). The Assigned field contains a number assigned by the service provider.
- Type 1: Value Field — Administrator subfield (4 bytes)  
Assigned number subfield (2 bytes)  
  
The administrator field must contain an IP address (using private IP address space is discouraged). The Assigned field contains a number assigned by the service provider.
- Type 2: Value Field — Administrator subfield (4 bytes)  
Assigned number subfield (2 bytes)  
  
The administrator field must contain a 4-byte AS number (using private AS numbers is discouraged). The Assigned field contains a number assigned by the service provider.

---

## Route Reflector

Per RFC2547bis the use of Route Reflectors is supported in the service provider core. The support uses multiple sets of route reflectors for different types of BGP data, including IPv4 and VPN-IPv4 as well as multicast and IPv6.

## CE to PE Route Exchange

Routing information between the Customer Edge (CE) and Provider Edge (PE) can be exchanged by the following methods:

- Static Routes
- E-BGP
- RIP
- OSPF
- OSPF3

Each protocol provides controls to limit the number of routes learned from each CE router.

---

## Route Redistribution

Routing information learned from the CE-to-PE routing protocols and configured static routes should be injected in the associated local VPN routing/forwarding (VRF). In the case of dynamic routing protocols, there may be protocol specific route policies that modify or reject certain routes before they are injected into the local VRF.

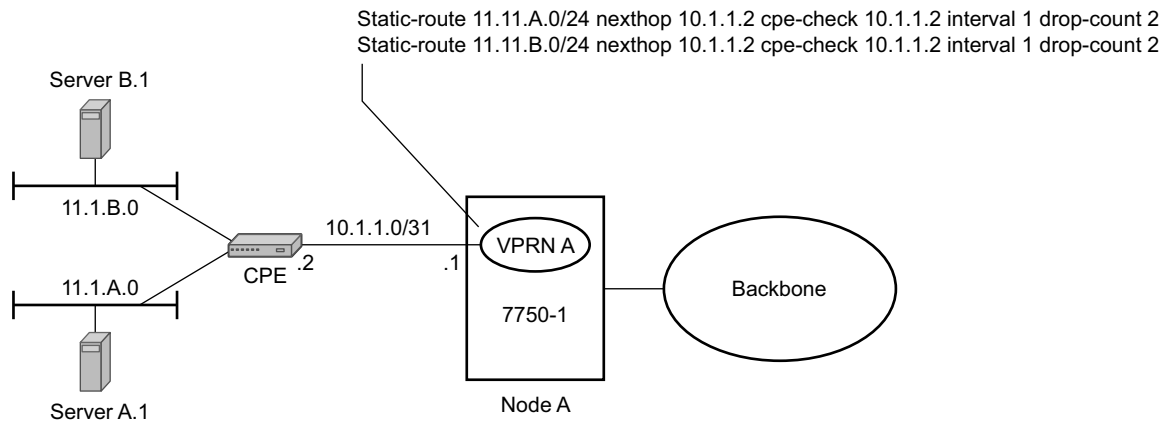
Route redistribution from the local VRF to CE-to-PE routing protocols is to be controlled via the route policies in each routing protocol instance, in the same manner that is used by the base router instance.

The advertisement or redistribution of routing information from the local VRF to or from the MP-BGP instance is specified per VRF and is controlled by VRF route target associations or by VRF route policies.

Routes belonging to a VPRN, must use the protocol owner, VPN-IPv4 to denote that it is an VPRN route. This can be used within the route policy match criteria.

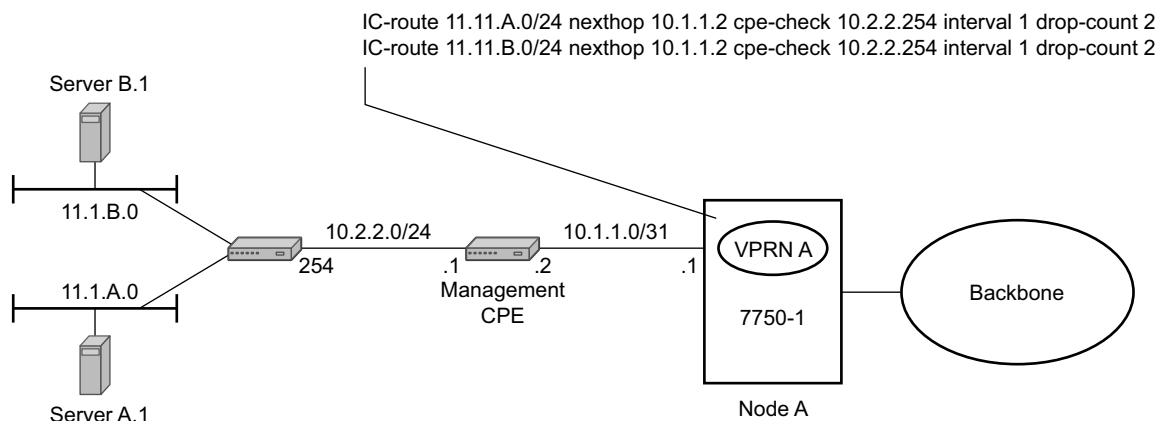
## CPE Connectivity Check

Static routes are used within many IES and VPRN services. Unlike dynamic routing protocols, there is no way to change the state of routes based on availability information for the associated CPE. CPE connectivity check adds flexibility so that unavailable destinations will be removed from the service provider's routing tables dynamically and minimize wasted bandwidth.



Fig\_18

**Figure 129: Directly Connected IP Target**



Fig\_19

**Figure 130: Multiple Hops to IP Target**

The availability of the far-end static route is monitored through periodic polling. The polling period is configured. If the poll fails a specified number of sequential polls, the static route is marked as inactive.

Either ICMP ping or unicast ARP mechanism can be used to test the connectivity. ICMP ping is preferred.

If the connectivity check fails and the static route is de-activated, the SR-Series router will continue to send polls and re-activate any routes that are restored.

## VPRN Features

This section describes various VPRN features and any special capabilities or considerations as they relate to VPRN services.

- [Subscriber Routed Redundancy Protocol \(SRRP\) on page 1060](#)
  - [SAPs on page 1072](#)
    - [Encapsulations on page 1072](#)
    - [QoS Policies on page 1073](#)
    - [Filter Policies on page 1073](#)
  - [CE to PE Routing Protocols on page 1077](#)
    - [PE to PE Tunneling Mechanisms on page 1077](#)
    - [Per VRF Route Limiting on page 1077](#)
    - [Using OSPF in IP-VPNs on page 1082](#)
  - [Spoke SDPs on page 1078](#)
    - [Multicast Protocols Supported in the Provider Network on page 1086](#)
- 

## IP Interfaces

VPRN customer IP interfaces can be configured with most of the same options found on the core IP interfaces. The advanced configuration options supported are:

- VRRP (for VPRN services with more than one IP interface)
- Cflowd
- Secondary IP addresses
- ICMP Options

Configuration options found on core IP interfaces not supported on VPRN IP interfaces are:

- NTP broadcast receipt

## Subscriber Interfaces

Subscriber interfaces are composed of a combination of two key technologies, subscriber interfaces and group interfaces. While the subscriber interface defines the subscriber subnets, the group interfaces are responsible for aggregating the SAPs.

- Subscriber interface — An interface that allows the sharing of a subnet among one or many group interfaces in the routed CO model.
- Group interface — Aggregates multiple SAPs on the same port.
- Redundant interfaces — A special spoke-terminated Layer 3 interface. It is used in a Layer 3 routed CO dual-homing configuration to shunt downstream (network to subscriber) to the active node for a given subscriber.

## Subscriber Routed Redundancy Protocol (SRRP)

Subscriber Routed Redundancy Protocol (SRRP) is closely tied to the multi-chassis synchronization protocol used to synchronize information between redundant nodes. An MCS peer must be configured and operational when subscriber hosts have a redundant connection to two nodes. Subscriber hosts are identified by the ingress SAP, the hosts IP and MAC addresses. Once a host is identified on one node, the MCS peering is used to inform the other node that the host exists and conveys the dynamic DHCP lease state information of the host. MCS creates a common association between the virtual ports (SAPs) shared by a subscriber. This association is configured at the MCS peering level by defining a tag for a port and range of SAPs. The same tag is defined on the other nodes peering context for another port (does not need to be the same port-ID) with the same SAP range. In this manner, a subscriber host and Dot1Q tag sent across the peering with the appropriate tag will be mapped to the redundant SAP on the other node.

Once SRRP is active on the group IP interface, the SRRP instance will attempt to communicate through in-band (over the group IP interfaces SAPs) and out-of-band (over the group IP interfaces redundant IP interface) messages to a remote router. If the remote router is also running SRRP with the same SRRP instance ID, one router will enter a master state while the other router will enter a backup state. Since both routers are sharing a common SRRP gateway MAC address that is used for the SRRP gateway IP addresses and for proxy ARP functions, either node may act as the default gateway for the attached subscriber hosts.

For proper operation, each subscriber subnet associated with the SRRP instance must have a gw-address defined. The SRRP instance cannot be activated (no shutdown) unless each subscriber subnet associated with the group IP interface has an SRRP gateway IP address. Once the SRRP instance is activated, new subscriber subnets cannot be added without a corresponding SRRP gateway IP address. [Table 22](#) describes how the SRRP instance state is used to manage access to subscriber hosts associated with the group IP interface.

SRRP instances are created in the disabled state (shutdown). To activate SRRP the no shutdown command in the SRRP context must be executed.

Before activating an SRRP instance on a group IP interface, the following actions are required:

- Add SRRP gateway IP addresses to all subscriber subnets associated with the group IP interface, including subnets on subscriber IP interfaces associated as retail routing contexts (at least one subnet must be on the subscriber IP interface containing the group IP interface and its SRRP instance).
- Create a redundant IP interface and associate it with the SRRP instances group IP interface for shunting traffic to the remote router when master.
- Specify the group IP interface SAP used for SRRP advertisement and Information messaging.



Before activating an SRRP instance on a group IP interface, the following actions should be considered:

- Associate the SRRP instance to a Multi-Chassis Synchronization (MCS) peering terminating on the neighboring router (the MCS peering should exist as the peering is required for redundant subscriber host management)
- Define a description string for the SRRP instance
- Specify the SRRP gateway MAC address used by the SRRP instance (must be the same on both the local and remote SRRP instance participating in the same SRRP context)
- Change the base priority for the SRRP instance
- Specify one or more VRRP policies to dynamically manage the SRRP instance base priority
- Specify a new keep alive interval for the SRRP instance

[Table 22](#) lists the SRRP's state effect on subscriber hosts associated with group IP interfaces.

**Table 22: SRRP State Effect on Subscriber Hosts Associated with Group IP Interface**

| SRRP State                                                                                  | ARP                                                                                                                                                                                                                                                                                                                                                          | Local Proxy ARP Enabled                                                                                                                                                                                            | Remote Proxy ARP Enabled                                                                                                                                                                           | Subscriber Host Routing                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disabled                                                                                    | <ul style="list-style-type: none"> <li>Will respond to ARP for all owned subscriber subnet IP addresses.</li> <li>Will not respond to ARP for subscriber subnet SRRP gateway IP addresses.</li> <li>All ARP responses will contain the native MAC of the group IP interface (not the SRRP gateway MAC).</li> </ul>                                           | <ul style="list-style-type: none"> <li>Will respond to ARP for all subscriber hosts on the subscriber subnet.</li> </ul>                                                                                           | <ul style="list-style-type: none"> <li>Will respond to ARP for all reachable remote IP hosts.</li> </ul>                                                                                           | <ul style="list-style-type: none"> <li>All routing out the group IP interface will use the native group IP interface MAC address.</li> <li>The group IP interface redundant IP interface will not be used.</li> <li>Will not accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul>                               |
| Becoming Master<br>(In order to enter becoming master state, a master must currently exist) | <ul style="list-style-type: none"> <li>Will respond to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>Will respond to ARP for subscriber subnet SRRP gateway IP addresses (hardware address = SRRP gateway IP address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>Will respond to ARP for all subscriber hosts on the subscriber subnet (hardware address = SRRP gateway MAC address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>Will respond to ARP for all reachable remote IP hosts (hardware address = SRRP gateway MAC address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>All routing out the group IP interface will use the native group IP interface MAC address.</li> <li>Subscriber hosts mapped to the redundant IP interface are remapped to the group IP interface.</li> <li>Will not accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul> |

**Table 22: SRRP State Effect on Subscriber Hosts Associated with Group IP Interface (Continued)**

| <b>SRRP State</b>                                    | <b>ARP</b>                                                                                                                                                                                                                                                                                                                                                       | <b>Local Proxy ARP Enabled</b>                                                                                                                                                                                       | <b>Remote Proxy ARP Enabled</b>                                                                                                                                                                      | <b>Subscriber Host Routing</b>                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Master                                               | <ul style="list-style-type: none"> <li>• Will respond to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will respond to ARP for subscriber subnet SRRP gateway IP addresses (hardware address = SRRP gateway IP address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• Will respond to ARP for all subscriber hosts on the subscriber subnet (hardware address = SRRP gateway MAC address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• Will respond to ARP for all reachable remote IP hosts (hardware address = SRRP gateway MAC address, source MAC = group IP interface native MAC).</li> </ul> | <ul style="list-style-type: none"> <li>• All routing out the group IP interface will use the SRRP gateway MAC address.</li> <li>• Subscriber hosts mapped to the redundant IP interface are remapped to the group IP interface.</li> <li>• Will accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul>                         |
| Becoming Backup (redundant IP interface operational) | <ul style="list-style-type: none"> <li>• Will respond to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses</li> </ul>                                                                                       | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any subscriber hosts on the subscriber subnet.</li> </ul>                                                                                       | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any remote IP hosts.</li> </ul>                                                                                                 | <ul style="list-style-type: none"> <li>• Will not route out the group IP interface for subscriber hosts associated with the subscriber subnet.</li> <li>• Subscriber hosts mapped to the group IP interface are remapped to the redundant IP interface.</li> <li>• Will accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul> |

**Table 22: SRRP State Effect on Subscriber Hosts Associated with Group IP Interface (Continued)**

| <b>SRRP State</b>                                      | <b>ARP</b>                                                                                                                                                                                                                                                                  | <b>Local Proxy ARP Enabled</b>                                                                                                 | <b>Remote Proxy ARP Enabled</b>                                                                      | <b>Subscriber Host Routing</b>                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Becoming Backup (redundant IP interface not available) | <ul style="list-style-type: none"> <li>• Will respond to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any subscriber hosts on the subscriber subnet.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any remote IP hosts.</li> </ul> | <ul style="list-style-type: none"> <li>• Will route out the group IP interface for subscriber hosts associated with the subscriber subnet using the group IP interface native MAC address.</li> <li>• Subscriber hosts mapped to the redundant IP interface are remapped to the group IP interface.</li> <li>• Will accept packets destined to the SRRP gateway MAC received on the group IP interface</li> </ul> |
| Backup (redundant IP interface operational)            | <ul style="list-style-type: none"> <li>• Will respond to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any subscriber hosts on the subscriber subnet</li> </ul>  | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any remote IP hosts</li> </ul>  | <ul style="list-style-type: none"> <li>• Will not route out the group IP interface for subscriber hosts associated with the subscriber subnet.</li> <li>• Subscriber hosts mapped to the group IP interface are remapped to the redundant IP interface.</li> <li>• Will not accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul>                                        |

**Table 22: SRRP State Effect on Subscriber Hosts Associated with Group IP Interface (Continued)**

| <b>SRRP State</b>                                | <b>ARP</b>                                                                                                                                                                                                                                                                  | <b>Local Proxy ARP Enabled</b>                                                                                                 | <b>Remote Proxy ARP Enabled</b>                                                                      | <b>Subscriber Host Routing</b>                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Backup<br>(redundant IP interface not available) | <ul style="list-style-type: none"> <li>• Will respond to ARP for all owned subscriber subnet IP addresses (hardware address and source MAC = group IP interface native MAC).</li> <li>• Will not respond to ARP for subscriber subnet SRRP gateway IP addresses.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any subscriber hosts on the subscriber subnet.</li> </ul> | <ul style="list-style-type: none"> <li>• Will not respond to ARP for any remote IP hosts.</li> </ul> | <ul style="list-style-type: none"> <li>• Will route out the group IP interface for subscriber hosts associated with the subscriber subnet using the group IP interface native MAC address.</li> <li>• Subscriber hosts mapped to the redundant IP interface are remapped to the group IP interface.</li> <li>• Will not accept packets destined to the SRRP gateway MAC received on the group IP interface.</li> </ul> |

## SRRP Messaging

SRRP uses the same messaging format as VRRP with slight modifications. The source IP address is derived from the system IP address assigned to the local router. The destination IP address and IP protocol are the same as VRRP (224.0.0.18 and 112, respectively).

The message type field is set to 1 (advertisement) and the protocol version is set to 8 to differentiate SRRP message processing from VRRP message processing.

The vr-id field has been expanded to support an SRRP instance ID of 32 bits.

Due to the large number of subnets backed up by SRRP, only one message every minute carries the gateway IP addresses associated with the SRRP instance. These gateway addresses are stored by the local SRRP instance and are compared with the gateway addresses associated with the local subscriber IP interface.

Unlike VRRP, only two nodes may participate in an SRRP instance due to the explicit association between the SRRP instance group IP interface, the associated redundant IP interface and the multi-chassis synchronization (MCS) peering. Since only two nodes are participating, the VRRP skew timer is not utilized when waiting to enter the master state. Also, SRRP always preempts when the local priority is better than the current master and the backup SRRP instance always inherits the master's advertisement interval from the SRRP advertisement messaging.

SRRP advertisement messages carry a *becoming-master* indicator flag. The *becoming-master* flag is set by a node that is attempting to usurp the master state from an existing SRRP master router. When receiving an SRRP advertisement message with a better priority and with the *becoming-master* flag set, the local master initiates its *becoming-backup* state, stops routing with the SRRP gateway MAC and sends an SRRP advertisement message with a priority set to zero. The new master continues to send SRRP advertisement messages with the *becoming-master* flag set until it either receives a return priority zero SRRP advertisement message from the previous master or its *becoming-master* state timer expires. The new backup node continues to send zero priority SRRP advertisement messages every time it receives an SRRP advertisement message with the *becoming-master* flag set. After the new master either receives the old master's priority zero SRRP advertisement message or the *become-master* state timer expires, it enters the *master* state. The *become-master* state timer is set to 10 seconds upon entering the *become-master* state.

The SRRP advertisement message is always evaluated to see if it has higher priority than the SRRP advertisement that would be sent by the local node. If the advertised priority is equal to the current local priority, the source IP address of the received SRRP advertisement is used as a tie breaker. The node with the lowest IP address is considered to have the highest priority.

The SRRP instance maintains the source IP address of the current master. If an advertisement is received with the current masters source IP address and the local priority is higher priority than the masters advertised priority, the local node immediately enters the *becoming-master* state unless the advertised priority is zero. If the advertised priority is zero, the local node bypasses the *becoming-master* state and immediately enters the *master* state. Priority zero is a special case and is sent when an SRRP instance is relinquishing the master state.

## SRRP and Multi-Chassis Synchronization

In order to take full advantage of SRRP resiliency and diagnostic capabilities, the SRRP instance should be tied to a MCS peering that terminates on the redundant node. The SRRP instance is tied to the peering using the **srrp srrp-id** command within the appropriate MCS peering configuration. Once the peering is associated with the SRRP instance, MCS will synchronize the local information about the SRRP instance with the neighbor router. MCS automatically derives the MCS key for the SRRP instance based on the SRRP instance ID. For example, an SRRP instance ID of 1 would appear in the MCS peering database with a MCS-key srrp-0000000001.

The SRRP instance information stored and sent to the neighbor router consists of:

- The SRRP instance MCS key
- Containing service type and ID
- Containing subscriber IP interface name
- Subscriber subnet information
- Containing group IP interface information
- The SRRP group IP interface redundant IP interface name, IP address and mask
- The SRRP advertisement message SAP
- The local system IP address (SRRP advertisement message source IP address)
- The Group IP interface MAC address
- The SRRP gateway MAC address
- The SRRP instance administration state (up / down)
- The SRRP instance operational state (disabled / becoming-backup / backup / becoming-master / master)
- The current SRRP priority
- Remote redundant IP interface availability (available / unavailable)
- Local receive SRRP advertisement SAP availability (available / unavailable)

## SRRP Instance

The SRRP instance uses the received information to verify provisioning and obtain operational status of the SRRP instance on the neighboring router.

- [SRRP Instance MCS Key on page 1068](#)
  - [Containing Service Type and ID on page 1068](#)
  - [Containing Subscriber IP Interface Name on page 1068](#)
  - [Subscriber Subnet Information on page 1069](#)
- 

### SRRP Instance MCS Key

The SRRP instance MCS key ties the received MCS information to the local SRRP instance with the same MCS key. If the received key does not match an existing SRRP instance, the MCS information associated with the key is ignored. Once an SRRP instance is created and mapped to an MCS peering, the SRRP instance evaluates received information with the same MCS key to verify it corresponds to the same peering. If the received MCS key is on a different peering than the local MCS key an SRRP peering mismatch event is generated detailing the SRRP instance ID, the IP address of the peering the MCS key is received on and the IP address to which the local MCS key is mapped. If the peering association mismatch is corrected, an SRRP peering mismatch clear event is generated.

---

### Containing Service Type and ID

The Containing Service Type is the service type (IES or VPRN) that contains the local SRRP instance. The Containing Service ID is the service ID of that service. This information is supplied for troubleshooting purposes only and is not required to be the same on both nodes.

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### Containing Subscriber IP Interface Name

The containing subscriber IP interface name is the subscriber IP interface name that contains the SRRP instance and its group IP interface. This information is supplied for troubleshooting purposes only and is not required to be the same on both nodes.



## Subscriber Subnet Information

The subscriber subnet information includes all subscriber subnets backed up by the SRRP instance. The information for each subnet includes the Owned IP address, the mask and the gateway IP address. If the received subscriber subnet information does not match the local subscriber subnet information, an SRRP Subscriber Subnet Mismatch event is generated describing the SRRP instance ID and the local and remote node IP addresses. Once the subscriber subnet information matches, an SRRP Subscriber Subnet Mismatch Clear event is generated.

---

## Containing Group IP Interface Information

The containing group IP interface information is the information about the group IP interface that contains the SRRP instance. The information includes the name of the group IP interface, the list of all SAPs created on the group IP interface, the administrative and operational state of each SAP and the MCS key and the peering destination IP address associated with each SAP. To obtain the MCS information, the SRRP instance queries MCS to determine the peering association of the SRRP instance and then queries MCS for each SAP on the group IP interface. If the local SRRP instance is associated with a different MCS peering than any of the SAPs or if one or more SAPs are not tied to an MCS peering, an SRRP group interface SAP peering mismatch event is generated detailing the SRRP instance ID, and the group IP interface name.

When receiving the remote containing group IP interface information, the local node compares the received SAP information with the local group IP interface SAP information. If a local SAP is not included in the SAP information or a remote SAP is not included in the local group IP interface, an SRRP Remote SAP mismatch event is generated detailing the SRRP instance ID and the local and remote group IP interface names. If a received SAP's MCS key does not match a local SAP's MCS Key, an SRRP SAP MCS key mismatch event is generated detailing the SRRP instance ID, the local and remote group IP interface names, the SAP-ID and the local and remote MCS keys.

---

## Remote Redundant IP Interface Mismatch

If the group IP remote redundant IP interface address space does not exist, is not within the local routing context for the SRRP instances group IP interface or is not on a redundant IP interface, the local node sends redundant IP interface unavailable to prevent the remote neighbor from using its redundant IP interface. An SRRP redundant IP interface mismatch event is generated for the SRRP instance detailing the SRRP instance, the local and remote system IP addresses, the local and remote group IP interface names and the local and remote redundant IP interface names and IP addresses and masks. The local redundant IP interface may still be used if the remote node is not sending redundant IP interface unavailable.

### **Remote Sending Redundant IP Interface Unavailable**

If the remote node is sending redundant IP interface unavailable, the local node will treat the local redundant IP interface associated with the SRRP instances group IP interface as down. A Local Redundant IP Interface Unavailable event is generated detailing the SRRP instance ID, the local and remote system IP addresses, the local group IP interface name, the local redundant IP interface name and the redundant IP interface IP address and mask.

---

### **Remote SRRP Advertisement SAP Non-existent**

If the remote node's SRRP advertisement SAP does not exist on the local SRRP instances group IP interface, the local node sends local receive SRRP advertisement SAP unavailable to the remote node. An SRRP receive advertisement SAP non-existent event is generated detailing the SRRP instance ID, the local and remote system IP addresses, the local group IP interface name and the received remote SRRP advertisement SAP. Since SRRP advertisement messages cannot be received, the local node will immediately become master if it has the lower system IP address.

---

### **Remote Sending Local Receive SRRP Advertisement SAP Unavailable**

If the local node is receiving local receive SRRP advertisements stating that the SAP is unavailable from the remote node, an SRRP Remote Receive advertisement SAP Unavailable event will be generated. This details the SRRP instance ID, the local and remote system IP addresses, the remote group IP interface name and the local SRRP advertisement SAP. Since the remote node cannot receive SRRP advertisement messages, the local node will immediately become master if it has the lower system IP address.

---

### **Local and Remote Dual Master Detected**

If the local SRRP state is master and the remote SRRP state is master, an SRRP dual master event is generated detailing the SRRP instance ID and the local, remote system IP addresses and the local and remote group IP interface names and port numbers.

## Subscriber Subnet Owned IP Address Connectivity

In order for the network to reliably reach the owned IP addresses on a subscriber subnet, the owning node must advertise the IP addresses as /32 host routes into the core. This is important since the subscriber subnet is advertised into the core by multiple routers and the network will follow the shortest path to the closest available router which may not own the IP address if the /32 is not advertised within the IGP.

---

## Subscriber Subnet SRRP Gateway IP Address Connectivity

The SRRP gateway IP addresses on the subscriber subnets cannot be advertised as /32 host routes since they may be active (master) on multiple group IP interfaces on multiple SRRP routers. Without a /32 host route path, the network will forward any packet destined to an SRRP gateway IP address to the closest router advertising the subscriber subnet. While a case may be made that only a node that is currently forwarding for the gateway IP address in a master state should respond to ping or other diagnostic messages, the distribution of the subnet and the case of multiple masters make any resulting response or non-response inconclusive at best. To provide some ability to ping the SRRP gateway address from the network side reliably, any node receiving the ICMP ping request will respond if the gateway IP address is defined on its subscriber subnet.

---

## Receive SRRP Advertisement SAP and Anti-Spoof

The group IP interface SAPs are designed to support subscriber hosts and perform an ingress anti-spoof function that ensures that any IP packet received on the group IP interface is coming in the correct SAP with the correct MAC address. If the IP and MAC are not registered as valid subscriber hosts on the SAP, the packet is silently discarded. Since the SRRP advertisement source IP addresses are not subscriber hosts, an anti-spoof entry will not exist and SRRP advertisement messages would normally be silently discarded. To avoid this issue, when a group IP interface SAP is configured to send and receive SRRP advertisement messages, anti-spoof processing on the SAP is disabled. This precludes subscriber host management on the SRRP messaging SAP.

## SAPs

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### Encapsulations

The following SAP encapsulations are supported on the 7750 SR VPRN service:

- Ethernet null
  - Ethernet dot1q
  - SONET/SDH IPCP
  - SONET/SDH ATM
  - ATM - LLC SNAP or VC-MUX
  - Cisco HDLC
  - Frame Relay
- 

### ATM SAP Encapsulations for VPRN Services

The SR-Series series supports ATM PVC service encapsulation for VPRN SAPs. Both UNI and NNI cell formats are supported. The format is configurable on a SONET/SDH path basis. A path maps to an ATM VC. All VCs on a path must use the same cell format.

The following ATM encapsulation and transport modes are supported:

- RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*:
  - AAL5 LLC/SNAP IPv4 routed
  - AAL5 VC mux IPv4 routed
  - AAL5 LLC/SNAP IPv4 bridged
  - AAL5 VC mux IPv4 bridged

## QoS Policies

When applied to 7750 SR VPRN services, service ingress QoS policies only create the unicast queues defined in the policy. The multipoint queues are not created on the service.

With VPRN services, service egress QoS policies function as with other services where the class-based queues are created as defined in the policy.

Note that both Layer 2 or Layer 3 criteria can be used in the QoS policies for traffic classification in an VPRN.

ATM traffic descriptor profiles define the traffic contract in the forward direction (ingress) and the traffic contract in the backward direction (egress).

---

## Filter Policies

Only IP filter policies can be applied to VPRN services.

## DSCP Marking

Specific DSCP, forwarding class, and Dot1P parameters can be specified to be used by every protocol packet generated by the node. This enables prioritization or de-prioritization of every protocol (as required). The markings effect a change in behavior on ingress when queuing. For example, if OSPF is not enabled, then traffic can be de-prioritized to best effort (be) DSCP. This change de-prioritizes OSPF traffic to the CPU complex.

DSCP marking for internally generated control and management traffic by marking the DSCP value should be used for the given application. This can be configured per routing instance. For example, OSPF packets can carry a different DSCP marking for the base instance and then for a VPRN service. ISIS and ARP traffic is not an IP-generated traffic type and is not configurable.

When an application is configured to use a specified DSCP value then the MPLS EXP, Dot1P bits will be marked in accordance with the network or access egress policy as it applies to the logical interface the packet will be egressing.

The DSCP value can be set per application. This setting will be forwarded to the egress IOM. The egress IOM does not alter the coded DSCP value and marks the LSP-EXP and IEEE 802.1p (Dot1P) bits according to the appropriate network or access QoS policy.

**Table 23: DSCP/FC Marking**

| Protocol              | IPv4 | IPv6 | DSCP Marking | Dot1P Marking | Default FC |
|-----------------------|------|------|--------------|---------------|------------|
| IS-IS                 |      |      |              | Yes           | NC         |
| ARP                   |      |      |              | Yes           | NC         |
| LDP (T-LDP)           | Yes  |      |              |               | NC         |
| MPLS (LSP ping, etc.) | Yes  |      | Yes          | Yes           | NC         |
| RSVP                  | Yes  |      | Yes          | Yes           | NC         |
| BGP                   | Yes  | Yes  | Yes          | Yes           | NC         |
| BFD                   | Yes  |      | Yes          | Yes           | NC         |
| RIP                   | Yes  | Yes  | Yes          | Yes           | NC         |
| MSDP                  | Yes  |      |              |               | NC         |
| PIM (SSM)             | Yes  | Yes  | Yes          | Yes           | NC         |
| OSPF                  | Yes  | Yes  | Yes          | Yes           | NC         |
| SMTP                  | Yes  |      |              |               | AF         |

**Table 23: DSCP/FC Marking**

| <b>Protocol</b>            | <b>IPv4</b> | <b>IPv6</b> | <b>DSCP<br/>Marking</b> | <b>Dot1P<br/>Marking</b> | <b>Default<br/>FC</b> |
|----------------------------|-------------|-------------|-------------------------|--------------------------|-----------------------|
| IGMP/MLD                   | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| Telnet                     | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| TFTP                       | Yes         |             | Yes                     | Yes                      | AF                    |
| FTP                        | Yes         |             |                         |                          | AF                    |
| SSH (SCP)                  | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| SNMP (get, set, etc.)      | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| SNMP trap/log              | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| syslog                     | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| OAM ping                   | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| ICMP ping                  | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| Traceroute                 | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| TACPLUS                    | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| DNS                        | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| SNTP/NTP                   | Yes         |             |                         |                          | AF                    |
| RADIUS                     | Yes         |             |                         |                          | AF                    |
| Cflowd                     | Yes         |             |                         |                          | AF                    |
| DHCP                       | Yes         | Yes         | Yes                     | Yes                      | AF                    |
| Bootp                      | Yes         |             |                         |                          | AF                    |
| IPv6 Neighbor<br>Discovery | Yes         |             |                         |                          | NC                    |

## Default DSCP Mapping Table

| DSCP Name | DSCP Value<br>Decimal | DSCP Value<br>Hexadecimal | DSCP Value<br>Binary | Label   |
|-----------|-----------------------|---------------------------|----------------------|---------|
| =====     |                       |                           |                      |         |
| Default   | 0                     | 0x00                      | 0b000000             | be      |
| nc1       | 48                    | 0x30                      | 0b110000             | h1      |
| nc2       | 56                    | 0x38                      | 0b111000             | nc      |
| ef        | 46                    | 0x2e                      | 0b101110             | ef      |
| af11      | 10                    | 0x0a                      | 0b001010             | assured |
| af12      | 12                    | 0x0c                      | 0b001100             | assured |
| af13      | 14                    | 0x0e                      | 0b001110             | assured |
| af21      | 18                    | 0x12                      | 0b010010             | l1      |
| af22      | 20                    | 0x14                      | 0b010100             | l1      |
| af23      | 22                    | 0x16                      | 0b010110             | l1      |
| af31      | 26                    | 0x1a                      | 0b011010             | l1      |
| af32      | 28                    | 0x1c                      | 0b011100             | l1      |
| af33      | 30                    | 0x1d                      | 0b011110             | l1      |
| af41      | 34                    | 0x22                      | 0b100010             | h2      |
| af42      | 36                    | 0x24                      | 0b100100             | h2      |
| af43      | 38                    | 0x26                      | 0b100110             | h2      |
| default*  | 0                     |                           |                      |         |

\*The default forwarding class mapping is used for all DSCP names/values for which there is no explicit forwarding class mapping.



## CE to PE Routing Protocols

The 7750 SR VPRN supports the following PE to CE routing protocols:

- BGP
  - Static
  - RIP
  - OSPF
- 

## PE to PE Tunneling Mechanisms

The 7750 SR supports multiple mechanisms to provide transport tunnels for the forwarding of traffic between PE routers within the 2547bis network.

The 7750 SR VPRN implementation supports the use of:

- RSVP-TE protocol to create tunnel LSP's between PE routers
- LDP protocol to create tunnel LSP's between PE routers
- GRE tunnels between PE routers.

These transport tunnel mechanisms provide the flexibility of using dynamically created LSPs where the service tunnels are automatically bound (the “autobind” feature) and the ability to provide certain VPN services with their own transport tunnels by explicitly binding SDPs if desired. When the autobind is used, all services traverse the same LSPs and do not allow alternate tunneling mechanisms (like GRE) or the ability to craft sets of LSP's with bandwidth reservations for specific customers as is available with explicit SDPs for the service.

---

## Per VRF Route Limiting

The 7750 SR allows setting the maximum number of routes that can be accepted in the VRF for a VPRN service. There are options to specify a percentage threshold at which to generate an event that the VRF table is near full and an option to disable additional route learning when full or only generate an event.

## Spoke SDPs

Distributed services use service distribution points (SDPs) to direct traffic to another SR-Series router via service tunnels. SDPs are created on each participating SR-Series and then bound to a specific service. SDP can be created as either GRE or MPLS. Refer to [Service Distribution Points \(SDPs\) on page 46](#) for information about configuring SDPs.

This feature provides the ability to cross-connect traffic entering on a spoke SDP, used for Layer 2 services (VLLs or VPLS), on to an IES or VPRN service. From a logical point of view, the spoke SDP entering on a network port is cross-connected to the Layer 3 service as if it entered by a service SAP. The main exception to this is traffic entering the Layer 3 service by a spoke SDP is handled with network QoS policies not access QoS policies.

[Figure 131](#) depicts traffic terminating on a specific IES or VPRN service that is identified by the *sdp-id* and VC label present in the service packet.

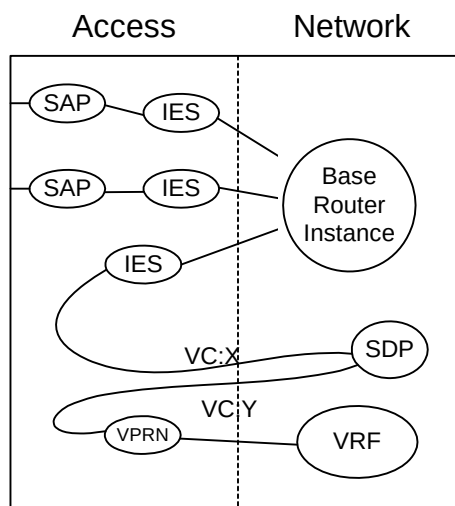


**Figure 131: SDP-ID and VC Label Service Identifiers**

## T-LDP Status Signaling for Spoke-SDPs Terminating on IES/VPRN

T-LDP status signaling and PW active/standby signaling capabilities are supported on ipipe and epipe spoke SDPs.

Spoke SDP termination on an IES or VPRN provides the ability to cross-connect traffic entering on a spoke SDP, used for Layer 2 services (VLLs or VPLS), on to an IES or VPRN service. From a logical point of view the spoke SDP entering on a network port is cross-connected to the Layer 3 service as if it had entered using a service SAP. The main exception to this is traffic entering the Layer 3 service using a spoke SDP is handled with network QoS policies instead of access QoS policies.

When a SAP Down or SDP binding down status message is received by the 7750 PE in which the ipipe or Ethernet spoke-sdp is terminated on an IES or VPRN interface, the interface is brought down and all associated routes are withdrawn in a similar way when the spoke-sdp goes down locally. The same actions are taken when the standby T-LDP status message is received by the 7750 IES/VPRN PE.

This feature can be used to provide redundant connectivity to a VPRN or IES from a PE providing a VLL service, as shown in [Figure 132](#).

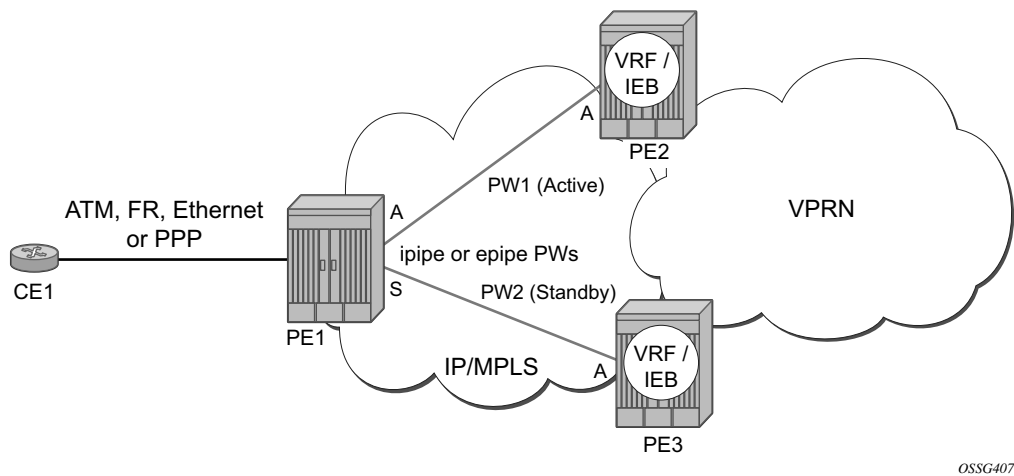


**Figure 132: Active/Standby VRF Using Resilient L2 Circuits**

## Spoke SDP Redundancy into IES/VPRN

This feature can be used to provide redundant connectivity to a VPRN or IES from a PE providing a VLL service, as shown in [Figure 132](#), using either epipe or ipipe spoke-SDPs.

In [Figure 132](#), PE1 terminates two spoke-SDPs that are bound to one SAP connected to CE1. PE1 chooses to forward traffic on one of the spoke SDPs (the active spoke-SDP), while blocking traffic on the other spoke-SDP (the standby spoke-SDP) in the transmit direction. PE2 and PE3 take any spoke-SDPs for which PW forwarding standby has been signaled by PE1 to an operationally down state.

Note that 7x50, 7710 routers are expected to fulfill both functions (VLL and VPRN/IES PE), while the 7705 must be able to fulfill the VLL PE function. [Figure 133](#) illustrates the model for spoke-SDP redundancy into a VPRN or IES.

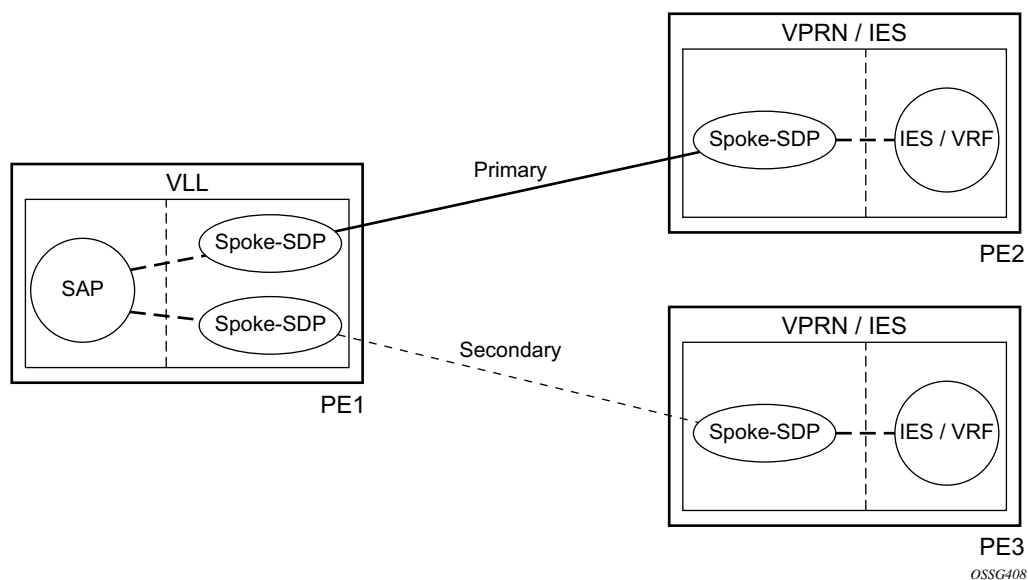


**Figure 133: Spoke-SDP Redundancy Model**



## IP-VPNs

---

### Using OSPF in IP-VPNs

Using OSPF as a CE to PE routing protocol allows OSPF that is currently running as the IGP routing protocol to migrate to an IP-VPN backbone without changing the IGP routing protocol, introducing BGP as the CE-PE or relying on static routes for the distribution of routes into the service providers IP-VPN. The following features are supported:

- Transportation of OSPF learned routes as OSPF externals. This feature uses OSPF as the protocol between the PE and CE routers, however instead of transporting the OSPF LSA information across the IP-VPN, the OSPF routes are “imported” into MP-BGP as AS externals. As a result, other OSPF attached VPRN sites on remote PEs receive these via type 5 LSA.

## Multicast in IP-VPN Applications

Applications for this feature include enterprise customer implementing a VPRN solution for their WAN networking needs, customer applications including stock-ticker information, financial institutions for stock and other types of trading data and video delivery systems.

Implementation of the draft-rosen-vpn-mcast, *Multicast in MPLS/BGP IP VPNs*, entails the support and separation of the providers core multicast domain from the various customer multicast domains and the various customer multicast domains from each other.

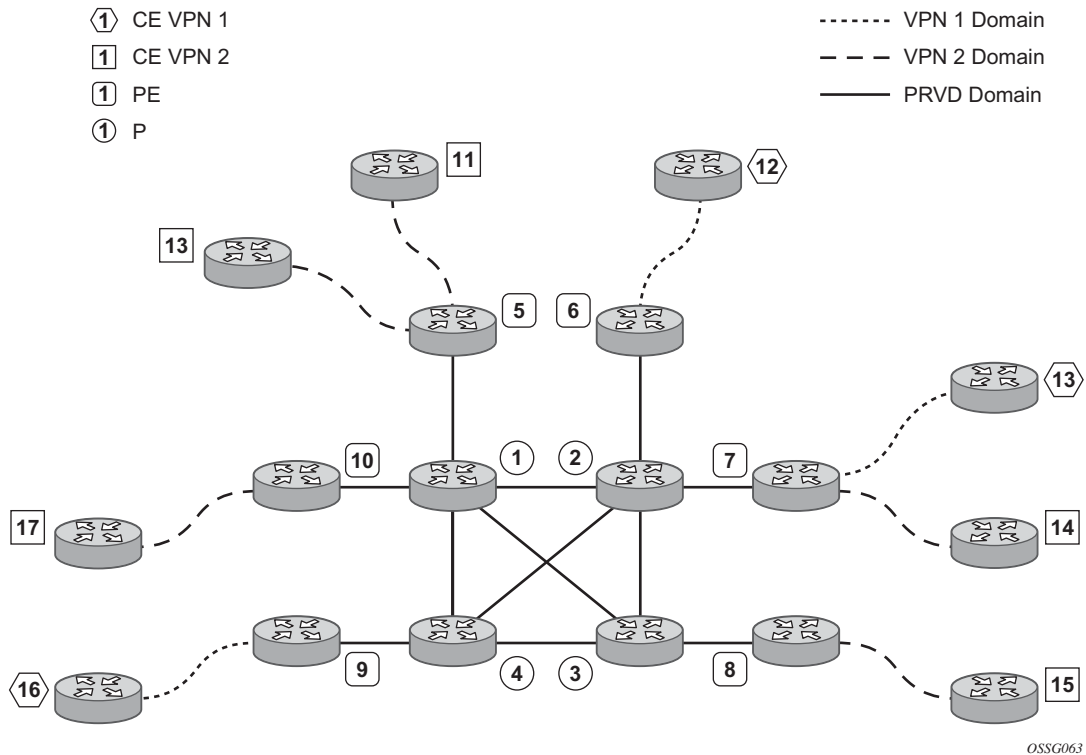


**Figure 134: Multicast in IP-VPN Applications**

Figure 134 depicts an example of multicast in an IP-VPN application. The provider's domain encompasses the core routers (1 through 4) and the edge routers (5 through 10). The various IP-VPN customers each have their own multicast domain, VPN-1 (CE routers 12, 13 and 16) and VPN-2 (CE Routers 11, 14, 15, 17 and 18). Multicast in this VPRN example, the VPN-1 data generated by the customer behind router 16 will be multicast only by PE 9 to PE routers 6 and 7 for delivery to CE routers 12 and 13 respectively. Data generated for VPN-2 generated by the customer behind router 15 will be forwarded by PE 8 to PE routers 5, 7 and 10 for delivery to CE routers 18, 11, 14 and 17 respectively.

The demarcation of these domains is in the PE's (routers 5 through 10). The PE router participates in both the customer multicast domain and the provider's multicast domain. The customer's CEs are limited to a multicast adjacency with the multicast instance on the PE specifically created to support that specific customer's IP-VPN. This way, customers are isolated from the provider's core multicast domain and other customer multicast domains while the provider's core routers only participate in the provider's multicast domain and are isolated from all customers' multicast domains.

The PE for a given customer's multicast domain becomes adjacent to the CE routers attached to that PE and to all other PE's that participate in the IP-VPN (or customer) multicast domain. This is achieved by the PE who encapsulates the customer multicast control data and multicast streams inside the provider's multicast packets. These encapsulated packets are forwarded only to the PE nodes that are attached to the same customer's edge routers as the originating stream and are part of the same customer VPRN. This prunes the distribution of the multicast control and data traffic to the PEs that participate in the customer's multicast domain. The Rosen draft refers to this as the default multicast domain for this multicast domain; the multicast domain is associated with a unique multicast group address within the provider's network.



## Use of Data MDTs

Using the above method, all multicast data offered by a given CE is always delivered to all other CEs that are part of the same multicast. It is possible that a number of CEs do not require the delivery of a particular multicast stream because they have no downstream receivers for a specific multicast group. At low traffic volumes, the impact of this is limited. However, at high data rates this could be optimized by devising a mechanism to prune PEs from the distribution tree that although forming part of the customer multicast have no need to deliver a given multicast stream to the CE attached to them. To facilitate this optimization, the Rosen draft specifies the use of data MDTs. These data MDTs are signaled once the bandwidth for a given SG exceeds the configurable threshold.

Once a PE detects it is transmitting data for the SG in excess of this threshold, it sends an MDT join TLV (at 60 second intervals) over the default MDT to all PEs. All PEs that require the SG specified in the MDT join TLV will join the data MDT that will be used by the transmitting PE to send the given SG. PEs that do not require the SG will not join the data MDT, thus pruning the multicast distribution tree to just the PEs requiring the SG. After providing sufficient time for all PEs to join the data MDT, the transmitting PE switches the given multicast stream to the data MDT.

PEs that do not require the SG to be delivered, keep state to allow them to join the data MDT as required.

When the bandwidth requirement no longer exceeds the threshold, the PE stops announcing the MDT join TLV. At this point the PEs using the data MDT will leave this group and transmission resumes over the default MDT.

Sampling to check if an s,g has exceeded the threshold occurs every ten seconds. If the rate has exceeded the configured rate in that sample period then the data MDT is created. If during that period the transmission rate has not exceeded the configured threshold then the data MDT is not created. If the data MDT is active and the transmission rate in the last sample period has not exceeded the configured rate then the data MDT is torn down and the multicast stream resumes transmission over the default MDT.

## Multicast Protocols Supported in the Provider Network

When MVPN auto-discovery is disabled, PIM-SM can be used for I-PMSI, and PIM-SSM can be used for S-PMSI; When MVPN S-PMSI auto-discovery is enabled, both PIM-SM and PIM SSM can be used for I-PMSI, and PIM-SSM can be used for S-PMSI. In the customer network, both PIM-SM and PIM-SSM are supported.

An MVPN is defined by two sets of sites: sender sites set and receiver sites set, with the following properties:

- Hosts within the sender sites set could originate multicast traffic for receivers in the receiver sites set.
- Receivers not in the receiver sites set should not be able to receive this traffic.
- Hosts within the receiver sites set could receive multicast traffic originated by any host in the sender sites set.
- Hosts within the receiver sites set should not be able to receive multicast traffic originated by any host that is not in the sender sites set.

A site could be both in the sender sites set and receiver sites set, which implies that hosts within such a site could both originate and receive multicast traffic. An extreme case is when the sender sites set is the same as the receiver sites set, in which case all sites could originate and receive multicast traffic from each other.

Sites within a given MVPN may be either within the same, or in different organizations, which implies that an MVPN can be either an intranet or an extranet. A given site may be in more than one MVPN, which implies that MVPNs may overlap. Not all sites of a given MVPN have to be connected to the same service provider, which implies that an MVPN can span multiple service providers.

Another way to look at MVPN is to say that an MVPN is defined by a set of administrative policies. Such policies determine both sender sites set and receiver site set. Such policies are established by MVPN customers, but implemented by MVPN service providers using the existing BGP/MPLS VPN mechanisms, such as route targets, with extensions, as necessary.

---

## MVPN Using BGP Control Plane

Note that the next generation MVPN solution replaces the Rosen MVPN draft and is currently being defined at the IETF. Its IETF status is still a working group draft but it has strong support. It is quite stable for implementation from a technical point of view.

The Alcatel-Lucent implementation supports the following features:

- MVPN membership auto-discovery using BGP
- PE-PE Transmission of C-Multicast Routing using BGP
- IPv4 support
- Use of PIM default and data MDTs as PMSIs
- Inter-AS support with direct VRF connect (option A)
- Backward compatibility with existing Rosen implementation to provide an easy migration path

---

## MVPN Membership Auto-discovery using BGP

BGP-based auto-discovery is performed by an multicast VPN address family. Any PE that attaches to an MVPN must issue a BGP update message containing an NLRI in this address family, along with a specific set of attributes.

The PE router uses route targets to specify MVPN route import and export. The route target may be the same as the one used for the corresponding unicast VPN, or it may be different. The PE router can specify separate import route targets for sender sites and receiver sites for a given MVPN.

The route distinguisher (RD) that is used for the corresponding unicast VPN can also be used for the MVPN.

When BGP auto-discovery is enabled, PIM peering on the I-PMSI is disabled, so no PIM hellos are sent on the I-PMSI. C-trees to P-tunnels bindings are also discovered using BGP S-PMSI AD routes, instead of PIM join TLVs. Configure PIM join TLVs when **c-mcast-signaling** is set to **pim** in the **config>service>vprn>mvpn>provider-tunnel>selective>auto-discovery-disable** context.

[Table 24](#) and [Table 25](#) describe the supported configuration combinations. If the CLI combination is not allowed, the system returns an error message. If the CLI command is marked as “ignored” in the table, the configuration is not blocked, but its value is ignored by the software.

**Table 24: Supported Configuration Combinations**

| Auto-Discovery | Inclusive PIM SSM | Action      |
|----------------|-------------------|-------------|
| Yes            | Yes               | Allowed     |
| No             | Yes               | Not Allowed |
| Yes or No      | No                | Allowed     |

**Table 25: Supported Configuration Combinations**

| <b>Auto-Discovery</b> | <b>C-Mcast-Signaling</b> | <b>s-PMSI A-D</b> | <b>Action</b> |
|-----------------------|--------------------------|-------------------|---------------|
| Yes                   | BGP                      | Ignored           | Allowed       |
| Yes                   | PIM                      | Yes               | Allowed       |
| Yes                   | PIM                      | No                | Allowed       |
| No                    | BGP                      | Ignored           | Not Allowed   |
| No                    | PIM                      | Ignored           | Allowed       |

For example, if auto-discovery is disabled, the **c-mcast-signaling bgp** command will fail with an error message stating:

**C-multicast signaling in BGP requires auto-discovery to be enabled**

If **c-mcast-signaling** is set to **bgp** then **no auto-discovery** will fail with an error message stating

**C-multicast signaling in BGP requires auto-discovery to be enabled**

When **c-mcast-signaling** is set to **bgp**, S-PMSI A-D is always enabled (its configuration is ignored);

When **auto-discovery** is disabled, S-PMSI A-D is always disabled (its configuration is ignored).

When auto-discovery is enabled and **c-multicast-signaling** is set to **pim**, S-PMSI A-D configuration value is used.

## PE-PE Transmission of C-Multicast Routing using BGP

MVPN c-multicast routing information is exchanged between PEs by using c-multicast routes that are carried using MCAST-VPN NLRI.

## Provider Tunnel Support

The following provider tunnels features are supported:

- • PIM ASM inclusive provider tunnel
  - • PIM SSM inclusive provider tunnel (only supported when auto-discovery is enabled)
  - • PIM SSM selective provider tunnel
- 

## Migration from Existing Rosen Implementation

The existing Rosen implementation is compatible to provide an easy migration path.

The following migration procedure are supported:

- Upgrade all the PE nodes that need to support MVPN to the newer release.
  - The old configuration will be converted automatically to the new style.
  - Node by node, MCAST-VPN address-family for BGP is enabled. Enable auto-discovery using BGP.
  - Change PE-to-PE signaling to BGP.
- 

## VRF Route Import Extended Community

VRF route import is an IP address-specific extended community, of an extended type, and is transitive across AS boundaries (RFC 4360, *BGP Extended Communities Attribute*).

To support MVPN, in addition to the import/export route target extended communities used by the unicast routing, each VRF on a PE must have an import route target extended community that controls imports of C-multicast routes into a particular VRF.

The c-multicast import RT uniquely identifies a VRF, and is constructed as follows:

- The Global Administrator field of the c-multicast import RT must be set to an IP address of the PE. This address should be common for all the VRFs on the PE (this address may be the PE's loopback address).
- The Local Administrator field of the c-multicast import RT associated with a given VRF contains a 2 octets long number that uniquely identifies that VRF within the PE that contains the VRF.

A PE that has sites of a given MVPN connected to it communicates the value of the c-multicast import RT associated with the VRF of that MVPN on the PE to all other PEs that have sites of that MVPN. To accomplish this, a PE that originates a (unicast) route to VPN-IP addresses includes in

the BGP updates message that carries this route the VRF route import extended community that has the value of the c-multicast import RT of the VRF associated with the route, except if it is known a priori that none of these addresses will act as multicast sources and/or RP, in which case the (unicast) route need not carry the VRF Route Import extended community.

All c-multicast routes with the c-multicast import RT specific to the VRF must be accepted. In this release, vrf-import and vrf-target policies don't apply to C-multicast routes.

The decision flow path is shown below.

```
if (route-type == c-mcast-route)
 if (route_target_list includes C-multicast_Import_RT) {
 else
 drop;
 else
 Run vrf_import and/or vrf-target;
```

## **Cflowd for IP-VPNs**

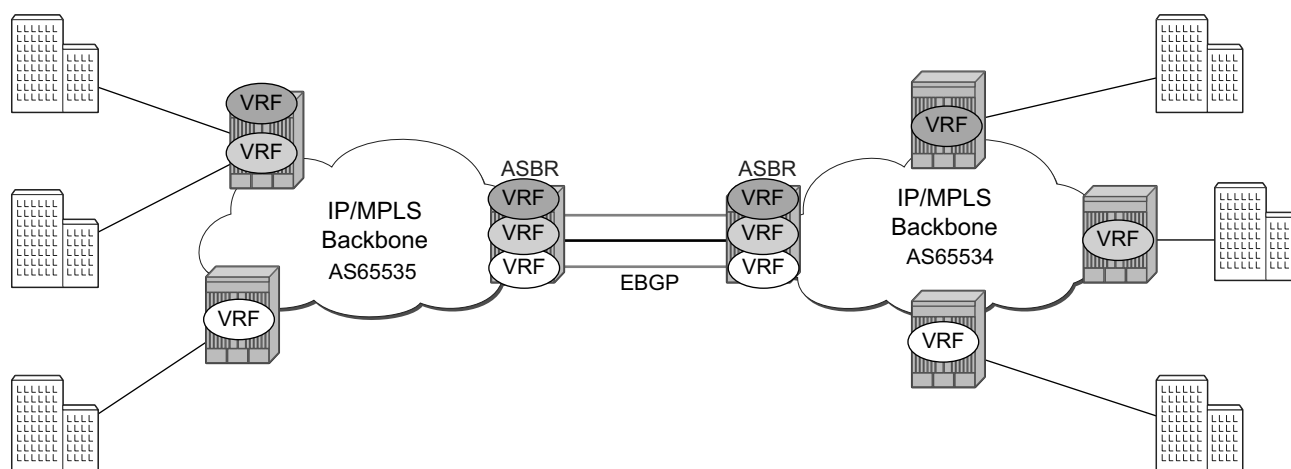
The cflowd feature allows service providers to collect IP flow data within the context of a VPRN. This data can be used to monitor types and general proportion of traffic traversing a VPRN context. This data can also be shared with the VPN customer to see the types of traffic traversing the VPN and use it for traffic engineering.

This feature should not be used for billing purposes. Existing queue counters are designed for this purpose and provide very accurate per bit accounting records.

## Inter-AS VPRNs

Inter-AS IP-VPN services have been driven by the popularity of IP services and service provider expansion beyond the borders of a single Autonomous System (AS) or the requirement for IP VPN services to cross the AS boundaries of multiple providers. Three options for supporting inter-AS IP-VPNs are described in RFC 4364, *BGP/MPLS IP Virtual Private Networks (VPNs)*.

The first option, referred to as Option-A (Figure 135), is considered inherent in any implementation. This method uses a back-to-back connection between separate VPRN instances in each AS. As a result, each VPRN instance views the inter-AS connection as an external interface to a remote VPRN customer site. The back-to-back VRF connections between the ASBR nodes require individual sub-interfaces, one per VRF.

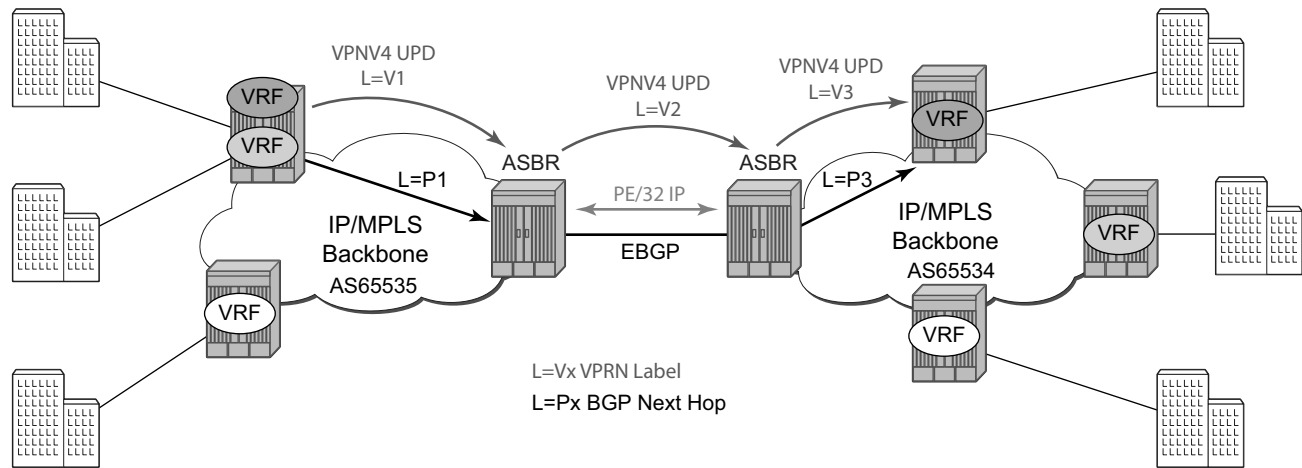


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**Figure 135: Inter-AS Option-A: VRF-to-VRF Model**

The second option, referred to as Option-B (Figure 136), relies heavily on the AS Boundary Routers (ASBRs) as the interface between the autonomous systems. This approach enhances the scalability of the eBGP VRF-to-VRF solution by eliminating the need for per-VPRN configuration on the ASBR(s). However it requires that the ASBR(s) provide a control plane and forwarding plane connection between the autonomous systems. The ASBR(s) are connected to the PE nodes in its local autonomous system using iBGP either directly or through route reflectors. This means the ASBR(s) receive all the VPRN information and will forward these VPRN updates, VPN-IPv4, to all its EBGP peers, ASBR(s), using itself as the next-hop. It also changes the label associated with the route. This means the ASBR(s) must maintain an associate mapping of labels received and labels issued for those routes. The peer ASBR(s) will in turn forward those updates to all local iBGP peers.





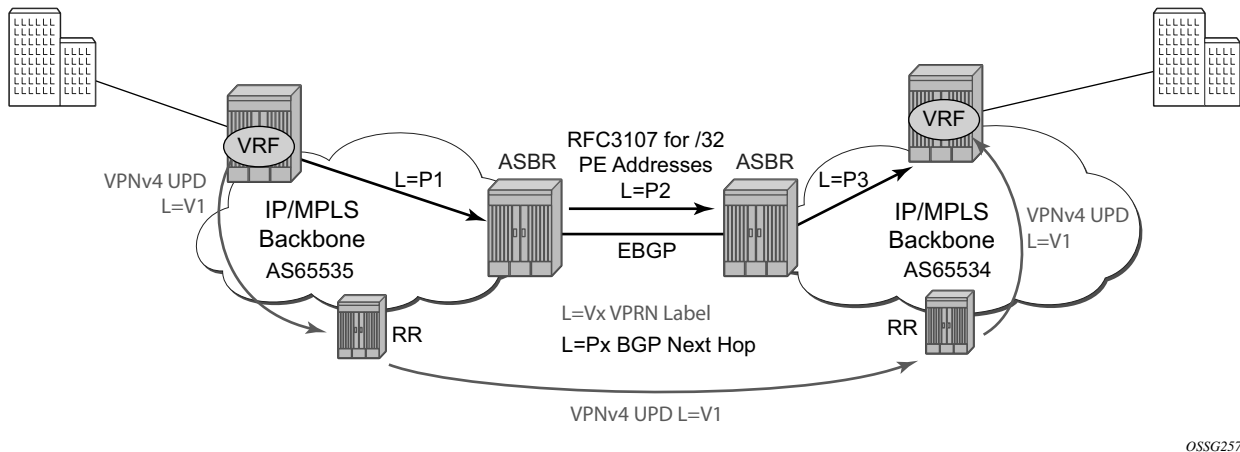
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**Figure 136: Inter-AS Option-B**

This form of inter-AS VPRNs does not require instances of the VPRN to be created on the ASBR, as in option-A, as a result there is less management overhead. This is also the most common form of Inter-AS VPRNs used between different service providers as all routes advertised between autonomous systems can be controlled by route policies on the ASBRs.

The third option, referred to as Option-C ([Figure 137](#)), allows for a higher scale of VPRNs across AS boundaries but also expands the trust model between ASNs. As a result this model is typically used within a single company that may have multiple ASNs for various reasons.

This model differs from Option-B, in that in Option-B all direct knowledge of the remote AS is contained and limited to the ASBR. As a result, in option-B the ASBR performs all necessary mapping functions and the PE routers do not need perform any additional functions then in a non-Inter-AS VPRN.



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**Figure 137: Option C Example**

With Option-C, knowledge from the remote AS is distributed throughout the local AS. This distribution allows for higher scalability but also requires all PEs and ASBRs involved in the Inter-AS VPRNs to participate in the exchange of inter-AS routing information.

In Option-C, the ASBRs distribute reachability information for remote PE's system IP addresses only. This is done between the ASBRs by exchanging MP-eBGP labeled routes, using RFC 3107, *Carrying Label Information in BGP-4*.

Distribution of VPRN routing information is handled by either direct MP-BGP peering between PEs in the different ASNs or more likely by one or more route reflectors in ASN.

## Traffic Leaking to GRT

Traffic leaking to Global Route Table (GRT) allows service providers to offer VPRN and Internet services to their customers over a single VRF interface. This currently supports IPv4 services and requires the customer VPRN interfaces to terminate on a minimum of IOM3-XP and IMM hardware. It is also supported on the 7750 SR-C12.

Packets entering a local VRF interface can have route processing results derived from the VPRN forwarding table or the GRT. The leaking and preferred lookup results are configured on a per VPRN basis. Configuration options can be general (for example, any lookup miss in the VPRN forwarding table can be resolved in the GRT), or specific (for example, specific route(s) should only be looked up in the GRT and ignored in the VPRN). In order to provide operational simplicity and improve streamlining, the CLI configuration is all contained within the context of the VPRN service.

This feature is enabled within the VPRN service context under **config>service>vprn>grt-lookup**. This is an administrative context and provides the container under which all specific commands can be entered, except for policy definition. Policy definitions remain unchanged but are referenced from this context.

The “enable-grt” command establishes the basic functionality. When it is configured, any lookup miss in the VRF table will be resolved in the GRT, if available. By itself, this only provides part of the solution. Packet forwarding within GRT must understand how to route packets back to the proper node and to the specific VPRN from which the destination exists. Destination prefixes must be leaked from the VPRN to the GRT through the use of policy. Policies are created under the **config>router>policy-options** hierarchy. By default, the number of prefixes leaked from the VPRN to the GRT is limited to five. The **export-limit** command under the **grt-lookup** hierarchy allows the service provider to override the default, or remove the limit.

When a VPRN forwarding table consists of a default route or an aggregate route, the customer may require the service provider to poke holes in those, or provide more specific route resolution in the GRT. In this case, the service provider may configure a “static-route”, under the “enable-grt” context. The lookup result will prefer any successful lookup in the GRT that is equal to or more specific than the static route, bypassing any successful lookup in the local VPRN.

This feature and Unicast Reverse Path Forwarding (uRPF) are mutually exclusive. When a VPRN service is configured with either of these functions, the other cannot be enabled. Also, prefixes leaked from any VPRN should never conflict with prefixes leaked from any other VPRN or existing prefixes in the GRT. Prefixes should be globally unique with the service provider network and if these are propagated outside of a single providers network, they must be from the public IP space and globally unique. Network Address Translation (NAT) is not supported as part of this feature.

## IPv6 VPRN

IP VPN services are widespread, and SR routers have been deployed by large service providers as VPRN PE routers. VPRN supports IPv4 and IPv6 address families for IP VPRN services.

IPv6 VPRN is sometimes referred to as “6VPE”. A difference between 6VPE and 6PE is that 6VPE supports multiple IPv6 VRFs on the PE routers, while 6PE only supports the default global IPv6 routing table.

## RIP Metric Propagation in VPRNs

When RIP is used as the PE-CE protocol for VPRNs (IP-VPNs), the RIP metric is only used by the local node running RIP with the Customer Equipment (CE). The metric is not used to or encoded into and MP-BGP path attributes exchanged between PE routers.

The RIP metric can also be used to exchanged between PE routers so if a customer network is dual homed to separate PEs the RIP metric learned from the CE router can be used to choose the best route to the destination subnet. By using the learned RIP metric to set the BGP MED attribute, remote PEs can choose the lowest MED and in turn the PE with the lowest advertised RIP metric as the preferred egress point for the VPRN.

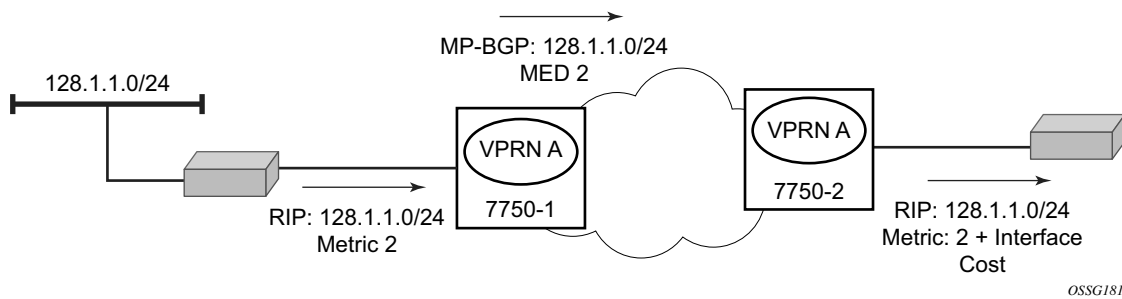


**Figure 138: RIP Metric Propagation in VPRNs**

## NTP Within a VPRN Service

The NTP within a VPRN service enables the service router to act as the NTP server to CPE devices on a VPRN interface. Individual VPRN interfaces may be configured to listen to and respond to client requests, or additionally may be configured to send NTP broadcast messages. Authentication keys are configurable on a per-VPRN basis.

Only a single instance of NTP remains in the node that is time sourced to as many as five NTP servers attached to the “base” or “management” network.

The NTP show command displays NTP servers and all known clients. Because NTP is UDP based only, no state is maintained. As a result, the show command output only displays when the last message from the client was received.

## Configuring a VPRN Service with CLI

This section provides information to configure Virtual Private Routed Network (VPRN) services using the command line interface.

Topics in this section include:

- [Basic Configuration on page 1100](#)
- [Common Configuration Tasks on page 1102](#)
  - [Configuring VPRN Components on page 1103](#)
    - [Creating a VPRN Service on page 1103](#)
    - [Configuring Global VPRN Parameters on page 1104](#)
    - [Configuring VPRN Protocols - PIM on page 1106](#)
    - [Configuring VPRN Protocols - BGP on page 1108](#)
    - [Configuring VPRN Protocols - RIP on page 1111](#)
    - [Configuring VPRN Protocols - OSPF on page 1113](#)
    - [Configuring a VPRN Interface on page 1114](#)
    - [Configuring a VPRN Interface SAP on page 1115](#)
- [Configuring Overload State on a Single SFM on page 1117](#)
- [Service Management Tasks on page 1118](#)
  - [Modifying VPRN Service Parameters on page 1118](#)
  - [Deleting a VPRN Service on page 1119](#)
  - [Disabling a VPRN Service on page 1120](#)
  - [Re-enabling a VPRN Service on page 1121](#)

## Basic Configuration

The following fields require specific input (there are no defaults) to configure a basic VPRN service:

- Customer ID (refer to [Configuring Customers on page 91](#))
- Specify interface parameters
- Specify spoke SDP parameters

The following example displays a sample configuration of a VPRN service.

```
*A:ALA-1>config>service>vprn# info

vrf-import "vrfImpPolCust1"
vrf-export "vrfExpPolCust1"
ecmp 8
autonomous-system 10000
route-distinguisher 10001:1
auto-bind ldp
vrf-target target:10001:1
interface "to-cel" create
 address 11.1.0.1/24
 proxy-arp
 exit
 sap 1/1/10:1 create
 ingress
 qos 100
 exit
 egress
 qos 1010
 filter ip 10
 exit
 exit
 dhcp
 description "DHCP test"
 exit
 vrrp 1
 exit
exit
static-route 6.5.0.0/24 next-hop 10.1.1.2
bgp
 router-id 10.0.0.1
 group "to-cel"
 export "vprnBgpExpPolCust1"
 peer-as 65101
 neighbor 10.1.1.2
 exit
exit
exit
pim
 apply-to all
 rp
 static
 exit
 bsr-candidate
 shutdown
 exit
 rp-candidate
```



```
 shutdown
 exit
 exit
 exit
 rip
 export "vprnRipExpPolCust1"
 group "cel"
 neighbor "to-cel"
 exit
 exit
exit
no shutdown

*A:ALA-1>config>service>vprn#
```

## Common Configuration Tasks

This section provides a brief overview of the tasks that must be performed to configure a VPRN service and provides the CLI commands.

1. Associate a VPRN service with a customer ID.
2. Define an autonomous system (optional).
3. Define a route distinguisher (mandatory).
4. Define VRF route-target associations or VRF import/export policies.
5. Define PIM parameters (optional).
6. Create a subscriber interface (optional).
7. Create an interface.
8. Define SAP parameters on the interface.
  - Select node(s) and port(s).
  - Optional - select QoS policies other than the default (configured in `config>qos` context).
  - Optional - select filter policies (configured in `config>filter` context).
  - Optional - select accounting policy (configured in `config>log` context).
  - Optional - configure DHCP features.
9. Define BGP parameters (optional).
  - BGP must be enabled in the `config>router>bgp` context.
10. Define RIP parameters (optional).
  - RIP must be enabled in the **config>router>rip** context.
11. Define spoke SDP parameters.
12. Enable the service.

## Configuring VPRN Components

This section provides VPRN configuration examples for the following entities:

- [Creating a VPRN Service on page 1103](#)
  - [Configuring Global VPRN Parameters on page 1104](#)
  - [Configuring VPRN Protocols - PIM on page 1106](#)
  - [Configuring Router Interfaces on page 1107](#)
  - [Configuring VPRN Protocols - OSPF on page 1113](#)
  - [Configuring a VPRN Interface SAP on page 1115](#)
  - [Configuring VPRN Protocols - BGP on page 1108](#)
  - [Configuring VPRN Protocols - RIP on page 1111](#)
- 

### Creating a VPRN Service

Use the following CLI syntax to create a VPRN service. A route distinguisher must be defined in order for VPRN to be operationally active.

**CLI Syntax:** `config>service# vprn service-id [customer customer-id]  
                   route-distinguisher [ip-address:number1 | asn:number2]  
                   description description-string  
                   no shutdown`

The following example displays a VPRN service configuration.

```
*A:ALA-1>config>service# info

...
 vprn 1 customer 1 create
 route-distinguisher 10001:0
 no shutdown
 exit
...

*A:ALA-1>config>service>vprn#
```

## Configuring Global VPRN Parameters

Refer to [VPRN Services Command Reference on page 1123](#) for CLI syntax to configure VPRN parameters.

The following example displays a VPRN service with configured parameters.

```
*A:ALA-1>config>service# info

...
 vprn 1 customer 1 create
 vrf-import "vrfImpPolCust1"
 vrf-export "vrfExpPolCust1"
 autonomous-system 10000
 route-distinguisher 10001:1
 spoke-sdp 2 create
 exit
 no shutdown
 exit
...

*A:ALA-1>config>service#
```

## Configuring a Spoke-SDP

Use the following CLI syntax to configure spoke SDP parameters:

**CLI Syntax:** config>service# vprn *service-id* [customer *customer-id*]  
 spoke-sdp *sdp-id*  
 no shutdown  
 interface *ip-int-name*  
   spoke-sdp *sdp-id:vc-id* [vc-type {ether|vlan|vpls}]  
   egress  
     filter {ip *ip-filter-id*}  
     vc-label *egress-vc-label*  
   ingress  
     filter {ip *ip-filter-id*}  
     vc-label *ingress-vc-label*  
   tos-marking-state {trusted|untrusted}  
 no shutdown

The following output displays a spoke SDP configuration

```
A:ALA-48>config>service>vprn# info

...
 interface "SpokeSDP" create
 spoke-sdp 3:4 create
 ingress
 vc-label 3000
 filter ip 10
 exit
 egress
 vc-label 2000
 filter ip 10
 exit
 exit
 exit
...
 spoke-sdp 3 create
 exit
 no shutdown

A:ALA-48>config>service>vprn#
```

## Configuring VPRN Protocols - PIM

Refer to [VPRN Services Command Reference on page 1123](#) for CLI syntax to configure VPRN parameters.

The following example displays a VPRN PIM configuration:

```
config>service# info
#-----
...
 vprn 1 customer 2 create
 route-distinguisher 1:11
 interface "if1" create
 address 12.13.14.15/32
 loopback
 exit
 interface "if2" create
 address 14.14.14.1/24
 sap 1/1/2:0 create
 exit
 exit
 pim
 interface "if1"
 exit
 interface "if2"
 exit
 rp
 static
 exit
 bsr-candidate
 shutdown
 exit
 rp-candidate
 shutdown
 exit
 exit
 exit
 no shutdown
 exit
exit
#-----
config>service#
```

## Configuring Router Interfaces

Refer to the 7750 SR OS Router Configuration Guide for command descriptions and syntax information to configure router interfaces.

The following example displays a router interface configurations:

```
ALA48>config>router# info
#-----
echo "IP Configuration"
#-----
...
 interface "if1"
 address 2.2.2.1/24
 port 1/1/33
 exit
 interface "if2"
 address 10.49.1.46/24
 port 1/1/34
 exit
 interface "if3"
 address 11.11.11.1/24
 port 1/1/35
 exit
...
#-----
ALA48>config>router#
```

## Configuring VPRN Protocols - BGP

Configuring BGP between the PE routers allows the PE routers to exchange information about routes originating and terminating in the VPRN. The PE routers use the information to determine which labels are used for traffic intended for remote sites.

In order to enable a VPRN BGP instance, the BGP protocol must be enabled in the `config>router>bgp` context on each participating SR-Series router.

**NOTE:** Careful planning is essential to implement commands that can affect the behavior of VPRN BGP global, group, and neighbor levels. Because the BGP commands are hierarchical, analyze the values that can disable features on a particular level.

The autonomous system number and router ID configured in the VPRN context only applies to that particular service.

The minimal parameters that should be configured for a VPRN BGP instance are:

- Specify an autonomous system number for the router. See [Configuring Global VPRN Parameters on page 1104](#).
- Specify a router ID - Note that if a new or different router ID value is entered in the BGP context, then the new value takes precedence and overwrites the router-level router ID. See [Configuring Global VPRN Parameters on page 1104](#).
- Specify a VPRN BGP peer group.
- Specify a VPRN BGP neighbor with which to peer.
- Specify a VPRN BGP peer-AS that is associated with the above peer.

VPRN BGP is administratively enabled upon creation. Minimally, to enable VPRN BGP in a VPRN instance, you must associate an autonomous system number and router ID for the VPRN service, create a peer group, neighbor, and associate a peer AS number. There are no default VPRN BGP groups or neighbors. Each VPRN BGP group and neighbor must be explicitly configured.

All parameters configured for VPRN BGP are applied to the group and are inherited by each peer, but a group parameter can be overridden on a specific basis. VPRN BGP command hierarchy consists of three levels:

- The global level
- The group level
- The neighbor level



For example:

|                    |                                                |                  |
|--------------------|------------------------------------------------|------------------|
| <b>CLI Syntax:</b> | <code>config&gt;service&gt;vprn&gt;bgp#</code> | (global level)   |
|                    | <code>group</code>                             | (group level)    |
|                    | <code>neighbor</code>                          | (neighbor level) |

Note that the local-address must be explicitly configured if two systems have multiple BGP peer sessions between them for the session to be established.

For more information about the BGP protocol, refer to the 7750 SR OS Router Configuration Guide.

## Configuring VPRN BGP Group and Neighbor Parameters

A group is a collection of related VPRN BGP peers. The group name should be a descriptive name for the group. Follow your group, name, and ID naming conventions for consistency and to help when troubleshooting faults.

All parameters configured for a peer group are applied to the group and are inherited by each peer (neighbor), but a group parameter can be overridden on a specific neighbor-level basis.

After a group name is created and options are configured, neighbors can be added within the same autonomous system to create IBGP connections and/or neighbors in different autonomous systems to create EBGP peers. All parameters configured for the peer group level are applied to each neighbor, but a group parameter can be overridden on a specific neighbor basis.

## Configuring Route Reflection

Route reflection can be implemented in autonomous systems with a large internal BGP mesh to reduce the number of IBGP sessions required. One or more routers can be selected to act as focal points, for internal BGP sessions. Several BGP-speaking routers can peer with a route reflector. A route reflector forms peer connections to other route reflectors. A router assumes the role as a route reflector by configuring the `cluster cluster-id` command. No other command is required unless you want to disable reflection to specific peers.

If you configure the `cluster` command at the global level, then all subordinate groups and neighbors are members of the cluster. The route reflector cluster ID is expressed in dotted decimal notation. The ID should be a significant topology-specific value. No other command is required unless you want to disable reflection to specific peers.

If a route reflector client is fully meshed, the `disable-client-reflect` command can be enabled to stop the route reflector from reflecting redundant route updates to a client.

### VPRN BGP CLI Syntax

Use the CLI syntax to configure VPRN BGP parameters ([BGP Configuration Commands on page 1154](#)).

The following example displays a VPRN BGP configuration:

```
*A:ALA-1>config>service# info

...
 vprn 1 customer 1 create
 vrf-import "vrfImpPolCust1"
 vrf-export "vrfExpPolCust1"
 ecmp 8
 autonomous-system 10000
 route-distinguisher 10001:1
 auto-bind ldp
 vrf-target target:10001:1
 interface "to-cel" create
 address 11.1.0.1/24
 sap 1/1/10:1 create
 ingress
 scheduler-policy "SLA2"
 qos 100
 exit
 egress
 scheduler-policy "SLA1"
 qos 1010
 filter ip 6
 exit
 exit
 static-route 6.5.0.0/24 next-hop 10.1.1.2
 bgp
 router-id 10.0.0.1
 group "to-cel"
 export "vprnBgpExpPolCust1"
 peer-as 65101
 neighbor 10.1.1.2
 exit
 exit
 spoke-sdp 2 create
 exit
 no shutdown
exit
...

*A:ALA-1>config>service#
```

## Configuring VPRN Protocols - RIP

PE routers which attach to a particular VPN need to know, for each of that VPN's sites, which addresses in that VPN are at each site. There are several ways that a PE router can obtain this set of addresses. The Routing Information Protocol (RIP) sends routing update messages that include entry changes. The routing table is updated to reflect the new information.

RIP can be used as a PE/CE distribution technique. PE and CE routers may be RIP peers, and the CE may use RIP to tell the PE router the set of address prefixes which are reachable at the CE router's site. When RIP is configured in the CE, care must be taken to ensure that address prefixes from other sites (i.e., address prefixes learned by the CE router from the PE router) are never advertised to the PE. Specifically, if a PE router receives a VPN-IPv4 route, and as a result distributes an IPv4 route to a CE, then that route must not be distributed back from that CE's site to a PE router (either the same router or different routers).

In order to enable a VPRN RIP instance, the RIP protocol must be enabled in the **config>router>rip** context on each participating SR-Series router. VPRN RIP is administratively enabled upon creation. Configuring other RIP commands and parameters are optional.

**NOTE:** Careful planning is essential to implement commands that can affect the behavior of VPRN RIP global, group, and neighbor levels. Because the RIP commands are hierarchical, analyze the values that can disable features on a particular level.

The parameters configured on the VPRN RIP global level are inherited by the group and neighbor levels. Many of the hierarchical VPRN RIP commands can be modified on different levels. The most specific value is used. That is, a VPRN RIP group-specific command takes precedence over a global VPRN RIP command. A neighbor-specific statement takes precedence over a global VPRN RIP and group-specific command. For example, if you modify a VPRN RIP neighbor-level command default, the new value takes precedence over VPRN RIP group- and global-level settings. There are no default VPRN RIP groups or neighbors. Each VPRN RIP group and neighbor must be explicitly configured.

The minimal parameters that should be configured for a VPRN instance are:

- Specify a VPRN RIP peer group.
- Specify a VPRN RIP neighbor with which to peer.
- Specify a VPRN RIP peer-AS that is associated with the above peer.

VPRN RIP command hierarchy consists of three levels:

- The global level
- The group level
- The neighbor level

For example:

|                    |                          |                  |
|--------------------|--------------------------|------------------|
| <b>CLI Syntax:</b> | config>service>vprn>rip# | (global level)   |
|                    | group                    | (group level)    |
|                    | neighbor                 | (neighbor level) |

### VPRN RIP CLI Syntax

The following example displays a VPRN RIP configuration:

```
*A:ALA-1>config>service# info

...
 vprn 1 customer 1 create
 vrf-import "vrfImpPolCust1"
 vrf-export "vrfExpPolCust1"
 ecmp 8
 autonomous-system 10000
 route-distinguisher 10001:1
 auto-bind ldp
 vrf-target target:10001:1
 interface "to-cel" create
 address 11.1.0.1/24
 sap 1/1/10:1 create
 ingress
 scheduler-policy "SLA2"
 qos 100
 exit
 egress
 scheduler-policy "SLA1"
 qos 1010
 filter ip 6
 exit
 exit
 static-route 6.5.0.0/24 next-hop 10.1.1.2
 bgp
 router-id 10.0.0.1
 group "to-cel"
 export "vprnBgpExpPolCust1"
 peer-as 65101
 neighbor 10.1.1.2
 exit
 exit
 rip
 export "vprnRipExpPolCust1"
 group "cel"
 neighbor "to-cel"
 exit
 exit
 spoke-sdp 2 create
 exit
 no shutdown
exit
...

*A:ALA-1>config>service# info
```

For more information about the RIP protocol, refer to the *7750 SR OS Router Configuration Guide*.

## Configuring VPRN Protocols - OSPF

Each VPN routing instance is isolated from any other VPN routing instance, and from the routing used across the backbone. OSPF can be run with any VPRN, independently of the routing protocols used in other VPRNs, or in the backbone itself. For more information about the OSPF protocol, refer to the *7750 SR OS Router Configuration Guide*.

**CLI Syntax:** `config>service>vprn>ospf#`

---

### VPRN OSPF CLI Syntax

Refer to [OSPF Configuration Commands on page 1158](#) for CLI syntax to configure VPRN parameters.

The following example displays the VPRN OSPF configuration shown above:

```
*A:ALA-48>config>service# info

 vprn 2 customer 1 create
 interface "test" create
 exit
 no shutdown
 exit
 area 0.0.0.0
 virtual-link 1.2.3.4 transit-area 1.2.3.4
 hello-interval 9
 dead-interval 40
 exit
 exit

*A:ALA-48>config>service#
```

For more information about the OSPF protocol, refer to the *7750 SR OS Router Configuration Guide*.

### Configuring a VPRN Interface

Interface names associate an IP address to the interface, and then associate the IP interface with a physical port. The logical interface can associate attributes like an IP address, port, Link Aggregation Group (LAG) or the system.

There are no default interfaces.

Note that you can configure a VPRN interface as a loopback interface by issuing the `loopback` command instead of the `sap sap-id` command. The loopback flag cannot be set on an interface where a SAP is already defined and a SAP cannot be defined on a loopback interface.

When using mtrace/mstat in a Layer 3 VPN context then the configuration for the VPRN should have a loopback address configured which has the same address as the core instance's system address (BGP next-hop).

Refer to [OSPF Configuration Commands on page 1158](#) for CLI commands and syntax.

The following example displays a VPRN interface configuration:

```
*A:ALA-1>config>service>vprn# info

...
 vprn 1 customer 1 create
 vrf-import "vrfImpPolCust1"
 vrf-export "vrfExpPolCust1"
 ecmp 8
 autonomous-system 10000
 route-distinguisher 10001:1
 auto-bind ldp
 vrf-target target:10001:1
 interface "to-cel" create
 address 11.1.0.1/24
 exit
 exit
 static-route 6.5.0.0/24 next-hop 10.1.1.2
 spoke-sdp 2 create
 exit
 no shutdown
 exit
...

*A:ALA-1>config>service#
```

## Configuring a VPRN Interface SAP

A SAP is a combination of a port and encapsulation parameters which identifies the service access point on the interface and within the SR. Each SAP must be unique within a router. A SAP cannot be defined if the interface **loopback** command is enabled.

When configuring VPRN interface SAP parameters, a default QoS policy is applied to each ingress and egress SAP. Additional QoS policies and scheduler policies must be configured in the `config>qos` context. Filter policies are configured in the `config>filter` context and must be explicitly applied to a SAP. There are no default filter policies.

VPRN interface ATM SAP parameters can only be configured on ATM-type MDAs and ATM-configured ports. The **periodic-loopback** command can only be enabled when the `config>system>atm>oam` context is enabled. See the 7750 SR OS Basic System Configuration Guide.

Refer to [OSPF Configuration Commands on page 1158](#) for CLI commands and syntax.

The following example displays a VPRN interface SAP configuration:

```
*A:ALA-1>config>service# info

...
 vprn 1 customer 1 create
 vrf-import "vrfImpPolCust1"
 vrf-export "vrfExpPolCust1"
 ecmp 8
 autonomous-system 10000
 route-distinguisher 10001:1
 auto-bind ldp
 vrf-target target:10001:1
 interface "to-cel" create
 address 11.1.0.1/24
 sap 1/1/10:1 create
 ingress
 scheduler-policy "SLA2"
 qos 100
 exit
 egress
 scheduler-policy "SLA1"
 qos 1010
 filter ip 6
 exit
 exit
 exit
 static-route 6.5.0.0/24 next-hop 10.1.1.2
 spoke-sdp 2 create
 exit
 no shutdown
 exit
...

*A:ALA-1>config>service#
```

## Configuring IPsec Parameters

The following output displays VPRN service with IPsec parameters configured.

```
*A:ALA-49>config# info

...
 vprn 200 customer 1 create
 ipsec
 security-policy 1 create
 entry 1 create
 local-ip 172.17.118.0/24
 remote-ip 172.16.91.0/24
 exit
 exit
 exit
 route-distinguisher 1:1
 ipsec-interface "ipsec-private" create
 sap ipsec-1.private:1 create
 tunnel "remote-office" create
 security-policy 1
 local-gateway-address 10.10.10.118 peer 10.10.7.91 delivery-service
100
 dynamic-keying
 ike-policy 1
 pre-shared-key "test"
 transform 1
 exit
 no shutdown
 exit
 exit
 exit
 interface "corporate-network" create
 address 172.17.118.118/24
 sap 1/1/2 create
 exit
 exit
 static-route 172.16.91.0/24 ipsec-tunnel "remote-office"
 no shutdown
 exit
exit
...

*A:ALA-49>config#
```



## Configuring Overload State on a Single SFM

A 7x50 system with a single SFM installed has a system multicast throughput that is only a half of a 7x50 system with dual SFMs installed. For example, in a mixed environment in which IOM1s, IOM2s, and IOM3s are installed in the same system (chassis mode B or C), system multicast throughput doubles when redundant SFMs are used instead of a single SFM. If the required system multicast throughput is between 16G and 32G (which means both SFMs are being actively used), when there is an SFM failure, multicast traffic needs to be rerouted around the node.

Some scenarios include:

- There is only one SFM installed in the system
- One SFM (active or standby) failed in a dual SFM configuration
- The system is in the ISSU process

You can use an overload state in IGP to trigger the traffic reroute by setting the overload bit in IS-IS or setting the metric to maximum in OSPF. Since PIM uses IGP to find out the upstream router, a next-hop change in IGP will cause PIM to join the new path and prune the old path, which effectively reroutes the multicast traffic downstream. When the problem is resolved, the overload condition is cleared, which will cause the traffic to be routed back to the router.

## Service Management Tasks

This section discusses the following service management tasks:

- [Modifying VPRN Service Parameters on page 1118](#)
  - [Deleting a VPRN Service on page 1119](#)
- 

### Modifying VPRN Service Parameters

Use the CLI syntax to modify VPRN parameters ([VPRN Services Command Reference on page 1123](#)).

The following example displays the VPRN service creation output.

```
*A:ALA-1>config>service# info

...
 vprn 1 customer 1 create
 shutdown
 vrf-import "vrfImpPolCust1"
 vrf-export "vrfExpPolCust1"
 ecmp 8
 maximum-routes 2000
 autonomous-system 10000
 route-distinguisher 10001:1
 interface "to-cel" create
 address 10.1.1.1/24
 sap 1/1/10:1 create
 exit
 exit
 static-route 6.5.0.0/24 next-hop 10.1.1.2
 bgp
 router-id 10.0.0.1
 group "to-cel"
 export "vprnBgpExpPolCust1"
 peer-as 65101
 neighbor 10.1.1.2
 exit
 exit
 exit
 spoke-sdp 2 create
 exit
 exit
 ...

*A:ALA-1>config>service>vprn#
```

## Deleting a VPRN Service

An VPRN service cannot be deleted until SAPs and interfaces are shut down and deleted. If protocols and/or a spoke-SDP are defined, they must be shut down and removed from the configuration as well.

Use the following CLI syntax to delete a VPRN service:

**CLI Syntax:** config>service#  
[no] vprn *service-id* [customer *customer-id*]  
shutdown  
[no] interface *ip-int-name*  
shutdown  
[no] sap *sap-id*  
[no] bgp  
shutdown  
[no] rip  
shutdown  
[no] spoke-sdp *sdp-id*  
[no] shutdown

## Disabling a VPRN Service

A VPRN service can be shut down without deleting any service parameters.

**CLI Syntax:** config>service#  
                   vprn *service-id* [customer *customer-id*]  
                   shutdown

**Example:** config>service# vprn 1  
               config>service>vprn# shutdown  
               config>service>vprn# exit

```
*A:ALA-1>config>service# info

...
 vprn 1 customer 1 create
 shutdown
 vrf-import "vrfImpPolCust1"
 vrf-export "vrfExpPolCust1"
 ecmp 8
 autonomous-system 10000
 route-distinguisher 10001:1
 auto-bind ldp
 vrf-target target:10001:1
 interface "to-cel" create
 address 11.1.0.1/24
 sap 1/1/10:1 create
 ingress
 scheduler-policy "SLA2"
 qos 100
 exit
 egress
 scheduler-policy "SLA1"
 qos 1010
 filter ip 6
 exit
 exit
 exit
 static-route 6.5.0.0/24 next-hop 10.1.1.2
 bgp
 router-id 10.0.0.1
 group "to-cel"
 export "vprnBgpExpPolCust1"
 peer-as 65101
 neighbor 10.1.1.2
 exit
 exit
 exit
 rip
 export "vprnRipExpPolCust1"
 group "cel"
 neighbor "to-cel"
 exit
 exit
 exit
 spoke-sdp 2 create
 exit
 exit
...

*A:ALA-1>config>service#
```

## Re-enabling a VPRN Service

To re-enable a VPRN service that was shut down.

**CLI Syntax:** `config>service#  
                vprn service-id [customer customer-id]  
                no shutdown`



---

## VPRN Services Command Reference

---

### Command Hierarchies

- [VPRN Service Configuration Commands on page 1124](#)
  - [L2TP Commands on page 1126](#)
  - [DHCP Commands on page 1128](#)
  - [GSMP Commands on page 1130](#)
  - [IGMP Commands on page 1131](#)
  - [Multicast VPN Commands on page 1135](#)
  - [Router Advertisement Commands on page 1138](#)
  - [Subscriber Interface Commands on page 1139](#)
  - [Interface Commands on page 1145](#)
    - [Interface Spoke SDP Commands on page 1147](#)
    - [Interface SAP Commands on page 1150](#)
    - [Interface VRRP Commands on page 1148](#)
  - [BGP Configuration Commands on page 1154](#)
  - [OSPF Configuration Commands on page 1158](#)
  - [PIM Configuration Commands on page 1161](#)
  - [RIP Configuration Commands on page 1163](#)
  - [IPSec Configuration Commands on page 1132](#)
- [Show Commands on page 1165](#)
- [Clear Commands on page 1167](#)
- [Debug Commands on page 1168](#)

## VPNRN Service Configuration Commands

```

config
— service
— vpn service-id [customer customer-id]
— no vpn service-id
— auto-bind {ldp | gre | rsvp-te | mpls}
— no auto-bind
— autonomous-system as-number
— no autonomous-system
— description description-string
— no description
— ecmp max-ecmp-routes
— no ecmp
— grt-lookup
— [no] enable-grt
— export-grt policy-name [policy-name ...(up to 5 max)]
— static-route {ip-prefix/prefix-length | ip-prefix netmask} [preference preference] [metric metric] [enable|disable] grt
— no static-route
— export-limit num-routes
— no export-limit
— igmp-host-tracking
— expiry-time expiry-time
— no expiry-time
— [no] shutdown
— [no] ignore-nh-metric
— maximum-ipv6-route number [log-only] [threshold percent]
— no maximum-ipv6-route
— maximum-routes number [log-only] [threshold percent]
— no maximum-routes
— mc-maximum-routes number [log-only] [threshold percent]
— no mc-maximum-routes
— multicast-info-policy policy-name
— no multicast-info-policy
— mvpn
— [no] nat
— route-distinguisher [ip-address:number1 | asn:number2]
— no route-distinguisher
— router-id ip-address
— no router-id
— service-name service-name
— no service-name
— sgt-qos
— application dscp-app-name dscp {dscp-value | dscp-name}
— application dot1p-app-name dot1p dot1p-priority
— no application {dscp-app-name | dot1p-app-name}
— dscp dscp-name fc fc-name
— no dscp dscp-name
— single-sfm-overload [holdoff-time holdoff-time]
— no single-sfm-overload
— [no] shutdown
— shutdown
— snmp-community community-name [version SNMP-version]
— no snmp-community community-name

```



- **source-address**
  - **application** *app* [*ip-int-name* | *ip-address*]
  - **no application** *app*
  - **application** *app* *ipv6-address*
- **[no] spoke-sdp** *sdp-id*
  - **[no] shutdown**
- **[no] static-route** {*ip-prefix/prefix-length* | *ip-prefix netmask*} [*preference preference*] [*metric metric*] [*tag tag*] [*enable* | *disable*] {*next-hop ip-int-name*|*ip-address* | *ipsec-tunnel ipsec-tunnel-name*} [*bfd-enable* | {*cpe-check cpe-ip-address* [*interval seconds*] [*drop-count count*] [*log*]}
- **[no] static-route** {*ip-prefix/prefix-length* | *ip-prefix netmask*} [*preference preference*] [*metric metric*] [*tag tag*] [*enable* | *disable*] *indirect ip-address* [*cpe-check cpe-ip-address* [*interval seconds*][*drop-count count*] [*log*]]
- **[no] static-route** {*ip-prefix/prefix-length* | *ip-prefix netmask*} [*preference preference*] [*metric metric*] [*tag tag*] [*enable* | *disable*] *black-hole*
- **type** {*hub* | *subscriber-split-horizon*}
- **no type**
- **vrf-export** *policy-name* [*policy-name...*(upto 5 max)]
- **no vrf-export**
- **vrf-import** *policy-name* [*policy-name...*(upto 5 max)]
- **no vrf-import**
- **vrf-target** {*ext-comm*|{[**export** *ext-comm*][**import** *ext-comm*]}}
- **no vrf-target**
- **[no] shutdown**

## L2TP Commands

```

config
 — service
 — vpn service-id [customer customer-id]
 — no vpn service-id
 — l2tp
 — no l2tp
 — calling-number-format ascii-spec
 — no calling-number-format
 — exclude-avps calling-number
 — no exclude-avps
 — group tunnel-group-name [create] [role lac | lns]
 — no group tunnel-group-name
 — avp-hiding sensitive | always
 — no avp-hiding
 — challenge always
 — no challenge
 — description description-string
 — no description
 — destruct-timeout destruct-timeout
 — no destruct-timeout
 — hello-interval hello-interval
 — no hello-interval
 — idle-timeout idle-timeout
 — no idle-timeout
 — lns-group lns-group-id
 — no lns-group
 — local-address ip-address
 — no local-address
 — local-name host-name
 — no local-name
 — max-retries-estab max-retries
 — no max-retries-estab
 — max-retries-not-estab max-retries
 — no max-retries-not-estab
 — password password [hash | hash2]
 — no password
 — ppp
 — authentication {chap|pap|pref-chap}
 — authentication-policy auth-policy-name
 — no authentication-policy
 — default-group-interface ip-int-name service-id service-id
 — no default-group-interface
 — keepalive seconds [hold-up-multiplier multiplier]
 — no keepalive
 — mtu mtu-bytes
 — no mtu
 — [no] proxy-authentication
 — [no] proxy-lcp
 — user-db local-user-db-name
 — no user-db
 — session-assign-method weighted

```

- **no session-assign-method**
- **session-limit** *session-limit*
- **no session-limit**
- **tunnel** *tunnel-name* [**create**]
- **no tunnel** *tunnel-name*
  - **[no] auto-establish**
  - **avp-hiding** {**never** | **sensitive** | **always**}
  - **no avp-hiding**
  - **challenge** *challenge-mode*
  - **no challenge**
  - **description** *description-string*
  - **no description**
  - **destruct-timeout** *destruct-timeout*
  - **no destruct-timeout**
  - **hello-interval** *hello-interval*
  - **hello-interval infinite**
  - **no hello-interval**
  - **idle-timeout** *idle-timeout*
  - **idle-timeout infinite**
  - **no idle-timeout**
  - **local-address** *ip-address*
  - **no local-address**
  - **local-name** *host-name*
  - **no local-name**
  - **max-retries-estab** *max-retries*
  - **no max-retries-estab**
  - **max-retries-not-estab** *max-retries*
  - **no max-retries-not-estab**
  - **password** *password* [**hash** | **hash2**]
  - **no password**
  - **peer** *ip-address*
  - **no peer**
  - **preference** *preference*
  - **no preference**
  - **remote-name** *host-name*
  - **no remote-name**
  - **session-limit** *session-limit*
  - **no session-limit**
  - **[no] shutdown**
- **peer-address-change-policy** {**accept** | **ignore** | **reject**}
- **receive-window-size** [*4..1024*]
- **no receive-window-size**
- **[no] shutdown**

## DHCP Commands

```

config
 — service
 — vpnrn service-id [customer customer-id]
 — no vpnrn service-id
 — dhcp
 — local-dhcp-server server-name [create]
 — no local-dhcp-server server-name
 — description description-string
 — no description
 — failover
 — maximum-client-lead-time [hrs hours] [min minutes] [sec seconds]
 — no maximum-client-lead-time
 — partner-down-delay [hrs hours] [min minutes] [sec seconds]
 — no partner-down-delay
 — peer ip-address tag sync-tag-name
 — no peer ip-address
 — [no] shutdown
 — [no] startup-wait-time [min minutes] [sec seconds]
 — [no] disable-force-renews
 — pool pool-name [create]
 — no pool pool-name
 — description description-string
 — no description
 — max-lease-time [days days] [hrs hours] [min minutes] [sec seconds]
 — no max-lease-time
 — min-lease-time [days days] [hrs hours] [min minutes] [sec seconds]
 — no min-lease-time
 — offer-time [min minutes] [sec seconds]
 — no offer-time
 — options
 — custom-option option-number address [ip-address...(up to 4 max)]
 — custom-option option-number hex hex-string
 — custom-option option-number string ascii-string
 — no custom-option option-number
 — dns-server [ip-address...(up to 4 max)]
 — domain-name domain-name
 — no domain-name
 — lease-rebind-time [days days] [hrs hours] [min minutes] [sec seconds]
 — no lease-rebind-time
 — lease-renew-time [days days] [hrs hours] [min minutes] [sec seconds]
 — no lease-renew-time
 — lease-time [days days] [hrs hours] [min minutes] [sec seconds]
 — no lease-time
 — netbios-name-server ip-address [ip-address...(up to 4 max)]
 — no netbios-name-server

```

- **netbios-node-type** *netbios-node-type*
- **no netbios-node-type**
- **subnet** {*ip-address/mask*|*ip-address netmask*} [**create**]
- **no subnet** {*ip-address/mask*|*ip-address netmask*}
  - [**no**] **address-range** *start-ip-address end-ip-address*
  - [**no**] **exclude-addresses** *start-ip-address [end-ip-address]*
  - **maximum-declined** *maximum-declined*
  - **no maximum-declined**
  - **minimum-free** *minimum-free*
  - **no minimum-free**
  - **options**
    - **custom-option** *option-number address* [*ip-address...(upto 4 max)*]
    - **custom-option** *option-number hex* *hex-string*
    - **custom-option** *option-number string* *ascii-string*
    - **no custom-option** *option-number*
    - **default-router** *ip-address* [*ip-address...(up to 4 max)*]
    - **no default-router**
    - **subnet-mask** *ip-address*
    - **no subnet-mask**
- [**no**] **use-gi-address**
- [**no**] **use-pool-from-client**
- **user-db** *local-user-db-name*
- **no user-db**

## GSMP Commands

```

config
 — service
 — vpn service-id [customer customer-id]
 — no vpn service-id
 — gsmp
 — [no] group name
 — ancp
 — [no] dynamic-topology-discover
 — [no] oam
 — description description-string
 — no description
 — hold-multiplier multiplier
 — no hold-multiplier
 — keepalive seconds
 — no keepalive
 — [no] neighbor ip-address
 — description description-string
 — no description
 — local-address ip-address
 — no local-address
 — priority-marking dscp dscp-name
 — priority-marking prec ip-prec-value
 — no priority-marking
 — [no] shutdown
 — [no] shutdown
 — [no] shutdown

```

## IGMP Commands

```

config
 — service
 — vprn service-id [customer customer-id]
 — no vprn service-id
 — igmp
 — [no] interface ip-int-name
 — import policy-name
 — no import
 — max-groups value
 — no max-groups
 — mcac
 — mc-constraints
 — level level-id bw bandwidth
 — no level level-id
 — number-down number-lag-port-down
 — number-down number-lag-port-down level level-id
 — [no] shutdown
 — policy policy-name
 — no policy
 — unconstrained-bw bandwidth mandatory-bw mandatory-bw
 — no unconstrained-bw
 — [no] shutdown
 — static
 — [no] group grp-ip-address
 — [no] source ip-address
 — [no] starg
 — [no] subnet-check
 — version version
 — no version
 — [no] query-interval
 — query-interval seconds
 — [no] query-last-member-interval
 — query-last-member-interval seconds
 — [no] query-response-interval
 — query-response-interval seconds
 — [no] robust-count
 — robust-count robust-count
 — [no] shutdown
 — ssm-translate
 — [no] grp-range start end
 — [no] source ip-address

```

## IPSec Configuration Commands

```

config
 — service
 — vpn service-id [customer customer-id]
 — no vpn service-id
 — ipsec
 — security-policy security-policy-id [create]
 — no security-policy security-policy-id
 — entry entry-id [create]
 — no entry entry-id
 — local-ip {ip-prefix/prefix-length | ip-prefix netmask | any}
 — remote-ip {ip-prefix/prefix-length | ip-prefix netmask | any}
 — ipsec-interface ip-int-name [create]
 — no ipsec-interface ip-int-name
 — [no] address {ip-address/mask | ip-address netmask}
 — description description-string
 — no description
 — ip-mtu octets
 — no ip-mtu
 — sap sap-id [create]
 — no sap sap-id
 — description description-string
 — no description
 — egress
 — agg-rate-limit agg-rate [queue-frame-based-accounting]
 — no agg-rate-limit agg-rate
 — filter ip ip-filter-id
 — no filter [ip ip-filter-id]
 — [no] qinq-mark-top-only
 — qos policy-id
 — no qos [policy-id]
 — [no] queue-override
 — [no] queue queue-id
 — adaptation-rule [pir adaptation-rule] [cir adaptation-rule]
 — no adaptation-rule
 — avg-frame-overhead percentage
 — no avg-frame-overhead
 — cbs size-in-kbytes
 — no cbs
 — high-prio-only percent
 — no high-prio-only
 — mbs {size-in-kbytes | default}
 — no mbs
 — rate pir-rate [cir cir-rate]
 — no rate
 — [no] scheduler-override
 — [no] scheduler scheduler-name
 — rate pir-rate [cir cir-rate]
 — no rate
 — scheduler-policy scheduler-policy-name

```



- **no scheduler-policy**
- **ingress**
  - **filter** *ip ip-filter-id*
  - **no filter** [*ip ip-filter-id*]
  - **match-qinq-dot1p** {*top* | *bottom*}
  - **qos** *policy-id* [*shared-queuing* | *multipoint-shared*]
  - **no qos** [*policy-id*]
  - **[no] queue-override**
    - **[no] queue** *queue-id*
      - **adaptation-rule** [*pir adaptation-rule*] [*cir adaptation-rule*]
      - **no adaptation-rule**
      - **cbs** *size-in-kbytes*
      - **no cbs**
      - **high-prio-only** *percent*
      - **no high-prio-only**
      - **mbs** {*size-in-kbytes* | *default*}
      - **no mbs**
      - **rate** *pir-rate* [*cir cir-rate*]
      - **no rate**
  - **[no] scheduler-override**
    - **[no] scheduler** *scheduler-name*
      - **rate** *pir-rate* [*cir cir-rate*]
      - **no rate**
  - **scheduler-policy** *scheduler-policy-name*
  - **no scheduler-policy**
- **[no] shutdown**
- **tunnel** *ipsec-tunnel-name* [**create**]
- **no tunnel** *ipsec-tunnel-name*
  - **[no] bfd-designate**
  - **[no] bfd-enable** **service** *service-id* **interface** *interface-name* **dst-ip** *ip-address*
  - **description** *description-string*
  - **no description**
  - **[no] dynamic-keying**
    - **[no] auto-establish**
    - **ike-policy** \*\*\*\*\* *ike-policy-id*
    - **no ike-policy** \*\*\*\*\*
    - **pre-shared-key** *key*
    - **no pre-shared-key**
    - **transform** *transform-id* [*transform-id...*(up to 4)]
    - **no transform**
  - **local-gateway-address** *ip-address* **peer** *ip-address* **delivery-service** *service-id*
  - **no local-gateway-address**
  - **[no] manual-keying**
    - **security-association** *security-entry-id* **authentication-key** *authentication-key* **encryption-key** *encryption-key* **spi** *spi* **transform** *transform-id* **direction** {*inbound* | *outbound*}
    - **no security-association** *security-entry-id* **direction** {*inbound* | *outbound*}
  - **replay-window** {32 | 64 | 128 | 256 | 512}
  - **no replay-window**

- **security-policy** *security-policy-id*
- **no security-policy**
- **[no] shutdown**

## Multicast VPN Commands

```

config
 — service
 — vprn service-id [customer customer-id]
 — no vprn service-id
 — mvpn
 — [no] auto-discovery
 — c-mcast-signaling {bgp | pim}
 — no c-mcast-signaling
 — [no] intersite-shared
 — provider-tunnel
 — inclusive
 — pim {asm | ssm} grp-ip-address
 — no pim
 — hello-interval hello-interval
 — no hello-interval
 — hello-multiplier deci-units
 — no hello-multiplier
 — [no] improved-assert
 — [no] shutdown
 — [no] three-way-hello
 — [no] tracking-support
 — selective
 — [no] auto-discovery-disable
 — data-delay-interval value
 — no data-delay-interval
 — data-threshold {c-grp-ip-addr/mask|c-grp-ip-addr
 netmask} s-psmi-threshold
 — no data-threshold {c-grp-ip-addr/mask|c-grp-ip-addr
 netmask}
 — [no] join-tlv-packing-disable
 — pim-ssm {grp-ip-address/mask|grp-ip-address net-
 mask}
 — no pim-ssm
 — umh-selection highest-ip | hash-based
 — no umh-selection
 — vrf-export {unicast | policy-name [policy-name...(up to 5 max)]}
 — no vrf-export
 — vrf-import {unicast | policy-name [policy-name...(up to 5 max)]}
 — no vrf-import
 — vrf-target {unicast | ext-community | export unicast | ext-community |
 import unicast | ext-community}
 — no vrf-target
 — export {unicast | ext-community}
 — import {unicast | ext-community}

```

## NTP Commands

Note that the **ntp-server** command is not supported in the **vpn>ntp** context. Then NTP is configured in a VPRN service, the NTP server mode is assumed and is not optional.

```

config
 — service
 — vpn
 — [no] ntp
 — [no] authentication-check
 — authentication-key key-id key key [hash | hash2] type {des | message-
 digest}
 — no authentication-key key-id
 — [no] broadcast [router router-name] {interface ip-int-name} [key-id
 key-id] [version version] [ttl ttl]

```

## Redundant Interface Commands

```

config
 — service
 — vpn service-id [customer customer-id]
 — no vpn service-id
 — [no] redundant-interface ip-int-name
 — address {ip-address/mask | ip-address netmask} [remote-ip ip-address]
 — no address
 — [no] description description-string
 — [no] shutdown
 — [no] spoke-sdp sdp-id:vc-id
 — egress
 — filter [ip ip-filter-id]
 — vc-label ingress-vc-label
 — no vc-label [ingress-vc-label]
 — ingress
 — filter [ip ip-filter-id]
 — no filter
 — vc-label ingress-vc-label
 — no vc-label [ingress-vc-label]
 — [no] shutdown

```

## Router Advertisement Commands

```

config
 — router
 — [no] router-advertisement
 — [no] interface ip-int-name
 — current-hop-limit number
 — no current-hop-limit
 — [no] managed-configuration
 — max-advertisement-interval seconds
 — no max-advertisement-interval
 — min-advertisement-interval seconds
 — no min-advertisement-interval
 — mtu mtu-bytes
 — no mtu
 — [no] other-stateful-configuration
 — prefix [ipv6-prefix/prefix-length]
 — no prefix
 — [no] autonomous
 — [no] on-link
 — preferred-lifetime {seconds | infinite}
 — no preferred-lifetime
 — valid-lifetime {seconds | infinite}
 — no valid-lifetime
 — reachable-time milli-seconds
 — no reachable-time
 — retransmit-time milli-seconds
 — no retransmit-time
 — router-lifetime seconds
 — no router-lifetime
 — [no] shutdown
 — [no] use-virtual-mac

```

## Subscriber Interface Commands

```

config
 — service
 — vpn service-id [customer customer-id]
 — no vpn service-id
 — subscriber-interface ip-int-name [fwd-service service-id fwd-subscriber-interface
 ip-int-name] [create]
 — no subscriber-interface ip-int-name
 — address {ip-address/mask | ip-address netmask} [gw-ip-address ip-
 address]
 — no address
 — authentication-policy name
 — no authentication-policy
 — delayed-enable seconds [init-only]
 — no delayed-enable
 — description description-string
 — no description
 — dhcp
 — client-applications dhcp
 — client-applications pppoe
 — client-applications dhcp pppoe
 — no client-applications
 — description description-string
 — no description
 — gi-address ip-address [src-ip-addr]
 — no gi-address
 — lease-populate nbr-of-leases
 — no lease-populate
 — [no] option
 — [no] vendor-specific-option
 — [no] client-mac-address
 — [no] sap-id
 — [no] service-id
 — string text
 — no string
 — [no] system-id
 — proxy-server
 — emulated-server ip-address
 — no emulated-server
 — lease-time [days days] [hrs hours] [min minutes] [sec
 seconds] [radius-override]
 — no lease-time
 — [no] shutdown
 — server server1 [server2...(up to 8 max)]
 — no server
 — [no] shutdown
 — [no] group-interface ip-int-name
 — arp-host
 — host-limit max-num-hosts
 — no host-limit
 — min-auth-interval min-auth-interval
 — no min-auth-interval
 — sap-host-limit max-num-hosts-sap

```

- **no sap-host-limit**
- **[no] shutdown**
- **[no] arp-populate**
- **arp-timeout** *seconds*
- **no arp-timeout**
- **authentication-policy** *name*
- **no authentication-policy**
- **description** *description-string*
- **no description**
- **dhcp**
  - **description** *description-string*
  - **no description**
  - **gi-address** *ip-address* [*src-ip-addr*]
  - **no gi-address**
  - **lease-populate** *nbr-of-leases*
  - **no lease-populate**
  - **[no] match-circuit-id**
  - **[no] option**
    - **action** {*replace* | *drop* | *keep*}
    - **no action**
    - **circuit-id** [*ascii-tuple* | *ifindex* | *sap-id* | *vlan-ascii-tupl*]
    - **no circuit-id**
    - **remote-id** [*mac* | *string string*]
    - **no remote-id**
    - **[no] vendor-specific-option**
      - **[no] client-mac-address**
      - **[no] sap-id**
      - **[no] service-id**
      - **string** *text*
      - **no string**
      - **[no] system-id**
  - **proxy-server**
    - **emulated-server** *ip-address*
    - **no emulated-server**
    - **lease-time** [*days days*] [*hrs hours*] [*min minutes*] [*sec seconds*] [*radius-override*]
    - **no lease-time**
    - **[no] shutdown**
  - **server** *server1* [*server2...*(up to 8 max)]
  - **no server**
  - **[no] shutdown**
  - **[no] trusted**
  - **user-db** *local-user-db-name*
  - **no user-db**
- **eth-cfm**
  - **mep** *mep-id* **domain** *md-index* **association** *ma-index* [*direction* {*up* | *down*}]
  - **no mep** *mep-id* **domain** *md-index* **association** *ma-index*
    - **fault-propagation-enable** {*use-if-tlv* | *suspend-ccm*}
    - **no fault-propagation-enable**
- **host-connectivity-verify** [*interval interval*] [*action* {*remove*|*alarm*}]



- **icmp**
  - **[no] mask-reply**
  - **redirects** *[number seconds]*
  - **no redirects**
  - **ttl-expired** *[number seconds]*
  - **no ttl-expired**
  - **unreachables** *[number seconds]*
  - **no unreachables**
- **[no] ipv6**
  - **[no] dhcp6**
    - **[no] proxy-server**
      - **renew-timer** *seconds*
      - **no renew-timer**
      - **rebind-timer** *seconds*
      - **no rebind-timer**
      - **preferred-lifetime** *[seconds | infinite]*
      - **no preferred-lifetime**
      - **valid-lifetime** *[seconds | infinite]*
      - **no valid-lifetime**
      - **client-applications** **[dhcp] [pppoe]**
      - **no client-applications**
      - **[no] shutdown**
      - **[no] router-advertisements**
      - **current-hop-limit** *hop-count*
    - **no current-hop-limit**
    - **[no] managed-configuration**
    - **max-advertisement-interval** *seconds*
    - **no max-advertisement-interval**
    - **min-advertisement-interval** *seconds*
    - **no min-advertisement-interval**
    - **mtu** *bytes*
    - **no mtu**
    - **[no] other-stateful-configuration**
    - **[no] prefix-options**
      - **[no] autonomous**
      - **preferred-lifetime** *[seconds | infinite]*
      - **no preferred-lifetime**
      - **valid-lifetime** *[seconds | infinite]*
      - **no valid-lifetime**
    - **reachable-time** *milliseconds*
    - **no reachable-time**
    - **retransmit-time** *milliseconds*
    - **no retransmit-time**
    - **router-lifetime** *seconds*
    - **router-lifetime no-default-router**
    - **no router-lifetime**
  - **[no] local-proxy-arp**
  - **[no] mac** *ieee-address*
  - **[no] pppoe**
    - **description** *description-string*
    - **no description**
    - **dhcp-client**
      - **[no] ccag-use-origin-sap**
    - **pap-chap-user-db** *local-user-db-name*

- **no pap-chap-user-db**
- **pppoe-policy** *pppoe-policy-name*
- **no pppoe-policy**
- **sap-session-limit** *sap-session-limit*
- **no sap-session-limit**
- **session-limit** *session-limit*
- **no session-limit**
- **user-db** *local-user-db-name*
- **no user-db**
- **[no] shutdown**
- **[no] proxy-arp-policy** *policy-name* [*policy-name...*(up to 5 max)]
- **redundant-interface** *red-ip-int-name*
- **no redundant-interface**
- **[no] remote-proxy-arp**
- **[no] sap** *sap-id*
  - **accounting-policy** *acct-policy-id*
  - **no accounting-policy** [*acct-policy-id*]
  - **anti-spoof** {**ip** | **ip-mac** | **nh-mac**}
  - **no anti-spoof**
  - **app-profile** *app-profile-name*
  - **no app-profile**
  - **atm**
    - **egress**
      - **traffic-desc** *traffic-desc-profile-id*
      - **no traffic-desc**
    - **encapsulation** *atm-encap-type*
    - **ingress**
      - **traffic-desc** *traffic-desc-profile-id*
      - **no traffic-desc**
    - **oam**
      - **[no] alarm-cells**
      - **[no] periodic-loopback**
  - **calling-station-id** *calling-station-id*
  - **no calling-station-id**
  - **[no] collect-stats**
  - **cpu-protection** *policy-id* [**mac-monitoring**]
  - **no cpu-protection**
  - **description** *description-string*
  - **no description**
  - **egress**
    - **agg-rate-limit** *agg-rate* [**queue-frame-based-accounting**]
    - **no agg-rate-limit** *agg-rate*
    - **filter ip** *ip-filter-id*
    - **filter ipv6** *ipv6-filter-id*
    - **no filter** [**ip** *ip-filter-id*] [**ipv6** *ipv6-filter-id*]
    - **no filter**
    - **[no] qinq-mark-top-only**
    - **[no] qos** *policy-id*
    - **scheduler-policy** *scheduler-policy-name*
    - **no scheduler-policy**
  - **igmp-host-tracking**
    - **expiry-time** *expiry-time*
    - **no expiry-time**

```

— import policy-name
— no import
— max-num-groups max-num-groups
— no max-num-groups
— max-num-sources max-num-sources
— no max-num-sources
— ingress
— filter ip ip-filter-id
— filter ipv6 ipv6-filter-id
— no filter [ip ip-filter-id] [ipv6 ipv6-filter-id]
— no filter
— match-qinq-dot1p {top | bottom}
— no match-qinq-dot1p
— qos policy-id [shared-queuing]
— no qos policy-id
— scheduler-policy scheduler-policy-name
— no scheduler-policy
— multi-service-site customer-site-name
— no multi-service-site
— static-host ip ip/did-address [mac ieee-address] [create]
— static-host mac ieee-address [create]
— no static-host [ip ip-address] mac ieee-address
— no static-host all [force]
— no static-host ip ip-address
— ancp-string ancp-string
— no ancp-string
— app-profile app-profile-name
— no app-profile
— inter-dest-id intermediate-destination-id
— no inter-dest-id
— managed-routes
— route {ip-prefix/length | ip-prefix netmask}
— [create]
— no route {ip-prefix/length | ip-prefix netmask}
— [no] shutdown
— sla-profile sla-profile-name
— no sla-profile
— sub-profile sub-profile-name
— no sub-profile
— subscriber sub-ident
— no subscriber
— [no] subscriber-sap-id
— [no] shutdown
— [no] sub-sla-mgmt
— def-sla-profile default-sla-profile-name
— no def-sla-profile
— def-sub-profile default-subscriber-profile-name
— no def-sub-profile
— multi-sub-sap subscriber-limit
— no multi-sub-sap
— [no] shutdown
— single-sub-parameters

```

- **non-sub-traffic** *sub-profile sub-profile-name*  
**sla-profile** *sla-profile-name* [*subscriber sub-ident-string*]
- **no non-sub-traffic**
- **[no] profiled-traffic-only**
- **sub-ident-policy** *sub-ident-policy-name*
- **no sub-ident-policy**
- **[no] shutdown**
- **[no] srrp** *srrp-id*
  - **[no] bfd-enable** [*base* | *service-id*] **interface** *interface-name* **dst-ip** *ip-address*
  - **description** *description-string*
  - **no description**
  - **gw-mac** *mac-address*
  - **no gw-mac**
  - **keep-alive-interval** *interval*
  - **no keep-alive-interval**
  - **message-path** *sap-id*
  - **no message-path**
  - **[no] policy** *vrrp-policy-id*
  - **priority** *priority*
  - **no priority**
  - **[no] shutdown**
- **tos-marking-state** {*trusted* | *untrusted*}
- **no tos-marking-state**
- **[no] ipv6**
  - **[no] delegated-prefix-length** *prefix-length*
  - **[no] subscriber-prefixes**
    - **prefix** *ipv6-address/prefix-length* [*pd*] [*wan-host*]
    - **no prefix** *ipv6-address/prefix-length*
- **[no] private-retail-subnets**
- **[no] shutdown**

## Interface Commands

```

config
 — service
 — vprn
 — [no] interface ip-int-name
 — [no] active-cpm-protocols
 — address ip-address[/mask] [netmask] [broadcast {all-ones | host-ones}]
 — no address
 — [no] allow-directed-broadcasts
 — [no] arp-populate
 — arp-timeout [seconds]
 — no arp-timeout
 — authentication-policy name
 — no authentication-policy
 — bfd transmit-interval [receive receive-interval] [multiplier multiplier][echo-receive echo-interval] [type cpm-np]
 — no bfd
 — cflowd {acl | interface}
 — no cflowd
 — cpu-protection policy-id
 — no cpu-protection
 — description description-string
 — no description [description-string]
 — dhcp
 — description description-string
 — no description
 — gi-address ip-address [src-ip-addr]
 — no gi-address
 — lease-populate [nbr-of-leases]
 — no lease-populate
 — [no] option
 — action {replace | drop | keep}
 — no action
 — circuit-id [ascii-tuple | ifindex | sap-id | vlan-ascii-tuple]
 — no circuit-id
 — remote-id [mac | string string]
 — [no] vendor-specific-option
 — [no] client-mac-address
 — [no] sap-id
 — [no] service-id
 — string text
 — no string
 — [no] system-id
 — proxy-server
 — emulated-server ip-address
 — no emulated-server
 — lease-time [days days] [hrs hours] [min minutes] [sec seconds] [radius-override]
 — no lease-time
 — [no] shutdown
 — [no] relay-plain-bootp
 — server server1 [server2...(up to 8 max)]

```

- **no server**
- **[no] shutdown**
- **[no] trusted**
- **[no] use-arp**
- **host-connectivity-verify** [source {vrrp | interface}] [interval interval] [action {remove | alarm}]
- **icmp**
  - **[no] mask-reply**
  - **redirects** number seconds
  - **no redirects** [number seconds]
  - **ttl-expired** number seconds
  - **no ttl-expired** [number seconds]
  - **unreachables** number seconds
  - **no unreachables** [number seconds]
- **ip-mtu** octets
- **no ip-mtu**
- **ipcp**
  - **dns** ip-address [secondary ip-address]
  - **dns secondary** ip-address
  - **no dns** [ip-address] [secondary ip-address]
  - **peer-ip-address** ip-address
  - **no peer-ip-address**
- **[no] ipv6**
  - **address** ipv6-address/prefix-length [eui-64] [preferred]
  - **no address** ipv6-address/prefix-length
  - **[no] dhcp6-relay**
  - **[no] dhcp6-server**
  - **icmp6**
  - **[no] local-proxy-nd**
  - **neighbor** ipv6-address mac-address
  - **no neighbor** ipv6-address
  - **proxy-nd-policy** policy-name [policy-name...(up to 5 max)]
  - **no proxy-nd-policy**
- **local-dhcp-server** local-server-name
- **no local-dhcp-server**
- **[no] local-proxy-arp**
- **[no] loopback**
- **mac** ieee-address
- **no mac** [ieee-address]
- **[no] proxy-arp-policy**
- **[no] remote-proxy-arp**
- **secondary** {ip-address/mask | ip-address netmask} [broadcast all-ones | host-ones] [igp-inhibit]
- **no secondary** {ip-address/mask | ip-address netmask}
- **[no] shutdown**
- **static-arp** ip-address ieee-address
- **no static-arp** ip-address [ieee-address]
- **tos-marking-state** {trusted | untrusted}
- **no tos-marking-state**
- **unnumbered** [ip-int-name | ip-address]
- **no unnumbered**
- **[no] urpf-check**
  - **mode** {strict | loose}
  - **no mode**

## Interface Spoke SDP Commands

```

config
 — service
 — vpn service-id [customer customer-id]
 — no vpn service-id
 — [no] interface ip-int-name
 — spoke-sdp sdp-id [:vc-id] vc-type {ether|ipipe} [create]
 — no spoke-sdp sdp-id [:vc-id] vc-type {ether|ipipe} [create]
 — accounting-policy acct-policy-id
 — no accounting-policy
 — app-profile app-profile-name
 — no app-profile
 — [no] collect-stats
 — egress
 — filter ip ip-filter-id
 — filter ipv6 ipv6-filter-id}
 — no filter
 — vc-label egress-vc-label
 — no vc-label [egress-vc-label]
 — eth-cfm
 — mep mep-id domain md-index association ma-index
 [direction {up | down}]
 — no mep mep-id domain md-index association ma-
 index
 — [no] ccm-enable
 — ccm-ltm-priority priority
 — no ccm-ltm-priority
 — fault-propagation-enable {use-if-tlv | sus-
 pend-ccm}
 — no fault-propagation-enable
 — low-priority-defect {allDef | macRemErrX-
 con | remErrXcon | errXcon | xcon | noX-
 con}
 — mac-address mac-address
 — no mac-address
 — [no] shutdown
 — [no] hash-label
 — ingress
 — filter ip ip-filter-id
 — filter ipv6 ipv6-filter-id}
 — no filter
 — vc-label ingress-vc-label
 — no vc-label [ingress-vc-label]
 — [no] shutdown

```

## Interface VRRP Commands

```

config
 — service
 — vpnrn service-id [customer customer-id]
 — no vpnrn service-id
 — interface ip-int-name
 — ipv6
 — vrrp virtual-router-id [owner]
 — no vrrp virtual-router-id
 — [no] backup ip-address
 — init-delay seconds
 — no init-delay
 — mac ieee-address
 — no mac
 — [no] master-int-inherit
 — message-interval {[seconds] [milliseconds milliseconds]}
 — no message-interval
 — [no] ping-reply
 — policy vrrp-policy-id
 — no policy
 — [no] preempt
 — priority priority
 — no priority
 — [no] shutdown
 — [no] ssh-reply
 — [no] standby-forwarding
 — [no] telnet-reply
 — [no] traceroute-reply
 — vrrp virtual-router-id [owner]
 — no vrrp virtual-router-id
 — authentication-key {authentication-key | hash-key} [hash | hash2]
 — no authentication-key
 — authentication-type {password | message-digest}
 — no authentication-type
 — [no] backup ip-address
 — [no] bfd-enable [base | service-id] interface interface-name
 dst-ip ip-address
 — init-delay seconds
 — no init-delay
 — mac ieee-address
 — no mac
 — [no] master-int-inherit
 — message-interval {[seconds] [milliseconds milliseconds]}
 — no message-interval
 — [no] ping-reply
 — policy vrrp-policy-id
 — no policy
 — [no] preempt
 — priority priority
 — no priority
 — [no] shutdown
 — [no] ssh-reply

```



- [no] **standby-forwarding**
- [no] **telnet-reply**
- [no] **traceroute-reply**

## Interface SAP Commands

```

config
 — service
 — vpnrn service-id [customer customer-id]
 — no vpnrn service-id
 — [no] interface ip-int-name
 — [no] sap sap-id
 — accounting-policy acct-policy-id
 — no accounting-policy [acct-policy-id]
 — anti-spoof {ip | mac | ip-mac}
 — no anti-spoof
 — app-profile app-profile-name
 — no app-profile
 — atm
 — egress
 — traffic-desc traffic-desc-profile-id
 — no traffic-desc
 — encapsulation atm-encap-type
 — ingress
 — traffic-desc traffic-desc-profile-id
 — no traffic-desc
 — oam
 — [no] alarm-cells
 — [no] periodic-loopback
 — [no] collect-stats
 — description description-string
 — no description [description-string]
 — egress
 — agg-rate-limit agg-rate [queue-frame-based-
 accounting]
 — no agg-rate-limit agg-rate
 — filter ip ip-filter-id
 — no filter [ip ip-filter-id]
 — [no] hsmda-queue-override
 — packet-byte-offset {add add-bytes | subtract
 sub-bytes}
 — no packet-byte-offset
 — queue queue-id
 — no queue queue-id
 — rate pir-rate [cir cir-rate]
 — no rate
 — slope-policy hsmda-slope-policy-name allow-
 able
 — no slope-policy
 — secondary-shaper secondary-shaper-name
 — no secondary-shaper
 — [no] qinq-mark-top-only
 — qos policy-id
 — no qos [policy-id]
 — [no] queue-override
 — [no] queue queue-id
 — adaptation-rule [pir adaptation-rule] [cir
 adaptation-rule]
 — no adaptation-rule

```

- **avg-frame-overhead** *percentage*
- **no avg-frame-overhead**
- **cbs** *size-in-kbytes*
- **no cbs**
- **high-prio-only** *percent*
- **no high-prio-only**
- **mbs** {*size-in-kbytes* | **default**}
- **no mbs**
- **rate** *pir-rate* [*cir cir-rate*]
- **no rate**
- **[no] scheduler-override**
- **[no] scheduler** *scheduler-name*
- **rate** *pir-rate* [*cir cir-rate*]
- **no rate**
- **scheduler-policy** *scheduler-policy-name*
- **no scheduler-policy**
- **eth-cfm**
  - **mep** *mep-id* **domain** *md-index* **association** *ma-index* [*direction* {**up** | **down**}]
  - **no mep** *mep-id* **domain** *md-index* **association** *ma-index*
    - **[no] ccm-enable**
    - **ccm-ltm-priority** *priority*
    - **no ccm-ltm-priority**
    - **fault-propagation-enable** {*use-if-tlv* | **suspend-ccm**}
    - **no fault-propagation-enable**
    - **low-priority-defect** {*allDef* | **macRemErrXcon** | **remErrXcon** | **errXcon** | **xcon** | **noXcon**}
    - **mac-address** *mac-address*
    - **no mac-address**
    - **[no] shutdown**
- **frame-relay**
  - **[no] frf-12**
  - **ete-fragment-threshold** *threshold*
  - **no ete-fragment-threshold**
  - **[no] interleave**
  - **scheduling-class** *class-id*
  - **no scheduling-class**
- **ingress**
  - **filter** **ip** *ip-filter-id*
  - **no filter** [**ip** *ip-filter-id*]
  - **[no] hsmda-queue-override**
  - **packet-byte-offset** {*add add-bytes* | **subtract** *sub-bytes*}
  - **no packet-byte-offset**
  - **queue** *queue-id*
  - **no queue** *queue-id*
  - **rate** *pir-rate* [*cir cir-rate*]
  - **no rate**
  - **slope-policy** *hsmda-slope-policy-name* *allowable*
  - **no slope-policy**
  - **match-qinq-dot1p** {**top** | **bottom**}

```

— qos policy-id [shared-queuing | multipoint-shared]
— no qos [policy-id]
— [no] queue-override
 — [no] queue queue-id
 — adaptation-rule [pir adaptation-rule] [cir adaptation-rule]
 — no adaptation-rule
 — cbs size-in-kbytes
 — no cbs
 — high-prio-only percent
 — no high-prio-only
 — mbs {size-in-kbytes | default}
 — no mbs
 — rate pir-rate [cir cir-rate]
 — no rate
 — [no] scheduler-override
 — [no] scheduler scheduler-name
 — rate pir-rate [cir cir-rate]
 — no rate
 — scheduler-policy scheduler-policy-name
 — no scheduler-policy
— ipsec-gw name
— no ipsec-gw
 — default-secure-service service-id ipsec-interface ip-int-name
 — no default-secure-service
 — default-tunnel-template ipsec template identifier
 — no default-tunnel-template
 — ike-policy **** ike-policy-id
 — no ike-policy ****
 — local-gateway-address ip-address
 — no local-gateway-address
 — pre-shared-key key
 — no pre-shared-key
 — [no] shutdown
— multi-service-site customer-site-name
— no multi-service-site
— [no] shutdown
— static-host ip ip/did-address [mac ieee-address] [create]
— static-host mac ieee-address [create]
— no static-host [ip ip-address] [mac ieee-address]
— no static-host all [force]
— no static-host ip ip-address
 — ancp-string ancp-string
 — no ancp-string
 — app-profile app-profile-name
 — no app-profile
 — inter-dest-id intermediate-destination-id
 — no inter-dest-id
 — [no] shutdown
 — sla-profile sla-profile-name
 — no sla-profile
 — sub-profile sub-profile-name
 — no sub-profile
 — subscriber sub-ident

```

- no **subscriber**
- [no] **subscriber-sap-id**
- **tod-suite** *tod-suite-name*
- no **tod-suite**

## BGP Configuration Commands

```

config
 — service
 — vpn service-id [customer customer-id]
 — no vpn service-id
 — [no] bgp
 — [no] advertise-inactive
 — [no] aggregator-id-zero
 — always-compare-med {zero | infinity}
 — no always-compare-med
 — [no] as-path-ignore
 — auth-keychain name
 — authentication-key [authentication-key | hash-key] [hash | hash2]
 — no authentication-key
 — [no] bfd-enable
 — cluster cluster-id
 — no cluster
 — [no] connect-retry seconds
 — [no] damping
 — description description-string
 — no description
 — [no] disable-4byte-asn
 — [no] disable-client-reflect
 — disable-communities [standard] [extended]
 — no disable-communities
 — [no] disable-fast-external-failover
 — [no] eibgp-loadbalance
 — [no] enable-peer-tracking
 — export policy-name [policy-name...(upto 5 max)]
 — no export
 — family [ipv4][ipv6]
 — no family
 — [no] graceful-restart
 — [no] stale-routes-time time
 — hold-time seconds [strict]
 — no hold-time
 — [no] ibgp-multipath
 — import policy-name [policy-name...(up to 5 max)]
 — no import
 — keepalive seconds
 — no keepalive
 — local-as as-number [private]
 — no local-as
 — local-preference local-preference
 — no local-preference
 — loop-detect {drop-peer | discard-route | ignore-loop | off}
 — no loop-detect
 — med-out {number | igp-cost}
 — no med-out
 — min-as-origination seconds
 — no min-as-origination
 — min-route-advertisement seconds
 — no min-route-advertisement
 — multihop ttl-value

```

```

— no multihop
— multipath max-paths [eibgp]
— no multipath
— preference preference
— no preference
— [no] rapid-update {[l2-vpn] [mvpn-ipv4]}
— [no] rapid-withdrawal
— [no] remove-private
— router-id ip-address
— no router-id
— [no] shutdown
— [no] group name [dynamic-peer]
 — [no] advertise-inactive
 — [no] aggregator-id-zero
 — [no] as-override
 — auth-keychain name
 — authentication-key [authentication-key | hash-key] [hash |
 hash2]
 — no authentication-key
 — [no] bfd-enable
 — cluster cluster-id
 — no cluster
 — connect-retry seconds
 — no connect-retry
 — [no] damping
 — description description-string
 — no description
 — [no] disable-4byte-asn
 — [no] disable-client-reflect
 — disable-communities [standard] [extended]
 — no disable-communities
 — [no] disable-fast-external-failover
 — [no] enable-peer-tracking
 — export policy-name [policy-name...(upto 5 max)]
 — no export
 — family [ipv4][ipv6]
 — no family
 — [no] graceful-restart
 — [no] stale-routes-time time
 — family [ipv4][ipv6]
 — no family
 — hold-time seconds [strict]
 — no hold-time
 — import policy-name [policy-name...(upto 5 max)]
 — no import
 — keepalive seconds
 — no keepalive
 — local-address ip-address
 — no local-address
 — local-as as-number [private]
 — no local-as
 — local-preference local-preference
 — no local-preference
 — loop-detect {drop-peer|discard-route|ignore-loop|off}

```

- **no loop-detect**
- **med-out** {number | igp-cost}
- **no med-out**
- **min-as-origination** seconds
- **no min-as-origination**
- **min-route-advertisement** seconds
- **no min-route-advertisement**
- **multihop** ttl-value
- **no multihop**
- **[no] next-hop-self**
- **[no] passive**
- **peer-as** as-number
- **no peer-as**
- **preference** preference
- **no preference**
- **prefix-limit** limit
- **no prefix-limit**
- **[no] remove-private**
- **[no] shutdown**
- **ttl-security** min-ttl-value
- **no ttl-security**
- **type** {internal | external}
- **no type**
- **[no] neighbor** ip-address
  - **[no] advertise-inactive**
  - **[no] aggregator-id-zero**
  - **[no] as-override**
  - **auth-keychain** name
  - **authentication-key** [authentication-key | hash-key] [hash | hash2]
  - **no authentication-key**
  - **[no] bfd-enable**
  - **cluster** cluster-id
  - **no cluster**
  - **connect-retry** seconds
  - **no connect-retry**
  - **[no] damping**
  - **description** description-string
  - **no description**
  - **[no] disable-4byte-asn**
  - **[no] disable-client-reflect**
  - **disable-communities** [standard] [extended]
  - **no disable-communities**
  - **[no] disable-fast-external-failover**
  - **[no] enable-peer-tracking**
  - **export** policy-name [policy-name...(upto 5 max)]
  - **no export**
  - **[no] graceful-restart**
    - **[no] stale-routes-time** time (for 7.0 7750/7710)
  - **family** [ipv4][ipv6]
  - **no family**
  - **hold-time** seconds [strict]
  - **no hold-time**
  - **import** policy-name [policy-name...(upto 5 max)]
  - **no import**



```

— family [ipv4][ipv6]keepalive seconds
— no keepalive
— local-address ip-address
— no local-address
— local-as as-number [private]
— no local-as
— local-preference local-preference
— no local-preference
— loop-detect { drop-peer | discard-route | ignore-loop |
 off }
— no loop-detect
— med-out { number | igp-cost }
— no med-out
— min-as-origination seconds
— no min-as-origination
— min-route-advertisement seconds
— no min-route-advertisement
— multihop ttl-value
— no multihop
— [no] next-hop-self
— [no] passive
— peer-as as-number
— no peer-as
— preference preference
— no preference
— prefix-limit limit
— no prefix-limit
— [no] remove-private
— [no] shutdown
— ttl-security min-ttl-value
— no ttl-security
— type {internal | external}
— no type

```

## OSPF Configuration Commands

```

config
 — service
 — vprn service-id [customer customer-id]
 — no vprn service-id
 — [no] ospf
 — [no] ospf3
 — [no] area area-id
 — area-range ip-prefix/mask [advertise | not-advertise]
 — no area-range ip-prefix/mask
 — [no] blackhole-aggregate
 — [no] interface ip-int-name
 — [no] advertise-subnet
 — authentication-key [authentication-key | hash-key]
 [hash | hash2]
 — no authentication-key
 — authentication-type {password | message-digest}
 — no authentication-type
 — dead-interval seconds
 — no dead-interval
 — [no] graceful-restart
 — helper-disable
 — hello-interval seconds
 — no hello-interval
 — interface-type {broadcast | point-to-point}
 — no interface-type
 — message-digest-key key-id md5 [key | hash-key]
 [hash | hash2]
 — no message-digest-key key-id
 — metric metric
 — no metric
 — mtu bytes
 — no mtu
 — [no] passive
 — priority number
 — no priority
 — retransmit-interval seconds
 — no retransmit-interval
 — [no] shutdown
 — transit-delay seconds
 — no transit-delay
 — [no] nssa
 — area-range ip-prefix/mask [advertise | not-advertise]
 — no area-range ip-prefix/mask
 — originate-default-route [type-7]
 — no originate-default-route
 — [no] redistribute-external
 — [no] summaries
 — [no] sham-link ip-int-name ip-address
 — authentication-key [authentication-key | hash-key]
 [hash | hash2]
 — no authentication-key
 — authentication-type {password | message-digest}
 — no authentication-type

```

```

— dead-interval seconds
— no dead-interval
— hello-interval seconds
— no hello-interval
— message-digest-key key-id md5 [key | hash-key] [hash
| hash2]
— no message-digest-key key-id
— metric metric
— no metric
— retransmit-interval seconds
— no retransmit-interval
— [no] shutdown
— transit-delay seconds
— no transit-delay
— [no] stub
— default-metric metric
— no default-metric
— [no] summaries
— [no] virtual-link router-id transit-area area-id
— authentication-key [authentication-key | hash-key]
[hash | hash2]
— no authentication-key
— authentication-type {password | message-digest}
— no authentication-type
— dead-interval seconds
— no dead-interval
— hello-interval seconds
— no hello-interval
— message-digest-key key-id md5 [key | hash-key] [hash
| hash2]
— no message-digest-key key-id
— retransmit-interval seconds
— no retransmit-interval
— [no] shutdown
— transit-delay seconds
— no transit-delay
— [no] compatible-rfc1583
— export policy-name [policy-name...(up to 5 max)]
— no export
— export-limit number [log percentage]
— no export-limit
— external-db-overflow limit seconds
— no external-db-overflow
— external-preference preference
— no external-preference
— [no] ignore-dn-bit
— overload [timeout seconds]
— no overload
— [no] overload-include-stub
— overload-on-boot [timeout seconds]
— no overload-on-boot
— preference preference
— no preference
— reference-bandwidth bandwidth-in-kbps

```

- **no reference-bandwidth**
- **router-id** *ip-address*
- **no router-id**
- **[no] shutdown**
- **[no] super-backbone**
- **[no] suppress-dn-bit**
- **timers**
  - **[no] lsa-arrival** *lsa-arrival-time*
  - **[no] lsa-generate** *max-lsa-wait* [*lsa-initial-wait* [*lsa-second-wait*]]
  - **[no] spf-wait** *max-spf-wait* [*spf-initial-wait* [*spf-second-wait*]]
- **vpn-domain** *id* {**0005** | **0105** | **0205** | **8005**}
- **no vpn-domain**
- **vpn-tag** *vpn-tag*
- **no vpn-tag**

## PIM Configuration Commands

```

config
 — service
 — vprn
 — [no] pim
 — apply-to {all | none}
 — import {join-policy | register-policy} [policy-name [.. policy-name]]
 — no import {join-policy | register-policy}
 — [no] interface ip-int-name
 — [no] bfd-enable
 — [no] bsm-check-rtr-alert
 — hello-interval hello-interval
 — no hello-interval
 — hello-multiplier deci-units
 — no hello-multiplier
 — [no] improved-assert
 — max-groups value
 — no max-groups
 — mcac
 — mc-constraints
 — level level-id bw bandwidth
 — no level
 — number-down number-lag-port-down
 — no number-down
 — [no] shutdown
 — policy policy-name
 — no policy
 — unconstrained-bw bandwidth mandatory-bw mandatory-bw
 — no unconstrained-bw
 — multicast-senders {auto | always | never}
 — no multicast-senders
 — priority dr-priority
 — no priority
 — [no] shutdown
 — sticky-dr [priority dr-priority]
 — no sticky-dr
 — three-way-hello [compatibility-mode]
 — no three-way-hello
 — [no] tracking-support
 — [no] mc-ecmp-balance
 — [no] mc-ecmp-balance-hold
 — [no] non-dr-attract-traffic
 — rp
 — [no] anycast rp-ip-address
 — [no] rp-set-peer ip-address
 — bootstrap-export policy-name [.. policy-name...up to five]
 — no bootstrap-export
 — bootstrap-import policy-name [.. policy-name...up to five]
 — no bootstrap-import
 — bsr-candidate
 — address ip-address
 — no address

```

- **hash-mask-len** *hash-mask-length*
- **no hash-mask-len**
- **priority** *bootstrap-priority*
- **no priority**
- **[no] shutdown**
- **rp-candidate**
  - **address** *ip-address*
  - **no address**
  - **[no] group-range** {*grp-ip-address/mask* | *grp-ip-address* [*netmask*]}
  - **holdtime** *holdtime*
  - **no holdtime**
  - **priority** *priority*
  - **no priority**
  - **[no] shutdown**
- **static**
  - **[no] address** *ip-address*
  - **[no] group-prefix** {*grp-ip-address/mask* | *grp-ip-address* *netmask*}
  - **[no] override**
- **[no] shutdown**
- **spt-switchover-threshold** {*grp-ip-address/mask* | *grp-ip-address net-mask*} *spt-threshold*
- **no spt-switchover-threshold** {*grp-ip-address/mask* | *grp-ip-address net-mask*}
- **[no] ssm-groups**
  - **[no] group-range** {*grp-ip-address/mask* | *grp-ip-address net-mask*}

## RIP Configuration Commands

```

config
 — service
 — vprn
 — [no] rip
 — authentication-key [authentication-key | hash-key] [hash | hash2]
 — no authentication-key
 — authentication-type {none | password | message-digest}
 — no authentication-type
 — check-zero {enable | disable}
 — no check-zero
 — description description-string
 — no description
 — export policy-name [policy-name...(upto 5 max)]
 — no export
 — export
 — export-limit number [log percentage]
 — no export-limit
 — [no] group name
 — authentication-key [authentication-key | hash-key] [hash | hash2]
 — no authentication-key
 — authentication-type {none | password | message-digest}
 — no authentication-type
 — check-zero {enable | disable}
 — no check-zero
 — description description-string
 — no description
 — export policy-name [policy-name...(upto 5 max)]
 — no export
 — import policy-name [policy-name...(upto 5 max)]
 — no import
 — message-size max-num-of-routes
 — no message-size
 — metric-in metric
 — no metric-in
 — metric-out metric
 — no metric-out
 — preference preference
 — no preference
 — receive receive-type
 — no receive
 — send send-type
 — no send
 — [no] shutdown
 — split-horizon {enable | disable}
 — no split-horizon
 — timers update timeout flush
 — no timers
 — [no] neighbor ip-int-name
 — authentication-key authentication-key | hash-key [hash | hash2]
 — no authentication-key

```

- **authentication-type** {none | password | message-digest}
- **no authentication-type**
- **check-zero** {enable | disable}
- **no check-zero**
- **description** *description-string*
- **no description**
- **export** *policy-name* [*policy-name...*(upto 5 max)]
- **no export**
- **import** *policy-name* [*policy-name...*(upto 5 max)]
- **no import**
- **message-size** *max-num-of-routes*
- **no message-size**
- **metric-in** *metric*
- **no metric-in**
- **metric-out** *metric*
- **no metric-out**
- **preference** *preference*
- **no preference**
- **receive** *receive-type*
- **no receive**
- **send** *send-type*
- **no send**
- **[no] shutdown**
- **split-horizon** {enable | disable}
- **no split-horizon**
- **no timers**
- **timers** *update timeout flush*
- **import** *policy-name* [*policy-name...*(upto 5 max)]
- **no import**
- **message-size** *max-num-of-routes*
- **no message-size**
- **metric-in** *metric*
- **no metric-in**
- **metric-out** *metric*
- **no metric-out**
- **preference** *preference*
- **no preference**
- **[no] propagate-metric**
- **receive** *receive-type*
- **no receive**
- **send** *send-type*
- **no send**
- **[no] shutdown**
- **split-horizon** {enable | disable}
- **no split-horizon**
- **timers** *update timeout flush*
- **no timers**



## Show Commands

```

show
 — service
 — egress-label start-label [end-label]
 — ingress-label start-label [[end-label]
 — id service-id
 — all
 — authentication
 — statistics [policy name] [sap sap-id]
 — arp [ip-address] | [mac ieee-address] | [sap port-id:encap] | [interface ip-int-name]
 — arp-host [wholesaler service-id] [sap sap-id | interface interface-name | ip-address
 ip-address[/mask] | mac ieee-address | {[port port-id] [no-inter-dest-id | inter-
 dest-id inter-dest-id]}] [detail]
 — arp-host statistics [sap sap-id | interface interface-name]
 — arp-host summary [interface interface-name]
 — base
 — dhcp
 — lease-state [[sap sap-id] [sdp [sdp-id[:vc-id]]] | [interface interface-
 name] | [ip-address ip-address[/mask]] | [mac ieee-address] | [wholesaler
 service-id]] [detail]
 — statistics [sap sap-id]
 — statistics [sdp sdp-id:vc-id]
 — statistics [interface interface-name]
 — summary
 — gsmf
 — neighbors group [name] [ip-address]
 — sessions [group name] neighbor ip-address [port port-number] [associa-
 tion] [statistics]
 — host [sap sap-id] [detail]
 — sessions summary
 — sessions [detail] wholesaler service-id
 — interface [ip-address | ip-int-name] [detail]
 — retailers
 — sap [sap-id [detail]]
 — sdp [sdp-id | far-end ip-address] [detail]
 — subscriber-hosts [sap sap-id] [ip ip-address[/mask]] [mac ieee-address] [sub-pro-
 file sub-profile-name] [sla-profile sla-profile-name] [detail]
 — subscriber-hosts [detail] wholesaler service-id
 — wholesalers
 — sap-using [sap sap-id]
 — sap-using interface [ip-address | ip-int-name]
 — sap-using [ingress | egress] atm-td-profile td-profile-id
 — sap-using [ingress | egress] filter filter-id
 — sap-using [ingress | egress] qos-policy qos-policy-id
 — sap-using authentication-policy policy-name
 — sdp-using [sdp-id | far-end ip-address] [detail | keep-alive-history]
 — sdp-using [sdp-id[:vc-id]
 — service-using [vpn] [sdp sdp-id] [customer customer-id]

```

```

show
— router [vprn-service-id]
— aggregate [active]
— arp [ip-address | ip-int-name | mac ieee-mac-address] [sdp sdp-id:vc-id] [summary]
— bgp
— damping [ip-prefix/mask | ip-address] [detail]
— damping [damp-type] [detail]
— group [name] [detail]
— neighbor [ip-address [[family family] filter1]]
— neighbor [as-number [[family family] filter2]]
— paths
— routes [family family] [prefix [detail | longer]]
— routes [family family] [prefix [hunt | brief]]
— routes [family family] [community comm-id]
— routes [family family] [aspath-regex reg-ex1]
— routes [family] [ipv6-prefix[/prefix-length] [detail | longer]][[hunt [brief]]]
— summary [all]
— dhcp
— statistics [ip-int-name | ip-address]
— summary
— ecmp
— interface [{[ip-address | ip-int-name] [detail]} | summary | exclude-services]
— mvpn
— rip
— database [ip-address[/mask] [longer]] [peer ip-address] [detail]
— neighbor [ip-int-name | ip-address] [detail] [advertised-routes]
— peer [interface-name]
— statistics [ip-int-name | ip-address]
— route-table [ip-address[/mask] [longer | best]] | [protocol protocol] | [summary]
— service-prefix
— static-arp [ip-address | ip-int-name | mac ieee-mac-address]
— static-route [ip-prefix /mask] | [preference preference] | [next-hop ip-address] [detail]
— tunnel-table [ip-address[/mask] [protocol protocol | sdp sdp-id]
— tunnel-table [summary]

```

## Clear Commands

```

clear
 — router
 — arp-host
 — arp-host { mac ieee-address | sap sap-id | ip-address ip-address[/mask] }
 — arp-host [port port-id] [inter-dest-id intermediate-destination-id | no-inter-dest-id]
 — arp-host statistics [sap sap-id | interface interface-name]
 — statistics interface [ip-int-name | ip-address]
 — bgp
 — damping [{prefix/mask [neighbor ip-address]} | {group name}]
 — flap-statistics [[ip-prefix/mask] [neighbor ip-address]] | [group group-name] |
 [regex reg-exp] | [policy policy-name]
 — neighbor {ip-address | as as-number | external | all} [soft | soft-inbound | statis-
 tics]
 — protocol
 — dhcp
 — statistics [interface ip-int-name | ip-address]
 — forwarding-table [slot-number]
 — interface [ip-int-name | ip-address] [icmp]
 — rip
 — database
 — statistics [neighbor ip-int-name | ip-address]

clear
 — service
 — id service-id
 — dhcp
 — lease-state
 — lease-state ip-address ip-address
 — lease-state mac ieee-address
 — lease-state sap sap-id
 — lease-state sdp sdp-id:vc-id
 — spoke-sdp sdp-id:vc-id ingress-vc-label
 — statistics
 — sap sap-id {all | counters | stp}
 — sdp sdp-id keep-alive
 — id service-id
 — counters
 — spoke-sdp sdp-id:vc-id {all | counters | stp}
 — spoke-sdp

```

## Debug Commands

```

debug
 — service
 — id service-id
 — [no] arp-host
 — [no] dhcp
 — detail-level {low | medium | high}
 — no detail-level
 — mode {dropped-only | ingr-and-dropped | egr-ingr-and-dropped}
 — no mode
 — [no] sap sap-id
 — [no] sdp sdp-id:vc-id
 — [no] event-type {config-change | svc-oper-status-change | sap-oper-status-change | sdpbind-oper-status-change}
 — [no] host-connectivity-verify
 — [no] ip ip-address
 — [no] mac ieee-address
 — [no] sap sap-id
 — [no] sap sap-id
 — event-type {config-change | oper-status-change}
 — [no] sdp sdp-id:vc-id
 — event-type {config-change | oper-status-change}
 — stp
 — [no] all-events
 — [no] bpdu
 — [no] core-connectivity
 — [no] exception
 — [no] fsm-state-changes
 — [no] fsm-timers
 — [no] port-role
 — [no] port-state
 — [no] sap sap-id
 — [no] sdp sdp-id:vc-id
 debug
 — router [router-instance]
 — igmp
 — [no] interface [ip-int-name | ip-address]
 — [no] mcs [ip-int-name]
 — [no] misc
 — [no] packet [query|v1-report|v2-report|v3-report|v2-leave] [ip-int-name|ip-address]

```

---

## VPRN Service Configuration Commands

---

### Generic Commands

#### shutdown

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>[no] shutdown</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b> | <pre> config&gt;service&gt;vprn config&gt;service&gt;vprn config&gt;service&gt;vprn&gt;igmp-trk config&gt;service&gt;vprn&gt;red-if config&gt;service&gt;vprn&gt;router-advert&gt;if config&gt;service&gt;vprn&gt;gsmp config&gt;service&gt;vprn&gt;gsmp&gt;group config&gt;service&gt;vprn&gt;gsmp&gt;group&gt;neighbor config&gt;service&gt;vprn&gt;igmp config&gt;service&gt;vprn&gt;igmp&gt;interface config&gt;service&gt;vprn&gt;igmp&gt;if&gt;mcac config&gt;service&gt;vprn&gt;igmp&gt;if&gt;mcac&gt;mc-constraints config&gt;service&gt;vprn&gt;interface config&gt;service&gt;vprn&gt;if&gt;dhcp config&gt;service&gt;vprn&gt;if&gt;dhcp&gt;proxy config&gt;service&gt;vprn&gt;if&gt;vrrp config&gt;service&gt;vprn&gt;if&gt;ipv6&gt;vrrp config&gt;service&gt;vprn&gt;if&gt;sap config&gt;service&gt;vprn&gt;if&gt;sap&gt;static-host config&gt;service&gt;vprn&gt;bgp config&gt;service&gt;vprn&gt;bgp&gt;group config&gt;service&gt;vprn&gt;bgp&gt;group&gt;neighbor config&gt;service&gt;vprn&gt;mvpn&gt;provider-tunnel&gt;inclusive&gt;pim config&gt;service&gt;vprn&gt;ospf config&gt;service&gt;vprn&gt;ospf&gt;area&gt;interface config&gt;service&gt;vprn&gt;ospf3 config&gt;service&gt;vprn&gt;ospf3&gt;area&gt;interface config&gt;service&gt;vprn&gt;ospf3&gt;area&gt;virtual-link config&gt;service&gt;vprn&gt;ospf&gt;area&gt;virtual-link config&gt;service&gt;vprn&gt;ospf&gt;area&gt;sham-link config&gt;service&gt;vprn&gt;red-if&gt;spoke-sdp config&gt;service&gt;vprn&gt;rip config&gt;service&gt;vprn&gt;rip&gt;group config&gt;service&gt;vprn&gt;rip&gt;group&gt;neighbor config&gt;service&gt;vprn&gt;pim config&gt;service&gt;vprn&gt;pim&gt;interface config&gt;service&gt;vprn&gt;pim&gt;rp&gt;bsr-candidate config&gt;service&gt;vprn&gt;pim&gt;rp&gt;rp-candidate </pre> |

```
config>service>vprn>spoke-sdp
config>service>vprn>sub-if>grp-if
config>service>vprn>sub-if>grp-if>dhcp
config>service>vprn>sub-if>grp-if>dhcp>proxy-server
config>service>vprn>sub-if>grp-if>sap
config>service>vprn>sub-if>grp-if>arp-host
config>service>vprn>sub-if>grp-if>sap>sub-sla-mgmt
config>service>vprn>dhcp>server>failover
config>service>vprn>ipsec-if
config>service>vprn>ipsec-interface>sap>tunnel
```

**Description** This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics.

The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they may be deleted.

Services are created in the administratively down (**shutdown**) state. When a **no shutdown** command is entered, the service becomes administratively up and then tries to enter the operationally up state. Default administrative states for services and service entities is described below in Special Cases.

The **no** form of this command places the entity into an administratively enabled state.

If the AS number was previously changed, the BGP AS number inherits the new value.

**Special Cases** **Service Admin State** — Bindings to an SDP within the service will be put into the out-of-service state when the service is shutdown. While the service is shutdown, all customer packets are dropped and counted as discards for billing and debugging purposes.

A service is regarded as operational providing that one IP Interface SAP and one SDP is operational.

**VPNRN BGP and RIP** — This command disables the BGP or RIP instance on the given IP interface. Routes learned from a neighbor that is shutdown are immediately removed from the BGP or RIP database and RTM. If BGP or RIP is globally shutdown, then all RIP group and neighbor interfaces are shutdown operationally. If a BGP or RIP group is shutdown, all member neighbor interfaces are shutdown operationally. If a BGP or RIP neighbor is shutdown, just that neighbor interface is operationally shutdown.

## description

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>description</b> <i>description-string</i><br><b>no description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>if>dhcp<br>config>service>vprn>bgp<br>config>service>vprn>rip<br>config>service>vprn<br>config>service>vprn>red-if<br>config>service>vprn>interface<br>config>service>vprn>if>sap<br>config>service>vprn>if>dhcp<br>config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor<br>config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor<br>config>service>vprn>subscriber-interface<br>config>service>vprn>sub-if>dhcp<br>config>service>vprn>sub-if>grp-if<br>config>service>vprn>sub-if>grp-if>dhcp<br>config>service>vprn>sub-if>grp-if>sap>atm<br>config>service>vprn>dhcp<br>config>service>vprn>dhcp>server>pool<br>config>service>vprn>sub-if>grp-if>pppoe<br>config>service>vprn>ipsec-interface>sap>tunnel |
| <b>Description</b> | This command creates a text description stored in the configuration file for a configuration context.<br><br>The <b>description</b> command associates a text string with a configuration context to help identify the content in the configuration file.<br><br>The <b>no</b> form of this command removes the string from the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Default</b>     | No description associated with the configuration context.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <i>string</i> — The description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## Global Commands

### vprn

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                       |                     |                |  |                   |                       |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|----------------|--|-------------------|-----------------------|
| Syntax        | <b>vprn</b> <i>service-id</i> [ <b>customer</b> <i>customer-id</i> ] [ <b>create</b> ]<br><b>no vprn</b> <i>service-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                     |                |  |                   |                       |
| Context       | config>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                     |                |  |                   |                       |
| Description   | <p>This command creates or edits a Virtual Private Routed Network (VPRN) service instance.</p> <p>If the <i>service-id</i> does not exist, a context for the service is created. If the <i>service-id</i> exists, the context for editing the service is entered.</p> <p>VPRN services allow the creation of customer-facing IP interfaces in the same routing instance used for service network core routing connectivity. VPRN services require that the IP addressing scheme used by the subscriber must be unique between it and other addressing schemes used by the provider and potentially the entire Internet.</p> <p>IP interfaces defined within the context of an VPRN service ID must have a SAP created as the access point to the subscriber network.</p> <p>When a service is created, the <b>customer</b> keyword and <i>customer-id</i> must be specified and associates the service with a customer. The <i>customer-id</i> must already exist having been created using the customer command in the service context. When a service is created with a customer association, it is not possible to edit the customer association. The service must be deleted and re-created with a new customer association.</p> <p>When a service is created, the use of the <b>customer</b> <i>customer-id</i> is optional to navigate into the service configuration context. If attempting to edit a service with the incorrect <i>customer-id</i> results in an error.</p> <p>Multiple VPRN services are created to separate customer-owned IP interfaces. More than one VPRN service can be created for a single customer ID. More than one IP interface can be created within a single VPRN service ID. All IP interfaces created within an VPRN service ID belongs to the same customer.</p> <p>The <b>no</b> form of the command deletes the VPRN service instance with the specified <i>service-id</i>. The service cannot be deleted until all the IP interfaces and all routing protocol configurations defined within the service ID have been shutdown and deleted.</p> |                       |                     |                |  |                   |                       |
| Default       | None — No VPRN service instances exist until they are explicitly created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                     |                |  |                   |                       |
| Parameters    | <p><i>service-id</i> — The unique service identification number identifying the service in the service domain. This ID must be unique to this service and may not be used for any other service of any type. The <i>service-id</i> must be the same number used for every 7750 SR and 7710 SR on which this service is defined.</p> <table><tr><td><b>Values</b></td><td><i>service-id</i>:</td><td>1 — 2147483648</td></tr><tr><td></td><td><i>svc-name</i>:</td><td>64 characters maximum</td></tr></table> <p><b>customer</b> <i>customer-id</i> — Specifies an existing customer identification number to be associated with the service. This parameter is required on service creation and optional for service editing or deleting.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Values</b>         | <i>service-id</i> : | 1 — 2147483648 |  | <i>svc-name</i> : | 64 characters maximum |
| <b>Values</b> | <i>service-id</i> :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1 — 2147483648        |                     |                |  |                   |                       |
|               | <i>svc-name</i> :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 64 characters maximum |                     |                |  |                   |                       |



**Values** 1 — 2147483647

## auto-bind

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>auto-bind</b> {ldp   gre   rsvp-te   mpls}<br><b>no auto-bind</b>                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command specifies the automatic binding type for the SDP assigned to this service.                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Default</b>     | None — The auto-bind type must be explicitly specified.                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <p><b>ldp</b> — Specifies LDP to be the automatic binding for the SDP assigned to the service.</p> <p><b>gre</b> — Specifies GRE to be the automatic binding for the SDP assigned to the service.</p> <p><b>rsvp-te</b> — Specifies RSVP-TE to be the automatic binding for the SDP assigned to the service.</p> <p><b>mpls</b> — Specifies that both LDP and RSVP-TE can be used to resolve the BGP nexthop for VPRN routes in an associated VPRN instance.</p> |

## autonomous-system

|                    |                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>autonomous-system</b> <i>as-number</i><br><b>no autonomous-system</b>                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command defines the autonomous system (AS) to be used by this VPN routing/forwarding (VRF). This command defines the autonomous system to be used by this VPN routing.</p> <p>The <b>no</b> form of the command removes the defined AS from this VPRN context.</p> |
| <b>Default</b>     | no autonomous-system                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>as-number</i> — Specifies the AS number for the VPRN service.                                                                                                                                                                                                           |
| <b>Values</b>      | 1 — 4294967295                                                                                                                                                                                                                                                             |

## ecmp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ecmp</b> <i>max-ecmp-routes</i><br><b>no ecmp</b>                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command enables equal-cost multipath (ECMP) and configures the number of routes for path sharing. For example, the value of 2 means that 2 equal cost routes will be used for cost sharing.</p> <p>ECMP groups form when the system routes to the same destination with equal cost values. Routing table entries can be entered manually (as static routes), or they can be formed when neighbors are</p> |

discovered and routing table information is exchanged by routing protocols. The system can balance traffic across the groups with equal costs.

ECMP can only be used for routes learned with the same preference and same protocol. See the discussion on preferences in the **static-route** command.

When more ECMP routes are available at the best preference than configured by the `max-ecmp-routes` parameter, then the lowest next-hop IP address algorithm is used to select the number of routes configured.

The **no** form of the command disables ECMP path sharing. If ECMP is disabled and multiple routes are available at the best preference and equal cost, the newly updated route is used.

|                   |                                                                                   |
|-------------------|-----------------------------------------------------------------------------------|
| <b>Default</b>    | no ecmp                                                                           |
| <b>Parameters</b> | <i>max-ecmp-routes</i> — Specifies the maximum number of routes for path sharing. |
| <b>Values</b>     | 0— 16                                                                             |

### grt-lookup

|                    |                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>grt-lookup</b>                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                  |
| <b>Description</b> | This command provides the context under which all grt-leaking commands are configured. If all the supporting commands in the context are removed, this command will also be removed. |

### enable-grt

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] enable-grt</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>grt-lookup                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command enables the functions required for looking up routes in the Global Route Table (GRT) when the lookup in the local VRF fails. If this command is enabled without the use of a static-route option (as subcommand to this parent), a lookup in the local VRF is preferred over the GRT. When the local VRF returns no route table lookup matches, the result from the GRT is preferred.</p> <p>The no form of this command disables the lookup in the GRT when the lookup in the local VRF fails.</p> |
| <b>Default</b>     | no enable-grt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## export-grt

|                    |                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>export-grt</b> <i>policy-name</i> [ <i>policy-name</i> ...(up to 5 max)]<br><b>no export-grt</b>                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>grt-lookup                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command uses route policy to determine which routes are exported from the VRF to the GRT along with all the forwarding information. These entries will be marked as BGP-VPN routes in the GRT. Routes must be in the GRT in order for proper routing to occur from the GRT to the VRF. |
| <b>Default</b>     | no export-grt                                                                                                                                                                                                                                                                               |

## export-limit

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>export-limit</b> <i>num-routes</i><br><b>no export-limit</b>                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>grt-lookup<br>config>service>vprn>ospf<br>config>service>vprn>ospf3<br>config>service>vprn>rip                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command provides the ability to limit the total number of routes exported from the VRF to the GRT. The value zero (0) provides an override that disables the maximum limit. Setting this value to zero (0) will not limit the number of routes exported from the VRF to the GRT. Configuring a range of one (1) to 1000 will limit the number of routes to the specified value.<br><br>The <b>no</b> form of the command sets the export-limit to a default of five (5). |
| <b>Default</b>     | export-limit 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>num-routes</i> — Specifies maximum number of routes that can be exported.<br><br><b>Values</b> 0 — 1000                                                                                                                                                                                                                                                                                                                                                                    |

## static-route

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static-route</b> { <i>ip-prefix/prefix-length</i>   <i>ip-prefix netmask</i> } [ <b>preference</b> <i>preference</i> ] [ <b>metric</b> <i>metric</i> ] [ <b>enable disable</b> ] <b>grt</b><br><b>no static-route</b>                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>grt-lookup>enable-grt                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command is a simplified version of the traditional static-route command pointing to the base routing instance. This instructs the route lookup function to look only in the GRT for a route matching destination static route and not look up the route in the local VRF. The GRT keyword is a required parameter.<br><br>The no form casues the feature into the default mode of primary lookup for all routes in the local VRF and failing a match in the local VRF, the lookup result in the GRT will be used. |

## VPRN Service Configuration Commands

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>ip-prefix/prefix-length</i> — Specifies the IPv4 prefix and prefix length.<br><b>Values</b> ip-prefix: a.b.c.d (host bits must be 0)<br>ipv4-prefix-length: [0..32]<br><i>netmask</i> — Specifies the netmask.<br><b>Values</b> a.b.c.d (network bits all 1 and host bits all 0)<br><i>preference</i> — Specifies the preference.<br><b>Values</b> 1..255<br><i>metric</i> — Specifies the metric.<br><b>Values</b> 0..65535<br><b>enable disable</b> — Keyword; specifies the state of the static-route.<br><b>grt</b> — Keyword; Global Route Table lookup. |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## gsmp

|                    |                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>gsmp</b>                                                                                |
| <b>Context</b>     | config>service>vprn                                                                        |
| <b>Description</b> | This command enables the context to configure GSMP connections maintained in this service. |
| <b>Default</b>     | not enabled                                                                                |

## group

|                    |                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group name</b>                                                                                                       |
| <b>Context</b>     | config>service>vprn>gsmp                                                                                                     |
| <b>Description</b> | This command specifies a GSMP name. A GSMP group name is unique only within the scope of the service in which it is defined. |
| <b>Parameters</b>  | <i>name</i> — Specifies the group name up to 32 characters in length.                                                        |

## ancp

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>Syntax</b>      | <b>ancp</b>                                                  |
| <b>Context</b>     | config>service>vprn>gsmp>group                               |
| <b>Description</b> | This command configures ANCP parameters for this GSMP group. |

## dynamic-topology-discover

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dynamic-topology-discover</b>                                                                                            |
| <b>Context</b>     | config>service>vprn>gsmp>group>ancp                                                                                              |
| <b>Description</b> | This command enables the ANCP dynamic topology discovery capability.<br>The <b>no</b> form of this command disables the feature. |

## oam

|                    |                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] oam</b>                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>gsmp>group>ancp                                                                                                                                                    |
| <b>Description</b> | This command specifies whether or not the GSMP ANCP OAM capability should be negotiated at startup of the GSMP connection.<br>The <b>no</b> form of this command disables the feature. |

## hold-multiplier

|                    |                                                                                        |
|--------------------|----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hold-multiplier</b> <i>multiplier</i><br><b>no hold-multiplier</b>                  |
| <b>Context</b>     | config>service>vprn>gsmp>group                                                         |
| <b>Description</b> | This command configures the hold-multiplier for the GSMP connections in this group.    |
| <b>Parameters</b>  | <i>multiplier</i> — Specifies the GSMP hold multiplier value.<br><b>Values</b> 1 — 100 |

## keepalive

|                    |                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keepalive</b> <i>seconds</i><br><b>no keepalive</b>                                        |
| <b>Context</b>     | config>service>vprn>gsmp>group                                                                |
| <b>Description</b> | This command configures keepalive values for the GSMP connections in this group.              |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the GSMP keepalive timer value in seconds.<br><b>Values</b> 1 — 25 |

## neighbor

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] neighbor</b> <i>ip-address</i>                                   |
| <b>Context</b>     | config>service>vprn>gsmp>group                                           |
| <b>Description</b> | This command adds or removes a neighbor in this group.                   |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the IP address in dotted decimal notation. |

## local-address

|                    |                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-address</b> <i>ip-address</i><br><b>no local-address</b>                          |
| <b>Context</b>     | config>service>vprn>gsmp>group>neighbor                                                    |
| <b>Description</b> | This command configures the source ip-address used in the connection towards the neighbor. |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the IP address in dotted decimal notation.                   |

## priority-marking

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>priority-marking dscp</b> <i>dscp-name</i><br><b>priority-marking prec</b> <i>ip-prec-value</i><br><b>no priority-marking</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>gsmp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command configures the type of priority marking to be used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <b>dscp</b> <i>dscp-name</i> — Specifies the DSCP code-point to be used.<br><br><div> <b>Values</b> be, cp1, cp2, cp3, cp4, cp5, cp6, cp7, cs1, cp9, af11, cp11, af12, cp13, af13, cp15, cs2, cp17, af21, cp19, af22, cp21, af23, cp23, cs3, cp25, af31, cp27, af32, cp29, af33, cp31, cs4, cp33, af41, cp35, af42, cp37, af43, cp39, cs5, cp41, cp42, cp43, cp44, cp45, ef, cp47, nc1, cp49, cp50, cp51, cp52, cp53, cp54, cp55, nc2, cp57, cp58, cp59, cp60, cp61, cp62, cp63 </div> <b>prec</b> <i>ip-prec-value</i> — Specifies the precedence value to be used.<br><div> <b>Values</b> 0 — 7 </div> |

## igmp

|                    |                                                                |
|--------------------|----------------------------------------------------------------|
| <b>Syntax</b>      | <b>igmp</b>                                                    |
| <b>Context</b>     | config>service>vprn                                            |
| <b>Description</b> | This command enables the context to configure IGMP parameters. |
| <b>Default</b>     | not enabled                                                    |

## interface

|                    |                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> <i>ip-int-name</i><br><b>no interface</b>                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>igmp                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command enables the context to configure IGMP interface parameters.                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the name of the IP interface. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.<br><br><b>Values</b> 1 — 32 characters maximum |

## import

|                    |                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>import</b> <i>policy-name</i><br><b>no import</b>                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>igmp>interface                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command imports a policy to filter IGMP packets. The <b>no</b> form of the command removes the policy association from the IGMP instance.                                                                                                                                                                                           |
| <b>Default</b>     | <b>no import</b> — No import policy specified.                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>policy-name</i> — The import route policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.<br><br>The specified name(s) must already be defined. |

## max-groups

|                    |                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-groups</b> <i>value</i><br><b>no max-groups</b>                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>igmp>interface                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command specifies the maximum number of groups for which IGMP can have local receiver information based on received IGMP reports on this interface. When this configuration is changed dynamically to a value lower than the currently accepted number of groups, the groups that are already accepted are not deleted. Only new groups will not be allowed. |
| <b>Default</b>     | 0, no limit to the number of groups.                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>value</i> — Specifies the maximum number of groups for this interface.<br><br><b>Values</b> 1 — 16000                                                                                                                                                                                                                                                          |

### mcac

|                    |                                                                                  |
|--------------------|----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mcac</b>                                                                      |
| <b>Context</b>     | config>service>vprn>interface<br>config>service>vprn>pim>if                      |
| <b>Description</b> | This command configures multicast CAC policy and constraints for this interface. |
| <b>Default</b>     | none                                                                             |

### mc-constraints

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mc-constraints</b>                                                    |
| <b>Context</b>     | config>service>vprn>igmp>if>mcac<br>config>service>vprn>pim>if>mcac      |
| <b>Description</b> | This command enables the context to configure multicast CAC constraints. |
| <b>Default</b>     | none                                                                     |

### level

|                    |                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>level</b> <i>level-id</i> <b>bw</b> <i>bandwidth</i><br><b>no level</b> <i>level-id</i>                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>igmp>if>mcac<br>config>service>vprn>pim>if>mcac                                                                                                                                                                                             |
| <b>Description</b> | This command configures interface levels and associated bandwidth for multicast CAC policy.                                                                                                                                                                     |
| <b>Parameters</b>  | <i>level-id</i> — Specifies an entry for the multicast CAC policy constraint level configured on this system.<br><b>Values</b> 1 — 8<br><i>bandwidth</i> — Specifies the bandwidth in kilobits per second (kbps) for the level.<br><b>Values</b> 1 — 2147483647 |

### number-down

|                    |                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>number-down</b> <i>number-lag-port-down</i><br><b>no number-down</b>                           |
| <b>Context</b>     | config>service>vprn>igmp>if>mcac>mc-constraints<br>config>service>vprn>pim>if>mcac>mc-constraints |
| <b>Description</b> | This command configures the number of ports down and level for interface's multicast CAC policy.  |
| <b>Default</b>     | not enabled                                                                                       |



## policy

|                    |                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>policy</b> <i>policy-name</i><br><b>no policy</b>                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>igmp>if>mcac<br>config>service>vprn>pim>if>mcac                                                                                                                                                                                                                 |
| <b>Description</b> | This command configures the mulitcast CAC policy name.                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>policy-name</i> — The multicast CAC policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. |

## unconstrained-bw

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>unconstrained-bw</b> <i>bandwidth</i> <b>mandatory-bw</b> <i>mandatory-bw</i><br><b>no unconstrained-bw</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>igmp>if>mcac<br>config>service>vprn>pim>if>mcac                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command configure the bandwidth assigned for interface's multicast CAC policy traffic. When disabled ( <b>no unconstrained-bw</b> ), there is no constraint on bandwidth allocated at the interface. When enabled and if a multicast CAC policy is assigned on the interface, then no group (channel) from that policy is allowed on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command configures the bandwidth for the interface's multicast CAC policy traffic. When disabled ( <b>no unconstrained-bw</b> ) there will be no checking of bandwidth constraints on the interface level. When enabled and a policy is defined, enforcement is performed. The allocated bandwidth for optional channels should not exceed the <b>unconstrained-bw</b> minus the <b>mandatory-bw</b> and the mandatory channels have to stay below the specified value for the <b>mandatory-bw</b> . After this interface check, the bundle checks are performed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><i>bandwidth</i> — The bandwidth assigned for interface's MCAC policy traffic, in kilo-bits per second.</p> <p><b>Values</b> 1— 2147483647</p> <p><b>mandatory-bw</b> <i>mandatory-bw</i> — Specifies the bandwidth pre-reserved for all the mandatory channels on a given interface in kilo-bits per second (kbps).</p> <p>If the <i>bandwidth</i> value is 0, no mandatory channels are allowed. If the value of <i>bandwidth</i> is '-1', then all mandatory and optional channels are allowed.</p> <p>If the value of <i>mandatory-bw</i> is equal to the value of <i>bandwidth</i>, then all the unconstrained bandwidth on a given interface is allocated to mandatory channels configured through multicast CAC policy on that interface and no optional groups (channels) are allowed.</p> <p>The value of <i>mandatory-bw</i> should always be less than or equal to that of <i>bandwidth</i>, An attempt to set the value of <i>mandatory-bw</i> greater than that of <i>bandwidth</i>, will result in inconsistent value error.</p> <p><b>Values</b> 1— 2147483647</p> |

### static

|                    |                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static</b>                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>igmp>interface                                                                                                                                             |
| <b>Description</b> | This command tests forwarding on an interface without a receiver host. When enabled, data is forwarded to an interface without receiving membership reports from host members. |
| <b>Default</b>     | none                                                                                                                                                                           |

### group

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group</b> <i>grp-ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>igmp>interface>static                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command adds a static multicast group either as a (*,G) or one or more (S,G) records. Use IGMP static group memberships to test multicast forwarding without a receiver host. When IGMP static groups are enabled, data is forwarded to an interface without receiving membership reports from host members.</p> <p>When static IGMP group entries on point-to-point links that connect routers to a rendezvous point (RP) are configured, the static IGMP group entries do not generate join messages toward the RP.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>grp-ip-address</i> — Specifies an IGMP multicast group address that receives data on an interface. The IP address must be unique for each static group. The address must be in dotted decimal notation                                                                                                                                                                                                                                                                                                                         |

### source

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>source</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>igmp>interface>static>group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command specifies a IPv4 unicast address that sends data on an interface. This enables a multicast receiver host to signal a router the group is to receive multicast traffic from, and from the source(s) that the traffic is expected.</p> <p>The <b>source</b> command is mutually exclusive with the specification of individual sources for the same group.</p> <p>The source command in combination with the group is used to create a specific (S,G) static group entry.</p> <p>Use the <b>no</b> form of the command to remove the source from the configuration.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the IPv4 unicast address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## starg

|                    |                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>starg</b>                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>igmp>interface>static>group                                                                                                                                                                                       |
| <b>Description</b> | This command adds a static (*,G) entry. This command can only be enabled if no existing source addresses for this group are specified.<br><br>Use the <b>no</b> form of the command to remove the starg entry from the configuration. |
| <b>Default</b>     | none                                                                                                                                                                                                                                  |

## subnet-check

|                    |                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] subnet-check</b>                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>igmp>interface                                                                                                                                     |
| <b>Description</b> | This command enables subnet checking for IGMP messages received on this interface. All IGMP packets with a source address that is not in the local subnet are dropped. |
| <b>Default</b>     | enabled                                                                                                                                                                |

## version

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>version <i>version</i></b><br><b>no version</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>igmp>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command specifies the IGMP version. If routers run different versions of IGMP, they will negotiate the lowest common version of IGMP that is supported by hosts on their subnet and operate in that version. For IGMP to function correctly, all routers on a LAN should be configured to run the same version of IGMP on that LAN.<br><br>For IGMPv3, note that a multicast router that is also a group member performs both parts of IGMPv3, receiving and responding to its own IGMP message transmissions as well as those of its neighbors. |
| <b>Default</b>     | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>version</i> — Specifies the IGMP version number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Values</b>      | 1, 2, 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## query-interval

|                    |                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>query-interval</b> <i>seconds</i><br><b>no query-interval</b>                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>igmp                                                                                                                                                                                                             |
| <b>Description</b> | This command specifies the frequency that the querier router transmits general host-query messages. The host-query messages solicit group membership information and are sent to the all-systems multicast group address, 224.0.0.1. |
| <b>Default</b>     | 125                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>seconds</i> — The time frequency, in seconds, that the router transmits general host-query messages.<br><b>Values</b> 2 — 1024                                                                                                    |

## query-last-member-interval

|                    |                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>query-last-member-interval</b> <i>seconds</i>                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>igmp                                                                                                                                                                                                                                |
| <b>Description</b> | This command configures the frequency at which the querier sends group-specific query messages including messages sent in response to leave-group messages. The lower the interval, the faster the detection of the loss of the last member of a group. |
| <b>Default</b>     | 1                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the frequency, in seconds, at which query messages are sent.<br><b>Values</b> 1 — 1024                                                                                                                                       |

## query-response-interval

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>query-response-interval</b> <i>seconds</i>                                                                                                      |
| <b>Context</b>     | config>service>vprn>igmp                                                                                                                           |
| <b>Description</b> | This command specifies how long the querier router waits to receive a response to a host-query message from a host.                                |
| <b>Default</b>     | 10                                                                                                                                                 |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the the length of time to wait to receive a response to the host-query message from the host.<br><b>Values</b> 1 — 1023 |

## robust-count

|                    |                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>robust-count</b> <i>robust-count</i><br><b>no robust-count</b>                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>igmp                                                                                                                                                                                |
| <b>Description</b> | This command configures the robust count. The robust-count variable allows tuning for the expected packet loss on a subnet. If a subnet anticipates losses, the robust-count variable can be increased. |
| <b>Default</b>     | 2                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>robust-count</i> — Specifies the robust count value.                                                                                                                                                 |
|                    | <b>Values</b> 2 — 10                                                                                                                                                                                    |

## ssm-translate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>igmp</b>                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>igmp                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command enables the context to configure group ranges which are translated to SSM (S,G) entries. If the static entry needs to be created, it has to be translated from a IGMPv1 IGMPv2 request to a Source Specific Multicast (SSM) join. An SSM translate source can only be added if the starg command is not enabled. An error message is generated if you try to configure the <b>source</b> command with <b>starg</b> command enabled. |

## grp-range

|                    |                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] grp-range</b> <i>start end</i>                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>igmp>ssm-translate                                                                                                                                                                                                       |
| <b>Description</b> | This command is used to configure group ranges which are translated to SSM (S,G) entries.                                                                                                                                                    |
| <b>Parameters</b>  | <i>start</i> — An IP address that specifies the start of the group range.<br><i>end</i> — An IP address that specifies the end of the group range. This value should always be greater than or equal to the value of the <i>start</i> value. |

## source

|                    |                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] source</b> <i>ip-address</i>                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>igmp>ssm-translate>grp-range                                                                                                                                                                                                                                  |
| <b>Description</b> | This command specifies the source IP address for the group range. Whenever a (*,G) report is received in the range specified by <b>grp-range</b> <i>start</i> and <i>end</i> parameters, it is translated to an (S,G) report with the value of this object as the source address. |

**Parameters**     *ip-address* — Specifies the IP address that will be sending data.

### igmp-host-tracking

**Syntax**     **igmp-host-tracking**

**Context**     config>service>vprn  
config>service>vprn>sap

**Description**     This command enables the context to configure IGMP host tracking parameters.

### expiry-time

**Syntax**     **expiry-time** *expiry-time*  
**no expiry-time**

**Context**     config>service>vprn>igmp-trk  
config>service>vprn>sap>igmp-trk

**Description**     This command configures the time that the system continues to track inactive hosts.  
The **no** form of the command removes the values from the configuration.

**Default**     no expiry-time

**Parameters**     *expiry-time* — Specifies the time, in seconds, that this system continues to track an inactive host.

**Values**     1 — 65535

### import

**Syntax**     **import** *policy-name*  
**no import**

**Context**     config>service>vprn>sap>igmp-trk

**Description**     This command associates an import policy to filter IGMP packets.  
The **no** form of the command removes the values from the configuration.

**Default**     no import

**Parameters**     *policy-name* — Specifies the import policy name.

## max-num-groups

|                    |                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-num-groups</b> <i>max-num-groups</i><br><b>no max-num-groups</b>                                                                                               |
| <b>Context</b>     | config>service>vprn>sap>igmp-trk                                                                                                                                      |
| <b>Description</b> | This command configures the maximum number of multicast groups allowed to be tracked.<br>The <b>no</b> form of the command removes the values from the configuration. |
| <b>Default</b>     | no max-num-groups                                                                                                                                                     |
| <b>Parameters</b>  | <i>max-num-groups</i> — Specifies the maximum number of multicast groups allowed to be tracked.<br><b>Values</b> 1 — 196607                                           |

## max-num-sources

|                    |                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-num-sources</b> <i>max-num-sources</i><br><b>no max-num-sources</b>                                                                                   |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if                                                                                                                            |
| <b>Description</b> | This command specifies the maximum number of multicast sources allowed to be tracked per group.<br>The <b>no</b> form of the command reverts to the default. |
| <b>Default</b>     | no max-num-sources                                                                                                                                           |
| <b>Parameters</b>  | <i>max-num-sources</i> — Specifies the maximum number of multicast sources allowed to be tracked per group.<br><b>Values</b> 1 — 1000                        |

## ignore-nh-metric

|                    |                                                  |
|--------------------|--------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ignore-nh-metric</b>                     |
| <b>Context</b>     | config>service>vprn                              |
| <b>Description</b> | This command enables the ignore next-hop metric. |
| <b>Default</b>     | no ignore-nh-metric                              |

## maximum-ipv6-route

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>maximum-ipv6-routes</b> <i>number</i> [ <b>log-only</b> ] [ <b>threshold</b> <i>percentage</i> ]<br><b>no maximum-ipv6-routes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command specifies the maximum number of IPv6 routes that can be held within a VPN routing/forwarding (VRF) context.</p> <p>Note that the VPRN service ID must be in a shutdown state in order to modify maximum-routes command parameters.</p> <p>If the <b>log-only</b> parameter is not specified and the maximum-routes value is set below the existing number of routes in a VRF, then the offending RIP peer (if applicable) is brought down (but the VPRN instance remains up). BGP peering will remain up but the exceeding BGP routes will not be added to the VRF.</p> <p>The maximum route threshold can dynamically change to increase the number of supported routes even when the maximum has already been reached. Protocols will resubmit their routes which were initially rejected.</p> <p>The <b>no</b> form of the command disables any limit on the number of routes within a VRF context. Issue the <b>no</b> form of the command only when the VPRN instance is shutdown.</p> |
| <b>Default</b>     | 0 or disabled — The threshold will not be raised.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><i>number</i> — An integer that specifies the maximum number of routes to be held in a VRF context.</p> <p><b>Values</b> 1 — 2147483647</p> <p><b>log-only</b> — This parameter specifies that if the maximum limit is reached, only log the event. <b>log-only</b> does not disable the learning of new routes.</p> <p><b>threshold</b> <i>percentage</i> — The percentage at which a warning log message and SNMP trap should be set. There are two warnings, the first is a mid-level warning at the threshold value set and the second is a high-level warning at level between the maximum number of routes and the mid-level rate ( <math>(\text{mid} + \text{max}) / 2</math> ).</p> <p><b>Values</b> 0 — 100</p>                                                                                                                                                                                                                                                                                 |

## maximum-routes

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>maximum-routes</b> <i>number</i> [ <b>log-only</b> ] [ <b>threshold</b> <i>percentage</i> ]<br><b>no maximum-routes</b>                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command specifies the maximum number of routes that can be held within a VPN routing/forwarding (VRF) context.</p> <p>Note that the VPRN service ID must be in a shutdown state in order to modify maximum-routes command parameters.</p> <p>If the <b>log-only</b> parameter is not specified and the maximum-routes value is set below the existing number of routes in a VRF, then the offending RIP peer (if applicable) is brought down (but the</p> |



VPRN instance remains up). BGP peering will remain up but the exceeding BGP routes will not be added to the VRF.

The maximum route threshold can dynamically change to increase the number of supported routes even when the maximum has already been reached. Protocols will resubmit their routes which were initially rejected.

The **no** form of the command disables any limit on the number of routes within a VRF context. Issue the **no** form of the command only when the VPRN instance is shutdown.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | 0 or disabled — The threshold will not be raised.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b> | <p><i>number</i> — An integer that specifies the maximum number of routes to be held in a VRF context.</p> <p><b>Values</b> 1 — 2147483647</p> <p><b>log-only</b> — This parameter specifies that if the maximum limit is reached, only log the event. <b>log-only</b> does not disable the learning of new routes.</p> <p><b>threshold percentage</b> — The percentage at which a warning log message and SNMP trap should be set. There are two warnings, the first is a mid-level warning at the threshold value set and the second is a high-level warning at level between the maximum number of routes and the mid-level rate ( <math>[\text{mid} + \text{max}] / 2</math> ).</p> <p><b>Values</b> 0 — 100</p> |

## multicast-info-policy

|                    |                                                                                          |
|--------------------|------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multicast-info-policy</b> <i>policy-name</i><br><b>no multicast-info-policy</b>       |
| <b>Context</b>     | config>service>vprn                                                                      |
| <b>Description</b> | This command configures multicast information policy.                                    |
| <b>Parameters</b>  | <p><i>policy-name</i> — Specifies the policy name.</p> <p><b>Values</b> 32 chars max</p> |

## mc-maximum-routes

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mc-maximum-routes</b> <i>number</i> [ <b>log-only</b> ] [ <b>threshold</b> <i>threshold</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command specifies the maximum number of multicast routes that can be held within a VPN routing/forwarding (VRF) context. When this limit is reached, a log and SNMP trap are sent. If the <b>log-only</b> parameter is not specified and the maximum-routes value is set below the existing number of routes in a VRF, then no new joins will be processed.</p> <p>The <b>no</b> form of the command disables the limit of multicast routes within a VRF context. Issue the <b>no</b> form of the command only when the VPRN instance is shutdown.</p> |
| <b>Default</b>     | no mc-maximum-routes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                   |                                                                                                                                    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>number</i> — Specifies the maximum number of routes to be held in a VRF context.                                                |
| <b>Values</b>     | 1 — 2147483647                                                                                                                     |
| <b>log-only</b>   | — Specifies that if the maximum limit is reached, only log the event. <b>log-only</b> does not disable the learning of new routes. |
| <b>threshold</b>  | <i>threshold</i> — The percentage at which a warning log message and SNMP trap should be sent.                                     |
| <b>Values</b>     | 0 — 100                                                                                                                            |
| <b>Default</b>    | 10                                                                                                                                 |

### route-distinguisher

|                    |                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>route-distinguisher</b> [ <i>ip-address:number</i>   <i>asn:number</i> ]<br><b>no route-distinguisher</b>                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vpn                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command sets the identifier attached to routes the VPN belongs to. Each routing instance must have a unique (within the carrier's domain) route distinguisher associated with it. A route distinguisher must be defined for a VPRN to be operationally active.                                                                                                                         |
| <b>Default</b>     | no route-distinguisher                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | The route distinguisher is a 6-byte value that can be specified in one of the following formats:<br><br><i>ip-address:number</i> — Specifies the IP address in dotted decimal notation. The assigned number must not be greater than 65535.<br><br><i>asn:number</i> — The ASN is a 2-byte value less than or equal to 65535. The assigned number can be any 32-bit unsigned integer value. |

### router-id

|                    |                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>router-id</b> <i>ip-address</i><br><b>no router-id</b>                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vpn<br>config>service>vpn>ospf<br>config>service>vpn>bgp                                                                                                                                                                                                                        |
| <b>Description</b> | This command sets the router ID for a specific VPRN context.<br><br>If neither the router ID nor system interface are defined, the router ID from the base router context is inherited.<br><br>The <b>no</b> form of the command removes the router ID definition from the given VPRN context. |
| <b>Default</b>     | no router-id                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>ip-address</i> — The IP address must be given in dotted decimal notation.                                                                                                                                                                                                                   |

## service-name

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>service-name</b> <i>service-name</i><br><b>no service-name</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures an optional service name, up to 64 characters in length, which adds a name identifier to a given service to then use that service name in configuration references as well as display and use service names in show commands throughout the system. This helps the service provider/administrator to identify and manage services within the 7750 SR, 7450 ESS and 7710 SR platforms.</p> <p>All services are required to assign a service ID to initially create a service. However, either the service ID or the service name can be used to identify and reference a given service once it is initially created.</p> |
| <b>Parameters</b>  | <i>service-name</i> — Specifies a unique service name to identify the service. Service names may not begin with an integer (0-9).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## sgt-qos

|                    |                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sgt-qos</b>                                                                                  |
| <b>Context</b>     | config>service>vprn                                                                             |
| <b>Description</b> | This command enables the context to configure DSCP/Dot1p re-marking for self-generated traffic. |

## application

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>application</b> <i>dscp-app-name</i> <b>dscp</b> { <i>dscp-value</i>   <i>dscp-name</i> }<br><b>application</b> <i>dot1p-app-name</i> <b>dot1p</b> <i>dot1p-priority</i><br><b>no application</b> { <i>dscp-app-name</i>   <i>dot1p-app-name</i> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>sgt-qos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command configures DSCP/Dot1p re-marking for self-generated traffic. When an application is configured using this command, then the specified DSCP name/value is used for all packets generated by this application within the router instance it is configured.</p> <p>Using the value configured in this command:</p> <ul style="list-style-type: none"> <li>• Sets the DSCP bits in the IP packet.</li> <li>• Maps to the FC. This value will be signaled from the CPM to the egress forwarding complex.</li> <li>• Based on this signaled FC the egress forwarding complex QoS policy sets the IEEE802.1 dot1P and LSP EXP bits.</li> <li>• The Dot1P and the LSP EXP bits are set by the egress complex for all packets based on the signaled FC. This includes ARP and IS-IS packets that, due to their nature, do not carry DSCP bits.</li> <li>• The DSCP value in the egress IP header will be as configured in this command. The egress QoS policy will not overwrite this value.</li> </ul> |

Only one DSCP name/value can be configured per application, if multiple entries are configured then the subsequent entry overrides the previous configured entry.

The **no** form of this command reverts back to the default value.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><i>dscp-app-name</i> — Specifies the DSCP application name.</p> <p><b>Values</b>      ldp, rsvp, bgp, rip, msdp, pim, ospf, igmp, mld, telnet, tftp, ftp, ssh, snmp, snmp-notification, syslog, icmp, traceroute, tacplus, dns, ntp, radius, cflowd, dhcp, bootp, ndis, vrrp, srp</p> <p><i>dscp-value</i> — Specifies a value when this packet egresses the respective egress policy should provide the mapping for the DSCP value to either LSP-EXP bits or IEEE 802.1p (Dot1P) bits as appropriate otherwise the default mapping applies.</p> <p><b>Values</b>      0 — 63</p> <p><i>dscp-name</i> — Specifies the DSCP name.</p> <p><b>Values</b>      none, be, ef, cp1, cp2, cp3, cp4, cp5, cp6, cp7, cp9, cs1, cs2, cs3, cs4, cs5, nc1, nc2, af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, cp11, cp13, cp15, cp17, cp19, cp21, cp23, cp25, cp27, cp29, cp31, cp33, cp35, cp37, cp39, cp41, cp42, cp43, cp44, cp45, cp47, cp49, cp50, cp51, cp52, cp53, cp54, cp55, cp57, cp58, cp59, cp60, cp61, cp62, cp63</p> <p><i>dot1p-priority</i> — Specifies the Dot1P priority.</p> <p><b>Values</b>      0 — 7</p> <p><i>dot1p-app-name</i> — Specifies the Dot1P application name.</p> <p><b>Values</b>      arp, isis</p> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## dscp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>dscp</b> <i>dscp-name</i> <b>fc</b> <i>fc-name</i></p> <p><b>no dscp</b> <i>dscp-name</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>sgt-qos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command creates a mapping between the DiffServ Code Point (DSCP) of the self generated traffic and the forwarding class.</p> <p>Self generated traffic that matches the specified DSCP will be assigned to the corresponding forwarding class. Multiple commands can be entered to define the association of some or all sixty-four DiffServ code points to the forwarding class. For undefined code points, packets are assigned to the forwarding class specified under the default-action command.</p> <p>All DSCP names that defines a DSCP value must be explicitly defined.</p> <p>The <b>no</b> form of this command removes the DiffServ code point to forwarding class association. The default-action then applies to that code point value.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><i>dscp-name</i> — The name of the DiffServ code point to be associated with the forwarding class. DiffServ code point can only be specified by its name and only an existing DiffServ code point can be specified. The software provides names for the well known code points.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

**Values** be, ef, cp1, cp2, cp3, cp4, cp5, cp6, cp7, cp9, cs1, cs2, cs3, cs4, cs5, nc1, nc2, af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, cp11, cp13, cp15, cp17, cp19, cp21, cp23, cp25, cp27, cp29, cp31, cp33, cp35, cp37, cp39, cp41, cp42, cp43, cp44, cp45, cp47, cp49, cp50, cp51, cp52, cp53, cp54, cp55, cp57, cp58, cp59, cp60, cp61, cp62, cp63

**fc** *fc-name* — Specifies the forwarding class name. All packets with DSCP value or MPLS EXP bits that is not defined will be placed in this forwarding class.

**Default** None, the fc name must be specified

**Values** be, l2, af, l1, h2, ef, h1, nc

## single-sfm-overload

|                    |                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>single-sfm-overload</b> [ <b>holdoff-time</b> <i>holdoff-time</i> ]<br><b>no single-sfm-overload</b>                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                      |
| <b>Description</b> | This command, if enabled, will cause the IGP protocols (either IS-IS or OSPF) for the service to enter an overload state when the node only has a single SFM functioning.<br>The <b>no</b> form of this command causes the overload state to be cleared. |
| <b>Default</b>     | no single-sfm-overload                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>holdoff-time</i> — This parameter specifies the delay between the detection of a single SFM and enacting the overload state.<br><b>Values</b> 1—600 seconds<br><b>Default</b> 0 seconds                                                               |

## snmp-community

|                    |                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>snmp-community</b> <i>community-name</i> [ <b>version</b> <i>SNMP-version</i> ]<br><b>no snmp-community</b> [ <i>community-name</i> ]                                                                                                                                  |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command sets the SNMP community name to be used with the associated VPRN instance.<br>If an SNMP community name is not specified, then SNMP access is not allowed.<br>The <b>no</b> form of the command removes the SNMP community name from the given VPRN context. |
| <b>Default</b>     | None — The SNMP community must be explicitly specified.                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>community-name</i> — Specifies one or more SNMP community names.<br><i>version</i> <i>SNMP-version</i> — Specifies the SNMP version.<br><b>Values</b> v1, v2c, both                                                                                                    |

### source-address

|                    |                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>source-address</b>                                                                                                          |
| <b>Context</b>     | config>service>vpn                                                                                                             |
| <b>Description</b> | This command enables the context to specify the source address and application that should be used in all unsolicited packets. |

## application

|                    |                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>application</b> <i>app</i> [ <i>ip-int-name</i>   <i>ip-address</i> ]<br><b>no application</b> <i>app</i>                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>source-address                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command specifies the source address and application.                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <i>app</i> — Specify the application name.<br><br><b>Values</b> telnet, ssh, traceroute, ping<br><br><i>ip-int-name</i>   <i>ip-address</i> — Specifies the name of the IP interface or IP address. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. |

## application

|                    |                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>application</b> <i>app</i> <i>ipv6-address</i>                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>source-address                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command specifies the IPv6 source address and application.                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>app</i> — Specify the application name.<br><br><b>Values</b> telnet, ssh, traceroute, ping<br><br><i>ipv6-address</i> — Specifies the name of the IPv6 address. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. |

## static-route

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] static-route</b> { <i>ip-prefix/prefix-length</i>   <i>ip-prefix netmask</i> } [ <b>preference</b> <i>preference</i> ]<br>[ <b>metric</b> <i>metric</i> ] [ <b>tag</b> <i>tag</i> ] [ <b>enable</b>   <b>disable</b> ] { <b>next-hop</b> <i>ip-int-name</i>   <i>ip-address</i>   <b>ipsec-tunnel</b> <i>ipsec-tunnel-name</i> } [ <b>bfd-enable</b>   { <b>cpe-check</b> <i>cpe-ip-address</i> [ <b>interval</b> <i>seconds</i> ] [ <b>drop-count</b> <i>count</i> ] [ <b>log</b> ] }]<br><b>[no] static-route</b> { <i>ip-prefix/prefix-length</i>   <i>ip-prefix netmask</i> } [ <b>preference</b> <i>preference</i> ]<br>[ <b>metric</b> <i>metric</i> ] [ <b>tag</b> <i>tag</i> ] [ <b>enable</b>   <b>disable</b> ] <b>indirect</b> <i>ip-address</i> [ <b>cpe-check</b> <i>cpe-ip-address</i> [ <b>interval</b> <i>seconds</i> ] [ <b>drop-count</b> <i>count</i> ] [ <b>log</b> ]]<br><b>[no] static-route</b> { <i>ip-prefix/prefix-length</i>   <i>ip-prefix netmask</i> } [ <b>preference</b> <i>preference</i> ]<br>[ <b>metric</b> <i>metric</i> ] [ <b>tag</b> <i>tag</i> ] [ <b>enable</b>   <b>disable</b> ] <b>black-hole</b> |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command creates static route entries within the associated router instance. When configuring a static route, either <b>next-hop</b> , <b>indirect</b> or <b>black-hole</b> must be configured.<br><br>The <b>no</b> form of the command deletes the static route entry. If a static route needs to be removed when multiple static routes exist to the same destination, then as many parameters to uniquely identify the static route must be entered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

If a CPE connectivity check target address is already being used as the target address in a different static route, then `cpe-check` parameters must match. If they do not, the new configuration command will be rejected.

If a static-route command is issued with no `cpe-check` target but the destination prefix/netmask and next-hop matches a static route that did have an associated `cpe-check`, the `cpe-check` test will be removed from the associated static route.

**Default** No static routes are defined.

**Parameters** *ip-prefix* — The destination address of the aggregate route in dotted decimal notation.

|               |                    |                                     |
|---------------|--------------------|-------------------------------------|
| <b>Values</b> | ipv4-prefix        | a.b.c.d (host bits must be 0)       |
|               | ipv4-prefix-length | 0 — 32                              |
|               | ipv6-prefix        | x:x:x:x:x:x:x (eight 16-bit pieces) |
|               |                    | x:x:x:x:x:d.d.d.d                   |
|               |                    | x: [0 — FFFF]H                      |
|               |                    | d: [0 — 255]D                       |
|               | ipv6-prefix-length | 0 — 128                             |

*netmask* — The subnet mask in dotted decimal notation.

**Values** 0.0.0.0 — 255.255.255.255 (network bits all 1 and host bits all 0)

*ip-int-name* — The name of the IP interface. Interface names must be unique within the group of defined IP interfaces for **config router interface** and **config service ies interface** commands. An interface name cannot be in the form of an IP address. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed with

*ip-address* — The IP address of the IP interface. The *ip-addr* portion of the **address** command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation.

|               |              |                                                                      |
|---------------|--------------|----------------------------------------------------------------------|
| <b>Values</b> | ipv4-address | a.b.c.d (host bits must be 0)                                        |
|               | ipv6-address | x:x:x:x:x:x:x[-interface]                                            |
|               |              | x:x:x:x:x:d.d.d.d[-interface]                                        |
|               |              | x: [0..FFFF]H                                                        |
|               |              | d: [0..255]D                                                         |
|               |              | interface: 32 characters maximum, mandatory for link local addresses |

**enable** — Static routes can be administratively enabled or disabled. Use the **enable** parameter to re-enable a disabled static route. In order to enable a static route, it must be uniquely identified by the IP address, mask, and any other parameter that is required to identify the exact static route.

The administrative state is maintained in the configuration file.

**Default** enable

**disable** — Static routes can be administratively enabled or disabled. Use the **disable** parameter to disable a static route while maintaining the static route in the configuration. In order to enable a static route, it must be uniquely identified by the IP address, mask, and any other parameter that is required to identify the exact static route.

The administrative state is maintained in the configuration file.

**Default** enable



**interval** *seconds* — This optional parameter specifies the interval between ICMP pings to the target IP address.

**Values** 1 —255 seconds

**Default** 1 seconds

**drop-count** *count* — This optional parameter specifies the number of consecutive ping-replies that must be missed to declare the CPE down and to de-active the associated static route.

**Values** Value range: 1 —255

**Default** 3

**log** — This optional parameter enables the ability to log transitions between active and in-active based on the CPE connectivity check. Events should be sent to the system log, syslog and SNMP traps.

**next-hop** [*ip-address* | *ip-int-name*] — Specifies the directly connected next hop IP address used to reach the destination. If the next hop is over an unnumbered interface, the *ip-int-name* of the unnumbered interface (on this node) can be configured.

The **next-hop** keyword and the **indirect** or **black-hole** keywords are mutually exclusive. If an identical command is entered (with the exception of either the **indirect** or **black-hole** parameters), then this static route will be replaced with the newly entered command, and unless specified, the respective defaults for preference and metric will be applied.

The *ip-addr* configured here can be either on the network side or the access side on this node. This address must be associated with a network directly connected to a network configured on this node.

**ipsec-tunnel** *ipsec-tunnel-name* — specifies an IPSec tunnel name up to 32 characters in length.

**indirect** *ip-address* — Specifies that the route is indirect and specifies the next hop IP address used to reach the destination.

The configured *ip-addr* is not directly connected to a network configured on this node. The destination can be reachable via multiple paths. The static route remains valid as long as the address configured as the indirect address remains a valid entry in the routing table. Indirect static routes cannot use an ip-prefix/mask to another indirect static route.

The **indirect** keyword and the **next-hop** or **black-hole** keywords are mutually exclusive. If an identical command is entered (with the exception of either the **next-hop** or **black-hole** parameters), then this static route will be replaced with the newly entered command and unless specified the respective defaults for preference and metric will be applied.

The *ip-addr* configured can be either on the network or the access side and is normally at least one hop away from this node.

**black-hole** — Specifies a black hole route meaning that if the destination address on a packet matches this static route it will be silently discarded.

The **black-hole** keyword is mutually exclusive with either the **next-hop** or **indirect** keywords. If an identical command is entered, with exception of either the **next-hop** or **indirect** parameters, then the static route is replaced with the new command, and unless specified, the respective defaults for **preference** and **metric** are applied.

**preference** *preference* — The preference of this static route (as opposed to the routes from different sources such as BGP or OSPF), expressed as a decimal integer. When modifying the **preference** value of an existing static route, unless specified, the metric will not change.

If multiple routes are learned with an identical preference using the same protocol, the lowest cost route is used. If multiple routes are learned with an identical preference using the same protocol and the costs (metrics) are equal, then the decision of which route to use is determined by the configuration of the ECMP command.

**Default** 5

**Values** 1 — 255

**metric** *metric* — The cost metric for the static route, expressed as a decimal integer. This value is used when importing this static route into other protocols such as OSPF. This value is also used to determine the static route to install in the forwarding table: When modifying the metrics of an existing static route, unless specified, the preference will not change.

If there are multiple static routes with the same preference but unequal metrics, the lower cost (metric) route is installed. If there are multiple static routes with equal preference and metrics then ECMP rules apply. If there are multiple routes with unequal preferences, then the lower preference route is installed.

**Default** 1

**Values** 0 — 65535

**tag** — Adds a 32-bit integer tag to the static route. The tag is used in route policies to control distribution of the route into other protocols.

**Values** 1..4294967295

**bfd-enable** — Associates the state of the static route to a BFD session between the local system and the configured nexthop. This keyword cannot be configured if the nexthop is **indirect** or a **blackhole** keywords are specified.

**cpe-check** *target-ip-address* — This parameter specifies the IP address of the target CPE device. ICMP pings will be sent to this target IP address. This parameter must be configured to enable the CPE connectivity feature for the associated static route. The target-ip-address cannot be in the same subnet as the static route subnet itself to avoid possible circular references. This option is mutually exclusive with BFD support on a given static route.

**Default** no cpe-check enabled

## type

|                    |                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>type</b> [ <b>hub</b>   <b>subscriber-split-horizon</b> ]<br><b>no type</b>                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vpn>                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command designates the type of VPRN instance being configured for hub and spoke topologies. Use the <b>no</b> form to reset to the default of a fully meshed VPRN.                                                                                                                                                       |
| <b>Default</b>     | no type                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <b>hub</b> — Specifies a hub VPRN which allows all traffic from the hub SAPs to be routed to the destination directly, while all traffic from spoke VPRNs or network interfaces can only be routed to a hub SAP.<br><br><b>subscriber-split-horizon</b> — Controls the flow of traffic for wholesale subscriber applications. |

## vrf-export

|                    |                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vrf-export</b> <i>policy</i> [ <i>policy...</i> ]<br><b>no vrf-export</b>                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vpn                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command specifies the export policies to control routes exported from the local VPN routing/forwarding (VRF) to other VRFs on the same or remote PE routers (via MP-BGP).<br>The <b>no</b> form of the command removes all route policy names from the export list. |
| <b>Default</b>     | None — No routes are exported from the VRF by default.                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>policy</i> — The route policy statement name.                                                                                                                                                                                                                         |

## vrf-import

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vrf-import</b> <i>policy</i> [ <i>policy...</i> ]<br><b>no vrf-import</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vpn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command sets the import policies to control routes imported to the local VPN routing/forwarding (VRF) from other VRFs on the same or remote PE routers (via MP-BGP). BGP-VPN routes imported with a vrf-import policy will use the BGP preference value of 170 when imported from remote PE routers, or retain the protocol preference value of the exported route when imported from other VRFs on the same router, unless the preference is changed by the policy.<br>The <b>no</b> form of the command removes all route policy names from the import list. |
| <b>Default</b>     | None — No routes are accepted into the VRF by default.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>policy</i> — The route policy statement name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## vrf-target

**vrf-target** {*ext-comm* | [**import** *ext-comm*] [**export** *ext-comm*]}  
**no vrf-target**

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |                                                                |                    |         |                  |           |                   |           |                      |                |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------|--------------------|---------|------------------|-----------|-------------------|-----------|----------------------|----------------|
| <b>Context</b>       | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |         |                                                                |                    |         |                  |           |                   |           |                      |                |
| <b>Description</b>   | <p>This command facilitates a simplified method to configure the route target to be added to advertised routes or compared against received routes from other VRFs on the same or remote PE routers (via MP-BGP).</p> <p>BGP-VPN routes imported with a vrf-target statement will use the BGP preference value of 170 when imported from remote PE routers, or retain the protocol preference value of the exported route when imported from other VRFs in the same router.</p> <p>Specified <b>vrf-import</b> or <b>vrf-export</b> policies override the <b>vrf-target</b> policy.</p> <p>The no form of the command removes the vrf-target</p>                                                                                                                                                                                            |         |                                                                |                    |         |                  |           |                   |           |                      |                |
| <b>Default</b>       | no vrf-target                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |                                                                |                    |         |                  |           |                   |           |                      |                |
| <b>Parameters</b>    | <p><i>ext-comm</i> — An extended BGP community in the <b>type:x:y</b> format. The value <b>x</b> can be an integer or IP address. The <b>type</b> can be the target or origin. <b>x</b> and <b>y</b> are 16-bit integers.</p> <p><b>Values</b></p> <table> <tr> <td>target:</td> <td>{<i>ip-address:comm-val</i>   <i>as-number:ext-comm-val</i>}</td> </tr> <tr> <td><i>ip-address:</i></td> <td>a.b.c.d</td> </tr> <tr> <td><i>comm-val:</i></td> <td>0 — 65535</td> </tr> <tr> <td><i>as-number:</i></td> <td>1 — 65535</td> </tr> <tr> <td><i>ext-comm-val:</i></td> <td>0 — 4294967295</td> </tr> </table> <p><b>import</b> <i>ext-community</i> — Specify communities allowed to be accepted from remote PE neighbors.</p> <p><b>export</b> <i>ext-community</i> — Specify communities allowed to be sent to remote PE neighbors.</p> | target: | { <i>ip-address:comm-val</i>   <i>as-number:ext-comm-val</i> } | <i>ip-address:</i> | a.b.c.d | <i>comm-val:</i> | 0 — 65535 | <i>as-number:</i> | 1 — 65535 | <i>ext-comm-val:</i> | 0 — 4294967295 |
| target:              | { <i>ip-address:comm-val</i>   <i>as-number:ext-comm-val</i> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |                                                                |                    |         |                  |           |                   |           |                      |                |
| <i>ip-address:</i>   | a.b.c.d                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |                                                                |                    |         |                  |           |                   |           |                      |                |
| <i>comm-val:</i>     | 0 — 65535                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |                                                                |                    |         |                  |           |                   |           |                      |                |
| <i>as-number:</i>    | 1 — 65535                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |                                                                |                    |         |                  |           |                   |           |                      |                |
| <i>ext-comm-val:</i> | 0 — 4294967295                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |                                                                |                    |         |                  |           |                   |           |                      |                |

## Router L2TP Commands

### l2tp

|                    |                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>l2tp</b><br><b>no l2tp</b>                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                         |
| <b>Description</b> | This command enables the context to configure L2TP parameters. L2TP extends the PPP model by allowing Layer 2 and PPP endpoints to reside on different devices interconnected by a packet-switched network. |

### calling-number-format

|                    |                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>calling-number-format</b> <i>ascii-spec</i><br><b>no calling-number-format</b>                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>l2tp                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command specifies the L2TP calling number AVP.                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>ascii-spec</i> — Specified as either char-specification or ascii-spec.<br><i>char-specification</i> — Ascii-char   char-origin<br><i>char-origin</i> — % origin<br><i>origin</i> — S   r   s<br><b>Values</b> S : system name, the value of TIMETRA-CHASSIS_MIB::tmnxChassisName<br><b>Values</b> r : Agent Remote ID<br><b>Values</b> s : SAP ID, formatted as a character string |

### exclude-avps

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>Syntax</b>      | <b>exclude-avps calling-number</b><br><b>no exclude-avps</b> |
| <b>Context</b>     | config>service>vprn>l2tp                                     |
| <b>Description</b> | This command configures the L2TP AVPs to exclude.            |

## peer-address-change-policy

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>peer-address-change-policy</b> { <b>accept</b>   <b>ignore</b>   <b>reject</b> }     |
| <b>Context</b>     | config>service>vprn>l2tp                                                                |
| <b>Description</b> | This command configures the reaction to a change of tunnel peer address in this router. |

## receive-window-size

|                    |                                                                       |
|--------------------|-----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>receive-window-size</b> [4..1024]<br><b>no receive-window-size</b> |
| <b>Context</b>     | config>service>vprn>l2tp                                              |
| <b>Description</b> | This command configures the L2TP receive window size.                 |

## session-limit

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>session-limit</b> <i>session-limit</i><br><b>no session-limit</b>           |
| <b>Context</b>     | config>service>vprn>l2tp                                                       |
| <b>Description</b> | This command configures the L2TP session limit of this router.                 |
| <b>Parameters</b>  | <i>session-limit</i> — Specifies the session limit.<br><b>Values</b> 1..131071 |

## group

|                    |                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>group</b> <i>tunnel-group-name</i> [ <b>create</b> ] [ <b>role</b> <i>lac</i>   <i>lns</i> ]<br><b>no group</b> <i>tunnel-group-name</i>                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>l2tp                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command configures an L2TP tunnel group.                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>tunnel-group-name</i> — Specifies a name string to identify a L2TP group up to 63 characters in length.<br><b>create</b> — This keyword is mandatory when creating a tunnel group name. The <b>create</b> keyword requirement can be enabled/disabled in the <b>environment&gt;create</b> context. |

## session-limit

|               |                                                                      |
|---------------|----------------------------------------------------------------------|
| <b>Syntax</b> | <b>session-limit</b> <i>session-limit</i><br><b>no session-limit</b> |
|---------------|----------------------------------------------------------------------|

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>service>vprn>l2tp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command configures the L2TP session limit for the router. L2TP is connection-oriented. The L2TP Network Server (LNS) and LAC maintain state for each call that is initiated or answered by an LAC. An L2TP session is created between the LAC and LNS when an end-to-end PPP connection is established between a remote system and the LNS. Datagrams related to the PPP connection are sent over the tunnel between the LAC and LNS. There is a one to one relationship between established L2TP sessions and their associated calls. |
| <b>Parameters</b>  | <i>session-limit</i> — Specifies the number of sessions allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Default</b>     | no session-limit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Values</b>      | 1 — 131071                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## avp-hiding

|                    |                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>avp-hiding</b> <i>sensitive</i>   <i>always</i><br><b>no avp-hiding</b>                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>l2tp>group                                                                                                                                                                                                                                              |
| <b>Description</b> | This command configures Attribute Value Pair (AVP) hiding. This capability can be used to avoid the passing of sensitive data, such as user passwords, as cleartext in an AVP.<br><br>The <b>no</b> form of the command returns the value to <b>never</b> allow AVP hiding. |
| <b>Parameters</b>  | <i>avp-hiding</i> — Specifies the method to be used for the authentication of the tunnels in this L2TP group.                                                                                                                                                               |
| <b>Default</b>     | no avp-hiding                                                                                                                                                                                                                                                               |
| <b>Values</b>      | <i>sensitive</i> — AVP hiding is used only for sensitive information (such as username/password).<br><i>always</i> — AVP hiding is always used.                                                                                                                             |

## challenge

|                    |                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>challenge</b> <i>always</i><br><b>no challenge</b>                                                                                                     |
| <b>Context</b>     | config>service>vprn>l2tp>group                                                                                                                            |
| <b>Description</b> | This command configures the use of challenge-response authentication.<br><br>The <b>no</b> form of the command reverts to the default <b>never</b> value. |
| <b>Parameters</b>  | <i>always</i> — Specifies when challenge-response is to be used for the authentication of the tunnels in this L2TP group.                                 |
| <b>Default</b>     | no challenge                                                                                                                                              |
| <b>Values</b>      | <i>always</i>                                                                                                                                             |

## destruct-timeout

|                    |                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>destruct-timeout</b> <i>destruct-timeout</i><br><b>no destruct-timeout</b>                                                                                                                           |
| <b>Context</b>     | config>service>vpn>l2tp>group<br>config>service>vpn>l2tp>group>tunnel                                                                                                                                   |
| <b>Description</b> | This command configures the period of time that the data of a disconnected tunnel will persist before being removed.<br><br>The <b>no</b> form of the command removes the value from the configuration. |
| <b>Default</b>     | no destruct-timeout                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>destruct-timeout</i> — [Specifies the automatic removal of dynamic L2TP sessions, in seconds, that are no longer active.<br><br><b>Default</b> no destruct-timeout<br><b>Values</b> 60 — 86400]      |

## hello-interval

|                    |                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hello-interval</b> <i>hello-interval</i><br><b>no hello-interval</b>                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vpn>l2tp>group                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command configures the time interval between two consecutive tunnel Hello messages. The Hello message is an L2TP control message sent by either peer of a LAC-LNS control connection. This control message is used as a keepalive for the tunnel.<br><br>The <b>no</b> form of the command removes the interval from the configuration. |
| <b>Default</b>     | 60                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>hello-interval</i> — Specifies the time interval, in seconds, between two consecutive tunnel Hello messages.<br><br><b>Default</b> no hello-interval<br><b>Values</b> 60 — 3600                                                                                                                                                           |

## idle-timeout

|                    |                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>idle-timeout</b> <i>idle-timeout</i><br><b>no idle-timeout</b>                                                                     |
| <b>Context</b>     | config>service>vpn>l2tp>group                                                                                                         |
| <b>Description</b> | This command configures the period of time that an established tunnel with no active sessions will persist before being disconnected. |



Enter the **no** form of the command to maintain a persistent tunnel.

The **no** form of the command removes the idle timeout from the configuration.

|                   |                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no idle-timeout                                                                                |
| <b>Parameters</b> | <i>idle-timeout</i> — Specifies the idle timeout value, in seconds until the group is removed. |
| <b>Default</b>    | no idle-timeout                                                                                |
| <b>Values</b>     | 0 — 3600                                                                                       |

## Ins-group

|                    |                                                             |
|--------------------|-------------------------------------------------------------|
| <b>Syntax</b>      | <b>Ins-group</b> <i>Ins-group-id</i><br><b>no Ins-group</b> |
| <b>Context</b>     | config>service>vpn>l2tp>group                               |
| <b>Description</b> | This command configures the ISA LNS group.                  |
| <b>Parameters</b>  | <i>Ins-group-id</i> — Specifies the LNS group ID.           |
| <b>Values</b>      | 1..4                                                        |

## local-address

|                    |                                                                               |
|--------------------|-------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-address</b> <i>ip-address</i><br><b>no local-address</b>             |
| <b>Context</b>     | config>service>vpn>l2tp>group>tunnel                                          |
| <b>Description</b> | This command configures the local address.                                    |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the IP address used during L2TP authentication. |

## local-name

|                    |                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-name</b> <i>host-name</i><br><b>no local-name</b>                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vpn>l2tp>group<br>config>service>vpn>l2tp>group>tunnel                                                                                                                                                                                                             |
| <b>Description</b> | This command creates the local host name used by this system for the tunnels in this L2TP group during the authentication phase of tunnel establishment. It can be used to distinguish tunnels.<br><br>The <b>no</b> form of the command removes the name from the configuration. |
| <b>Default</b>     | local-name                                                                                                                                                                                                                                                                        |

## VPNRN Service Configuration Commands

**Parameters**     *host-name* — Specifies the host name, up to 64 characters in length, that the router will use to identify itself during L2TP authentication.

**Default**        no local-name

### max-retries-estab

**Syntax**        **max-retries-estab** *max-retries*  
**no max-retries-estab**

**Context**        config>service>vpn>l2tp>group  
config>service>vpn>l2tp>group>tunnel

**Description**    This command configures the number of retries allowed for this L2TP tunnel while it is established, before its control connection goes down.

The **no** form of the command removes the value from the configuration.

**Default**        no max-retries-estab

**Parameters**    *max-retries* — Specifies the maximum number of retries for an established tunnel.

**Default**        no max-retries-estab

**Values**        2 — 7

### max-retries-not-estab

**Syntax**        **max-retries-not-estab** *max-retries*  
**no max-retries-not-estab**

**Context**        config>service>vpn>l2tp>group  
config>service>vpn>l2tp>group>tunnel

**Description**    This command configures the number of retries allowed for this L2TP tunnel while it is not established, before its control connection goes down.

The **no** form of the command removes the value from the configuration.

**Default**        no max-retries-not-estab

**Parameters**    *max-retries* — Specifies the maximum number of retries for non-established tunnels.

**Default**        no max-retries-not-estab

**Values**        2 — 7

### password

**Syntax**        **password** *password* [*hash* | *hash2*]  
**no password**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | config>service>vprn>l2tp>group<br>config>service>vprn>l2tp>group>tunnel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command configures the password between L2TP LAC and LNS<br>The no form of the command removes the password.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Default</b>     | no password                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>password</i> — Configures the password used for challenge/response calculation and AVP hiding. The maximum length can be up to 20 characters if unhashed, 32 characters if hashed, 54 characters if the hash2 keyword is specified.</p> <p><b>hash</b> — Specifies the key is entered in an encrypted form. If the <b>hash</b> parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted</p> <p><b>hash2</b> — Specifies the key is entered in a more complex encrypted form. If the <b>hash2</b> parameter is not used, the less encrypted <b>hash</b> form is assumed.</p> <p><b>Default</b>      no password</p> |

## ppp

|                    |                                                        |
|--------------------|--------------------------------------------------------|
| <b>Syntax</b>      | <b>ppp</b>                                             |
| <b>Context</b>     | config>service>vprn>l2tp>group                         |
| <b>Description</b> | This command configures PPP for the L2TP tunnel group. |

## authentication

|                    |                                                                       |
|--------------------|-----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication {chap pap pref-chap}</b>                            |
| <b>Context</b>     | config>service>vprn>l2tp>group>ppp                                    |
| <b>Description</b> | This command configures the PPP authentication protocol to negotiate. |

## authentication-policy

|                    |                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-policy <i>auth-policy-name</i></b><br><b>no authentication-policy</b>                           |
| <b>Context</b>     | config>service>vprn>l2tp>group>ppp                                                                                |
| <b>Description</b> | This command configures the authentication policy.                                                                |
| <b>Parameters</b>  | <p><i>auth-policy-name</i> — Specifies the authentication policy name.</p> <p><b>Values</b>      32 chars max</p> |

## default-group-interface

|                    |                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>default-group-interface</b> <i>ip-int-name</i> <b>service-id</b> <i>service-id</i><br><b>no default-group-interface</b>                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>l2tp>group>ppp                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command configures the default group interface.                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the interface name.<br><div> <b>Values</b> 32 chars max         </div> <i>service-id</i> — Specifies the service ID.<br><div> <b>Values</b> 1..2147483648         </div> <i>svc-name</i> — Specifies the service name (instead of service ID).<br><div> <b>Values</b> 64 chars max         </div> |

## keepalive

|                    |                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keepalive</b> <i>seconds</i> [ <b>hold-up-multiplier</b> <i>multiplier</i> ]<br><b>no keepalive</b>                                                                                     |
| <b>Context</b>     | config>service>vprn>l2tp>group>ppp                                                                                                                                                         |
| <b>Description</b> | This command configures the PPP keepalive interval and multiplier.                                                                                                                         |
| <b>Parameters</b>  | <i>seconds</i> — Specifies in seconds the interval.<br><div> <b>Values</b> 10..300         </div> <i>multiplier</i> — Specifies the multiplier.<br><div> <b>Values</b> 1..5         </div> |

## mtu

|                    |                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>mtu-bytes</i><br><b>no mtu</b>                                                                      |
| <b>Context</b>     | config>service>vprn>l2tp>group>ppp                                                                                |
| <b>Description</b> | This command configures the maximum PPP MTU size.                                                                 |
| <b>Parameters</b>  | <i>mtu-bytes</i> — Specifies, in bytes, the maximum PPP MTU size.<br><div> <b>Values</b> 512..9212         </div> |

## proxy-authentication

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] proxy-authentication</b>                                                  |
| <b>Context</b>     | config>service>vprn>l2tp>group>ppp                                                |
| <b>Description</b> | This command configures the use of the authentication AVPs received from the LAC. |

## proxy-lcp

|                    |                                                                              |
|--------------------|------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] proxy-lcp</b>                                                        |
| <b>Context</b>     | config>service>vprn>l2tp>group>ppp                                           |
| <b>Description</b> | This command configures the use of the proxy LCP AVPs received from the LAC. |

## user-db

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>user-db</b> <i>local-user-db-name</i><br><b>no user-db</b>                           |
| <b>Context</b>     | config>service>vprn>l2tp>group>ppp                                                      |
| <b>Description</b> | This command configures the local user database to use for PPP PAP/CHAP authentication. |
| <b>Parameters</b>  | <i>local-user-db-name</i> — Specifies the local user database name.                     |
| <b>Values</b>      | 32 chars max                                                                            |

## session-assign-method

|                    |                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>session-assign-method</b> <i>weighted</i><br><b>no session-assign-method</b>                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>l2tp>group                                                                                                                                                                                                                                                |
| <b>Description</b> | This command specifies how new sessions are assigned to one of the set of suitable tunnels that are available or could be made available.                                                                                                                                     |
| <b>Default</b>     | no session-assign-method                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>weighted</i> — specifies that the sessions are shared between the available tunnels. If necessary, new tunnels are set up until the maximum number is reached. The distribution aims at an equal ratio of the actual number of sessions to the maximum number of sessions. |
| <b>Default</b>     | no session-assign-method. All new sessions are placed by preference in existing tunnels.                                                                                                                                                                                      |
| <b>Values</b>      | <i>weighted</i> — Enables weighted preference to tunnels in the group.                                                                                                                                                                                                        |

## session-limit

|                    |                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>session-limit</b> <i>session-limit</i><br><b>no session-limit</b>                                                                                                                                                            |
| <b>Context</b>     | config>service>vpn>l2tp>group<br>config>service>vpn>l2tp>group>tunnel                                                                                                                                                           |
| <b>Description</b> | This command configures the session limit. The value controls how many L2TP session will be allowed within a given context (system, group, tunnel).<br><br>The no form of the command removes the value from the configuration. |
| <b>Default</b>     | no session-limit                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>session-limit</i> — Specifies the allowed number of sessions within the given context.<br><br><b>Values</b> 1 — 131071                                                                                                       |

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## Router L2TP Tunnel Commands

### tunnel

|                    |                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tunnel</b> <i>tunnel-name</i> [ <b>create</b> ]<br><b>no tunnel</b> <i>tunnel-name</i>                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>l2tp>group                                                                                                                                                                                                                                            |
| <b>Description</b> | This command configures an L2TP tunnel. A tunnel exists between a LAC-LNS pair and consists of a Control Connection and zero or more L2TP sessions. The tunnel carries encapsulated PPP datagrams and control messages between the LAC and the L2TP Network Server (LNS). |
| <b>Parameters</b>  | <i>tunnel-name</i> — Specifies a valid string to identify a L2TP up to 32 characters in length.<br><b>create</b> — mandatory while creating a new tunnel                                                                                                                  |

### auto-establish

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>auto-establish</b>                                                |
| <b>Context</b>     | config>service>vprn>l2tp>group>tunnel                                              |
| <b>Description</b> | This command specifies if this tunnel is to be automatically set up by the system. |
| <b>Default</b>     | no auto-establish                                                                  |

### avp-hiding

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>avp-hiding</b> { <b>never</b>   <b>sensitive</b>   <b>always</b> }<br><b>no avp-hiding</b>                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>l2tp>group>tunnel                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command configures Attribute Value Pair (AVP) hiding. This capability can be used to avoid the passing of sensitive data, such as user passwords, as cleartext in an AVP.</p> <p>Note that it is recommended that sensitive information not be sent in clear text.</p> <p>The <b>no</b> form of the command removes the parameter of the configuration and indicates that the value on group level will be taken.</p> |
| <b>Default</b>     | no avp-hiding                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>avp-hiding</i> — Specifies the method to be used for the authentication of the tunnel.                                                                                                                                                                                                                                                                                                                                     |
| <b>Values</b>      | <p><b>never</b> — AVP hiding is not used.</p> <p><b>sensitive</b> — AVP hiding is used only for sensitive information (such as username/password).</p> <p><b>always</b> — AVP hiding is always used.</p>                                                                                                                                                                                                                      |

## challenge

|                    |                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>challenge</b> <i>challenge-mode</i><br><b>no challenge</b>                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>l2tp>group>tunnel                                                                                                                                                                                                                                         |
| <b>Description</b> | This command configures the use of challenge-response authentication.<br><br>The <b>no</b> form of the command removes the parameter from the configuration and indicates that the value on group level will be taken.                                                        |
| <b>Default</b>     | no challenge                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>challenge-mode</i> — Specifies when challenge-response is to be used for the authentication of the tunnel.<br><br><b>Values</b> always — Always allows the use of challenge-response authentication.<br>never — Never allows the use of challenge-response authentication. |

## hello-interval

|                    |                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hello-interval</b> <i>hello-interval</i><br><b>hello-interval infinite</b><br><b>no hello-interval</b>                                                                                                          |
| <b>Context</b>     | config>service>vprn>l2tp>group>tunnel                                                                                                                                                                              |
| <b>Description</b> | This command configures the number of seconds between sending Hellos for a L2TP tunnel. The no form removes the parameter from the configuration and indicates that the value on group level will be taken.        |
| <b>Parameters</b>  | <i>hello-interval</i> — Specifies the time interval, in seconds, between two consecutive tunnel Hello messages.<br><br><b>Values</b> 60 — 3600<br><br><b>infinite</b> — Specifies that no hello messages are sent. |

## idle-timeout

|                    |                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>idle-timeout</b> <i>idle-timeout</i><br><b>idle-timeout infinite</b><br><b>no idle-timeout</b>                                                                                                                    |
| <b>Context</b>     | config>service>vprn>l2tp>group>tunnel                                                                                                                                                                                |
| <b>Description</b> | This command configures the idle timeout to wait before being disconnect. The no form indicates that the parameter will be removed from the configuration and that the value specified on group level will be taken. |



**Parameters** *idle-timeout* — Specifies the idle timeout, in seconds.

**Values** 0 — 3600

**infinite** — Specifies that the tunnel will not be closed when idle.

## peer

**Syntax** **peer** *ip-address*  
**no peer**

**Context** config>service>vprn>l2tp>group>tunnel

**Description** This command configures the peer address.  
The **no** form of the command removes the IP address from the tunnel configuration.

**Default** no peer

**Parameters** *ip-address* — Sets the LNS IP address for the tunnel.

## preference

**Syntax** **preference** *preference*  
**no preference**

**Context** config>service>vprn>l2tp>group>tunnel

**Description** This command configures a preference number that indicates the relative preference assigned to a tunnel when using a weighted session assignment.  
The **no** form of the command removes the preference value from the tunnel configuration.

**Default** no preference

**Parameters** *preference* — Specifies the tunnel preference number with its group. The value 0 corresponds to the highest preference.

**Values** 0 — 16777215

## remote-name

**Syntax** **remote-name** *host-name*  
**no remote-name**

**Context** config>service>vprn>l2tp>group>tunnel

**Description** This command configures a string to be compared to the host name used by the tunnel peer during the authentication phase of tunnel establishment.

**Parameters** *host-name* — Specifies a remote host name for the tunnel up to 64 characters in length.

---

## Router DHCP Configuration Commands

### dhcp

|                    |                                                                |
|--------------------|----------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                    |
| <b>Context</b>     | config>service>vprn                                            |
| <b>Description</b> | This command enables the context to configure DHCP parameters. |

### local-dhcp-server

|                    |                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-dhcp-server</b> <i>server-name</i> [ <b>create</b> ]<br><b>no local-dhcp-server</b> <i>server-name</i>                                                                                                                     |
| <b>Context</b>     | config>service>vprn>dhcp<br>config>service>vprn>if                                                                                                                                                                                  |
| <b>Description</b> | This command instantiates a local DHCP server. A local DHCP server can serve multiple interfaces but is limited to the routing context it was which it was created.                                                                 |
| <b>Default</b>     | none                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>server-name</i> — Specifies the name of local DHCP server.<br><b>create</b> — Keyword used to create the server name. The <b>create</b> keyword requirement can be enabled/disabled in the <b>environment&gt;create</b> context. |

### failover

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| <b>Syntax</b>      | <b>failover</b>                                                    |
| <b>Context</b>     | config>service>vprn>dhcp                                           |
| <b>Description</b> | This command enables the context to configure failover parameters. |

### maximum-client-lead-time

|                    |                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>maximum-client-lead-time</b> [ <b>hrs</b> <i>hours</i> ] [ <b>min</b> <i>minutes</i> ] [ <b>sec</b> <i>seconds</i> ]<br><b>no maximum-client-lead-time</b>                                             |
| <b>Context</b>     | config>service>vprn>dhcp>server>failover                                                                                                                                                                  |
| <b>Description</b> | This command specifies the maximum client lead time (MCLT). The MCLT is the maximum amount of time that one server can extend a lease for a client's binding beyond the time known by the partner server. |

|                   |                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <b>hrs</b> <i>hours</i> — Specifies the hour parameter of the MCLT.<br><b>Values</b> 1 — 23      |
|                   | <b>min</b> <i>minutes</i> — Specifies the minute parameter of the MCLT.<br><b>Values</b> 1 — 59  |
|                   | <b>sec</b> <i>seconds</i> — Specifies the seconds parameter of the MCLT.<br><b>Values</b> 1 — 59 |

## partner-down-delay

|                    |                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>partner-down-delay</b> [ <b>hrs</b> <i>hours</i> ] [ <b>min</b> <i>minutes</i> ] [ <b>sec</b> <i>seconds</i> ]<br><b>no partner-down-delay</b>                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>dhcp>server>failover                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command specifies the minimum safe-time after the beginning of a communications-interrupted state. After the expiry of this time, the server enters a partner-down state.                                                                                                                                                                                       |
| <b>Parameters</b>  | <b>hrs</b> <i>hours</i> — Specifies the hour parameter of the partner down delay feature.<br><b>Values</b> 1 — 23<br><b>min</b> <i>minutes</i> — Specifies the minute parameter of the partner down delay feature.<br><b>Values</b> 1 — 59<br><b>sec</b> <i>seconds</i> — Specifies the seconds parameter of the partner down delay feature.<br><b>Values</b> 1 — 59 |

## peer

|                    |                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>peer</b> <i>ip-address</i> <b>tag</b> <i>sync-tag-name</i><br><b>no peer</b> <i>ip-address</i>                             |
| <b>Context</b>     | config>service>vprn>dhcp>server>failover                                                                                      |
| <b>Description</b> | This command creates a synchronization tag.                                                                                   |
| <b>Parameters</b>  | <b>sync-tag</b> <i>sync-tag</i> — Specifies a synchronization tag to be used while synchronizing with the multi-chassis peer. |

## startup-wait-time

|                    |                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] startup-wait-time [min <i>minutes</i>] [sec <i>seconds</i>]</b>                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>dhcp>server>failover                                                                                                                                                                                                                         |
| <b>Description</b> | This command specifies the startup wait time. The startup wait time is the time that one server attempts to contact the partner server. During this time, the server is unresponsive to DHCP client requests.                                                    |
| <b>Parameters</b>  | <p><b>min <i>minutes</i></b> — Specifies the minute parameter of the startup wait time feature.</p> <p><b>Values</b> 1 — 59</p> <p><b>sec <i>seconds</i></b> — Specifies the seconds parameter of the startup wait time feature.</p> <p><b>Values</b> 1 — 59</p> |

## disable-force-renews

|                    |                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] disable-force-renews</b>                                                                                                                       |
| <b>Context</b>     | config>service>vprn>dhcp>server                                                                                                                        |
| <b>Description</b> | <p>This command enables the sending of sending forcerenew messages.</p> <p>The no form of the command disables the sending of forcerenew messages.</p> |
| <b>Default</b>     | no disable-force-renews                                                                                                                                |

## pool

|                    |                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>pool <i>pool-name</i> [create]</b></p> <p><b>no pool <i>pool-name</i></b></p>                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>dhcp>server                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command configures a DHCP address pool on the router.                                                                                                                                                                                                                                                                                              |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><b><i>pool name</i></b> — Specifies the name of this IP address pool. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters.</p> <p><b>create</b> — Keyword used to create the entity. The <b>create</b> keyword requirement can be enabled/disabled in the <b>environment&gt;create</b> context.</p> |

## max-lease-time

|                    |                                                                                                                                                                       |          |          |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|
| <b>Syntax</b>      | <b>max-lease-time</b> [ <b>days</b> <i>days</i> ] [ <b>hrs</b> <i>hours</i> ] [ <b>min</b> <i>minutes</i> ] [ <b>sec</b> <i>seconds</i> ]<br><b>no max-lease-time</b> |          |          |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool                                                                                                                                  |          |          |
| <b>Description</b> | This command configures the maximum lease time.<br>The <b>no</b> form of the command returns the value to the default.                                                |          |          |
| <b>Default</b>     | 10 days                                                                                                                                                               |          |          |
| <b>Parameters</b>  | <i>time</i> — Specifies the maximum lease time.                                                                                                                       |          |          |
|                    | <b>Values</b>                                                                                                                                                         | days :   | 0 — 3650 |
|                    |                                                                                                                                                                       | hours    | 0 — 23   |
|                    |                                                                                                                                                                       | minutes: | 0 — 59   |
|                    |                                                                                                                                                                       | seconds  | 0 — 59   |

## min-lease-time

|                    |                                                                                                                                                                       |          |          |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|
| <b>Syntax</b>      | <b>min-lease-time</b> [ <b>days</b> <i>days</i> ] [ <b>hrs</b> <i>hours</i> ] [ <b>min</b> <i>minutes</i> ] [ <b>sec</b> <i>seconds</i> ]<br><b>no min-lease-time</b> |          |          |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool                                                                                                                                  |          |          |
| <b>Description</b> | This command configures the minimum lease time.<br>The <b>no</b> form of the command returns the value to the default.                                                |          |          |
| <b>Default</b>     | 10 minutes                                                                                                                                                            |          |          |
| <b>Parameters</b>  | <i>time</i> — Specifies the minimum lease time.                                                                                                                       |          |          |
|                    | <b>Values</b>                                                                                                                                                         | days :   | 0 — 3650 |
|                    |                                                                                                                                                                       | hours    | 0 — 23   |
|                    |                                                                                                                                                                       | minutes: | 0 — 59   |
|                    |                                                                                                                                                                       | seconds  | 0 — 59   |

## offer-time

|                    |                                                                                                                |  |  |
|--------------------|----------------------------------------------------------------------------------------------------------------|--|--|
| <b>Syntax</b>      | <b>offer-time</b> [ <b>min</b> <i>minutes</i> ] [ <b>sec</b> <i>seconds</i> ]<br><b>no offer-time</b>          |  |  |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool                                                                           |  |  |
| <b>Description</b> | This command configures the offer time.<br>The <b>no</b> form of the command returns the value to the default. |  |  |
| <b>Default</b>     | 1 minute                                                                                                       |  |  |

|                   |                                         |          |        |
|-------------------|-----------------------------------------|----------|--------|
| <b>Parameters</b> | <i>time</i> — Specifies the offer time. |          |        |
|                   | <b>Values</b>                           | minutes: | 0 — 10 |
|                   |                                         | seconds  | 0 — 59 |

## options

|                    |                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>options</b>                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool                                                                                                                          |
| <b>Description</b> | This command enables the context to configure pool options. The options defined here can be overruled by defining the same option in the local user database. |
| <b>Default</b>     | none                                                                                                                                                          |

## custom-option

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>custom-option</b> <i>option-number</i> <b>address</b> [ <i>ip-address...</i> (up to 4 max)]<br><b>custom-option</b> <i>option-number</i> <b>hex</b> <i>hex-string</i><br><b>custom-option</b> <i>option-number</i> <b>string</b> <i>ascii-string</i><br><b>no custom-option</b> <i>option-number</i>                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>options<br>config>service>vprn>dhcp>server>pool>subnet>options                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command configures specific DHCP options. The options defined here can overrule options in the local user database.<br><br>The <b>no</b> form of the removes the option from the configuration.                                                                                                                                                                                                                                                                                                                       |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>option-number</i> — specifies the option number that the DHCP server uses to send the identification strings to the DHCP client.<br><br><b>Values</b> 1 — 254<br><br><b>address</b> <i>ip-address</i> — Specifies the IP address of this host.<br><br><b>hex</b> <i>hex-string</i> — Specifies the hex value of this option.<br><b>Values</b> 0x0..0xFFFFFFFF...(maximum 254 hex nibbles)<br><br><b>string</b> <i>ascii-string</i> — Specifies the value of this option.<br><b>Values</b> Up to 127 characters maximum. |

## dns-server

|                    |                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dns-server</b> <i>ip-address</i> [ <i>ip-address...</i> (up to 4 max)]                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>options                                                                                                                                                                                                        |
| <b>Description</b> | This command configures the IP address of the DNS server.                                                                                                                                                                                           |
| <b>Default</b>     | none                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>ip-address</i> — The IP address of the DNS server. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets). |

## domain-name

|                    |                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>domain-name</b> <i>domain-name</i><br><b>no domain-name</b>                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>options                                                                                                                                                                                              |
| <b>Description</b> | This command configures the default domain for a DHCP client that the router uses to complete unqualified hostnames (without a dotted-decimal domain name).<br>The <b>no</b> form of the command removes the name from the configuration. |
| <b>Default</b>     | none                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>domain-name</i> — Specifies the domain name for the client.<br><b>Values</b> Up to 127 characters                                                                                                                                      |

## lease-rebind-time

|                    |                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-rebind-time</b> [ <b>days</b> <i>days</i> ] [ <b>hrs</b> <i>hours</i> ] [ <b>min</b> <i>minutes</i> ] [ <b>sec</b> <i>seconds</i> ]<br><b>no lease-rebind-time</b> |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>options                                                                                                                                |
| <b>Description</b> | This command configures the time the client transitions to a rebinding state.<br>The <b>no</b> form of the command removes the time from the configuration.                 |
| <b>Default</b>     | none                                                                                                                                                                        |
| <b>Parameters</b>  | <i>time</i> — Specifies the lease rebind time.<br><b>Values</b><br>days: 0 — 3650<br>hours: 0 — 23<br>minutes: 0 — 59<br>seconds 0 — 59                                     |

## lease-renew-time

|                    |                                                                                                                                                                           |          |          |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|
| <b>Syntax</b>      | <b>lease-renew-time</b> [ <b>days</b> <i>days</i> ] [ <b>hrs</b> <i>hours</i> ] [ <b>min</b> <i>minutes</i> ] [ <b>sec</b> <i>seconds</i> ]<br><b>no lease-renew-time</b> |          |          |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>options                                                                                                                              |          |          |
| <b>Description</b> | This command configures the time the client transitions to a renew state.<br>The <b>no</b> form of the command removes the time from the configuration.                   |          |          |
| <b>Default</b>     | none                                                                                                                                                                      |          |          |
| <b>Parameters</b>  | <i>time</i> — Specifies the lease renew time.                                                                                                                             |          |          |
|                    | <b>Values</b>                                                                                                                                                             | days:    | 0 — 3650 |
|                    |                                                                                                                                                                           | hours:   | 0 — 23   |
|                    |                                                                                                                                                                           | minutes: | 0 — 59   |
|                    |                                                                                                                                                                           | seconds  | 0 — 59   |

## lease-time

|                    |                                                                                                                                                                                                                                     |          |          |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|
| <b>Syntax</b>      | <b>lease-time</b> [ <b>days</b> <i>days</i> ] [ <b>hrs</b> <i>hours</i> ] [ <b>min</b> <i>minutes</i> ] [ <b>sec</b> <i>seconds</i> ]<br><b>no lease-time</b>                                                                       |          |          |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>options                                                                                                                                                                                        |          |          |
| <b>Description</b> | This command configures the amount of time that the DHCP server grants to the DHCP client permission to use a particular IP address.<br>The <b>no</b> form of the command removes the lease time parameters from the configuration. |          |          |
| <b>Default</b>     | none                                                                                                                                                                                                                                |          |          |
| <b>Parameters</b>  | <i>time</i> — Specifies the lease time.                                                                                                                                                                                             |          |          |
|                    | <b>Values</b>                                                                                                                                                                                                                       | days :   | 0 — 3650 |
|                    |                                                                                                                                                                                                                                     | hours    | 0 — 23   |
|                    |                                                                                                                                                                                                                                     | minutes: | 0 — 59   |
|                    |                                                                                                                                                                                                                                     | seconds  | 0 — 59   |

## netbios-name-server

|                    |                                                                                                                     |  |  |
|--------------------|---------------------------------------------------------------------------------------------------------------------|--|--|
| <b>Syntax</b>      | <b>netbios-name-server</b> <b>ip-address</b> [ <i>ip-address</i> ...(up to 4 max)]<br><b>no netbios-name-server</b> |  |  |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>options                                                                        |  |  |
| <b>Description</b> | This command configures up to four Network Basic Input/Output System (NetBIOS) name server IP addresses.            |  |  |
| <b>Default</b>     | none                                                                                                                |  |  |



**Parameters** *ip-address* — The IP address of the NetBIOS name server. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).

## netbios-node-type

**Syntax** **netbios-node-type** *netbios-node-type*  
**no netbios-node-type**

**Context** config>service>vprn>dhcp>server>pool>options

**Description** This command configures the Network Basic Input/Output System (NetBIOS) node type.

**Default** none

**Parameters** *netbios-node-type* — Specifies the netbios node type.

**Values**

- B — Broadcast node uses broadcasting to query nodes on the network for the owner of a NetBIOS name.
- P — Peer-to-peer node uses directed calls to communicate with a known NetBIOS name server for the IP address of a NetBIOS machine name.
- M — Mixed node uses broadcasted queries to find a node, and if that fails, queries a known P-node name server for the address.
- H — Hybrid node is the opposite of the M-node action so that a directed query is executed first, and if that fails, a broadcast is attempted.

## subnet

**Syntax** **subnet** {*ip-address/mask* | *ip-address netmask*} [**create**]  
**no subnet** {*ip-address/mask* | *ip-address netmask*}

**Context** config>service>vprn>dhcp>server>pool

**Description** This command creates a subnet of IP addresses to be served from the pool. The subnet cannot include any addresses that were assigned to subscribers without those addresses specifically excluded. When the subnet is created no IP addresses are made available until a range is defined.

**Default** none

**Parameters** *ip-address* — Specifies the base IP address of the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).

*mask* — The subnet mask in dotted decimal notation. Allowed values are dotted decimal addresses in the range 128.0.0.0 – 255.255.255.252. Note that a mask of 255.255.255.255 is reserved for system IP addresses.

*netmask* — Specifies a string of 0s and 1s that mask or screen out the network part of an IP address so that only the host computer part of the address remains.

**create** — Keyword used to create the entity. The **create** keyword requirement can be enabled/disabled in the **environment>create** context.

## address-range

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] address-range</b> <i>start-ip-address end-ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>subnet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command configures a range of IP addresses to be served from the pool. All IP addresses between the start and end IP addresses will be included (other than specific excluded addresses).                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><i>start-ip-address</i> — Specifies the start address of this range to include. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> <p><i>end-ip-address</i> — Specifies the end address of this range to include. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> |

## exclude-addresses

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] exclude-addresses</b> <i>start-ip-address [end-ip-address]</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>subnet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command specifies a range of IP addresses that excluded from the pool of IP addresses in this subnet.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><i>start-ip-address</i> — Specifies the start address of this range to exclude. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> <p><i>end-ip-address</i> — Specifies the end address of this range to exclude. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> |

## maximum-declined

|                    |                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>maximum-declined</b> <i>maximum-declined</i><br><b>no maximum-declined</b>                                                         |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>subnet                                                                                           |
| <b>Description</b> | This command configures the maximum number of declined addresses allowed.                                                             |
| <b>Default</b>     | 64                                                                                                                                    |
| <b>Parameters</b>  | <p><i>maximum-declined</i> — Specifies the maximum number of declined addresses allowed.</p> <p><b>Values</b>      0 — 4294967295</p> |

## minimum-free

|                    |                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>minimum-free</b> <i>minimum-free</i><br><b>no minimum-free</b>                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>subnet                                                                                                                                                          |
| <b>Description</b> | This command configures the minimum number of free addresses in this subnet. If the actual number of free addresses in this subnet falls below this configured minimum, a notification is generated. |
| <b>Default</b>     | 1                                                                                                                                                                                                    |
| <b>Parameters</b>  | <i>minimum-free</i> — Specifies the minimum number of free addresses in this subnet.<br><b>Values</b> 0 — 255                                                                                        |

## default-router

|                    |                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>default-router</b> <i>ip-address</i> [ <i>ip-address...</i> (up to 4 max)]<br><b>no default-router</b>                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>subnet                                                                                                                                                                                                                       |
| <b>Description</b> | This command configures the IP address of the default router for a DHCP client. Up to four IP addresses can be specified.<br><br>The <b>no</b> form of the command removes the address(es) from the configuration.                                                |
| <b>Default</b>     | none                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the IP address of the default router. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets). |

## subnet-mask

|                    |                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subnet-mask</b> <i>ip-address</i><br><b>no subnet-mask</b>                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>dhcp>server>pool>subnet                                                                                                                                                                                                                    |
| <b>Description</b> | This command specifies the subnet-mask option to the client. The mask can either be defined (for supernetting) or taken from the pool address.<br><br>The <b>no</b> form of the command removes the address from the configuration.                            |
| <b>Default</b>     | none                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the IP address of the subnet mask. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets). |

## use-gi-address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] use-gi-address</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vpn>dhcp>server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command enables the use of gi-address matching. If the gi-address flag is enabled, a pool can be used even if a subnets is not found. If the local-user-db-name is not used, the gi-address flag is used and addresses are handed out by GI only. If a user must be blocked from getting an address the server maps to a local user database and configures the user with no address.</p> <p>A pool can include multiple subnets. Since the GI is shared by multiple subnets in a subscriber-interface the pool may provide IP addresses from any of the subnets included when the GI is matched to any of its subnets. This allows a pool to be created that represents a sub-int.</p> |
| <b>Default</b>     | no use-gi-address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## use-pool-from-client

|                    |                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] use-pool-from-client</b>                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vpn>dhcp>server                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command specifies if the IP address pool to be used by this server is the pool indicated by the vendor-specific sub-option 13 of the DHCP Option 82.</p> <p>When enabled, the pool indicated by the sub-option 13 is to be used.</p> <p>The <b>no</b> form of the command indicates that the pool selection is specified by the value of <b>use-gi-address</b> setting.</p> |

## user-db

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>user-db</b> <i>local-user-db-name</i><br><b>no user-db</b>            |
| <b>Context</b>     | config>service>vpn>dhcp>server                                           |
| <b>Description</b> | This command configures a local user database for authentication.        |
| <b>Default</b>     | not enabled                                                              |
| <b>Parameters</b>  | <i>local-user-db-name</i> — Specifies the name of a local user database. |

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## Multicast VPN Commands

### mvpn

|                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mvpn</b>                                                                           |
| <b>Context</b>     | config>service>vpn                                                                    |
| <b>Description</b> | This command enables the context to configure MVPN-related parameters for the IP VPN. |

### auto-discovery

|                    |                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] auto-discovery</b>                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vpn>mvpn                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command enables MVPN membership auto-discovery through BGP. When auto-discovery is enabled, PIM peering on the inclusive provider tunnel is disabled.</p> <p>The <b>no</b> form of the command disables MVPN membership auto-discovery through BGP.</p> |
| <b>Default</b>     | enabled                                                                                                                                                                                                                                                         |

### c-mcast-signaling

|                    |                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>c-mcast-signaling {bgp   pim}</b><br><b>no c-mcast-signaling</b>                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vpn>mvpn                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command specifies BGP or PIM, for PE-to-PE signaling of CE multicast states. When this command is set to PIM and neighbor discovery by BGP is disabled, PIM peering will be enabled on the inclusive tree.</p> <p>Changes may only be made to this command when the mvpn node is shutdown.</p> <p>The <b>no</b> form of the command reverts it back to the default.</p> |
| <b>Default</b>     | mcast-signaling bgp                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><b>bgp</b> — Specifies to use BGP for PE-to-PE signaling of CE multicast states. Auto-discovery must be enabled.</p> <p><b>pim</b> — Specifies to use PIM for PE-to-PE signaling of CE multicast states.</p>                                                                                                                                                                 |

## intersite-shared

|                    |                                                                         |
|--------------------|-------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>intersite-shared</b><br><b>no intersite-shared</b>                   |
| <b>Context</b>     | config>service>vprn>mvpn                                                |
| <b>Description</b> | This command specifies whether to use inter-site shared C-trees or not. |
| <b>Default</b>     | intersite-shared                                                        |

## provider-tunnel

|                    |                                                                           |
|--------------------|---------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>provider-tunnel</b>                                                    |
| <b>Context</b>     | config>service>vprn>mvpn                                                  |
| <b>Description</b> | This command enables context to configure tunnel parameters for the MVPN. |

## inclusive

|                    |                                                                            |
|--------------------|----------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>inclusive</b>                                                           |
| <b>Context</b>     | config>service>vprn>mvpn>pt                                                |
| <b>Description</b> | This command enables the context for specifying inclusive provider tunnels |

## pim

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pim {asm   ssm} grp-ip-address</b><br><b>no pim</b>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>mvpn>pt>inclusive                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command specifies the PIM mode to use, ASM or SSM, for PIM-based inclusive provider tunnels and the multicast group address to use. Also enables the context for specifying parameters for PIM peering on the inclusive provider tunnel.</p> <p>Note that auto-discovery must be enabled in order for SSM to operate.</p> <p>The <b>no</b> form of the command removes the pim context including the statements under the context.</p> |
| <b>Default</b>     | no pim                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><b>asm</b> — Specifies to use PIM ASM for inclusive provider tunnels.</p> <p><b>ssm</b> — Specifies to use PIM SSM for inclusive provider tunnels.</p> <p><b>group-address</b> — Specifies the multicast group address to use.</p>                                                                                                                                                                                                          |

## hello-interval

|                    |                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hello-interval</b> <i>hello-interval</i><br><b>no hello-interval</b>                                                                                                                       |
| <b>Context</b>     | config>service>vprn>mvpn>provider-tunnel>inclusive>pim                                                                                                                                        |
| <b>Description</b> | This command specifies the interval at which PIM hello messages are transmitted on the PIM inclusive provider tunnel.<br><br>The <b>no</b> form of this command reverts to the default value. |
| <b>Default</b>     | 30 seconds                                                                                                                                                                                    |
| <b>Parameters</b>  | <i>hello-interval</i> — Specifies the hello interval, in seconds. A 0 (zero) value disables the sending of hello messages.<br><br><b>Values</b> 0 — 255                                       |

## hello-multiplier

|                    |                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hello-multiplier</b> <i>deci-units</i><br><b>no hello-multiplier</b>                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>mvpn>provider-tunnel>inclusive>pim                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command specifies the hello multiplier. The hello-multiplier in conjunction with the hello-interval determines the hold time for a PIM neighbor.<br><br>$\text{Hold time} = (\text{hello-interval} * \text{hello-multiplier}) / 10.$<br><br>The <b>no</b> form of the command reverts the value to the default. |
| <b>Default</b>     | 35                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>deci-units</i> — Specifies the value, in multiples of 0.1, for the formula used to calculate the hold time<br><br><b>Values</b> 20 — 100                                                                                                                                                                          |

## improved-assert

|                    |                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] improved-assert</b>                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>mvpn>provider-tunnel>inclusive>pim                                                                                                            |
| <b>Description</b> | This command enables improved assert procedure on the PIM inclusive provider tunnel.<br><br>The <b>no</b> form of the command disables improved assert procedure. |
| <b>Default</b>     | enabled                                                                                                                                                           |

## three-way-hello

|                    |                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] three-way-hello</b>                                                                                                                |
| <b>Context</b>     | config>service>vpn>mvpn>provider-tunnel>inclusive>pim                                                                                      |
| <b>Description</b> | This command enables PIM three-way hello on the inclusive provider tunnel.<br>The no form of the command disables the PIM three-way hello. |
| <b>Default</b>     | disabled                                                                                                                                   |

## tracking-support

|                    |                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] tracking-support</b>                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vpn>mvpn>provider-tunnel>inclusive>pim                                                                                                                                                                                |
| <b>Description</b> | This command enables the setting of the T bit in the LAN Prune Delay option of the hello message.<br>This indicates the router's capability to disable Join message suppression.<br>The no form of the command disables the setting. |
| <b>Default</b>     | disabled                                                                                                                                                                                                                             |

## selective

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>selective</b>                                                                  |
| <b>Context</b>     | config>service>vpn>mvpn>provider-tunnel                                           |
| <b>Description</b> | This command enables the context to specify selective provider tunnel parameters. |
| <b>Default</b>     | none                                                                              |

## auto-discovery-disable

|                    |                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] auto-discovery-disable</b>                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vpn>mvpn>provider-tunnel>selective                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command disables C-trees to P-tunnel binding auto-discovery through BGP so it is signaled using PIM join TLVs.<br>This command requires the <b>c-mcast-signaling</b> parameter to be set to PIM.<br>The <b>no</b> form of the command enables multicast VPN membership auto-discovery through BGP. |
| <b>Default</b>     | no auto-discovery-disable                                                                                                                                                                                                                                                                               |



## data-delay-interval

|                    |                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>data-delay-interval</b> <i>value</i><br><b>no data-delay-interval</b>                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>mvpn>provider-tunnel>selective                                                                                                                                                                                                    |
| <b>Description</b> | This command specifies the interval, in seconds, before a PE router connected to the source switches traffic from the inclusive provider tunnel to the selective provider tunnel.<br><br>The no form of the command reverts the value to the default. |
| <b>Default</b>     | 3 seconds                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <i>value</i> — Specifies the data delay interval, in seconds.<br><br><b>Values</b> 3 — 180                                                                                                                                                            |

## data-threshold

|                    |                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>data-threshold</b> { <i>c-grp-ip-addr/mask</i>   <i>c-grp-ip-addr netmask</i> } <i>s-pmsi-threshold</i><br><b>no data-threshold</b> { <i>c-grp-ip-addr/mask</i>   <i>c-grp-ip-addr netmask</i> }                                                                                                                                |
| <b>Context</b>     | config>service>vprn>mvpn>provider-tunnel>selective                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command specifies the data rate threshold that triggers the switch from the inclusive provider tunnel to the selective provider tunnel for C-(S,G) within the group range. Multiple statements are allowed in the configuration.<br><br>The <b>no</b> form of the command removes the values from the configuration.          |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <i>group-address/mask</i> — Specifies a multicast group address and netmask length.<br><br><i>rate-threshold</i> — Specifies the rate, in kilobits per second (kbps). If the rate for a C-(S,G) within the specified group range exceeds the threshold, traffic for the C-(S,G) will be switched to the selective provider tunnel. |

## join-tlv-packing-disable

|                    |                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] join-tlv-packing-disable</b>                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>mvpn>provider-tunnel>selective>pim                                                                                                                                                                                         |
| <b>Description</b> | This command enables packing of MDT join TLVs into a single PDU to improve efficiency, if multiple Join TLVs are available at the time of transmission.<br><br>The no form of the command disables packing of MDT join TLVs into a single PDU. |
| <b>Default</b>     | no join-tlv-packing-disable                                                                                                                                                                                                                    |

### pim-ssm

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pim-ssm</b> { <i>grp-ip-address/mask</i>   <i>grp-ip-address netmask</i> }<br><b>no pim-ssm</b> |
| <b>Context</b>     | config>service>vprn>mvpn>provider-tunnel>selective                                                 |
| <b>Description</b> | This command specifies the PIM SSM groups to use for the selective provider tunnel.                |
| <b>Parameters</b>  | <i>group-address/mask</i> — Specifies a multicast group address and netmask length.                |

### umh-selection

|                    |                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>umh-selection highest-ip   hash-based</b><br><b>no umh-selection</b>                                                                              |
| <b>Context</b>     | config>service>vprn>mvpn                                                                                                                             |
| <b>Description</b> | This command specifies which UMH selection mechanism to use, highest IP address or hash based. The no form of the command resets it back to default. |
| <b>Default</b>     | umh-selection highest-ip                                                                                                                             |

### vrf-export

|                    |                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vrf-export</b> { <b>unicast</b>   <i>policy-name</i> [ <i>policy-name...</i> (up to 5 max)]}<br><b>no vrf-export</b>                               |
| <b>Context</b>     | config>service>vprn>mvpn                                                                                                                              |
| <b>Description</b> | This command specifies the export policy (up to 5) to control MVPN routes exported from the local VRF to other VRFs on the same or remote PE routers. |
| <b>Default</b>     | vrf-export unicast                                                                                                                                    |
| <b>Parameters</b>  | <b>unicast</b> — Specifies to use unicast VRF export policy for the MVPN.<br><i>policy</i> — Specifies a route policy name.                           |

### vrf-import

|                    |                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vrf-import</b> { <b>unicast</b>   <i>policy-name</i> [ <i>policy-name...</i> (up to 5 max)]}<br><b>no vrf-import</b>                               |
| <b>Context</b>     | config>service>vprn>mvpn                                                                                                                              |
| <b>Description</b> | This command specifies the import policy (up to 5) to control MVPN routes imported to the local VRF from other VRFs on the same or remote PE routers. |
| <b>Default</b>     | vrf-import unicast                                                                                                                                    |

**Parameters**     **unicast** — Specifies to use a unicast VRF import policy for the MVPN.  
*policy* — Specifies a route policy name.

## vrf-target

**Syntax**     **vrf-target** {**unicast** | *ext-community* | **export unicast** | *ext-community* | **import unicast** | *ext-community*}  
**no vrf-target**

**Context**     config>service>vprn>mvpn

**Description**     This command specifies the route target to be added to the advertised routes or compared against the received routes from other VRFs on the same or remote PE routers. vrf-import or vrf-export policies override the vrf-target policy.  
 The **no** form of the command removes the vrf-target.

**Default**     no vrf-target

**Parameters**     **unicast** — Specifies to use unicast vrf-target ext-community for the multicast VPN.  
*ext-comm* — An extended BGP community in the **type:x:y** format. The value **x** can be an integer or IP address. The **type** can be the target or origin. **x** and **y** are 16-bit integers.

**Values**     target: {*ip-address:comm-val* | *2byte-asnumber:ext-comm-val* | *4byte-asnumber:comm-val*}  
                   *ip-address:*                    a.b.c.d  
                   *comm-val:*                      0 — 65535  
                   *2byte-asnumber:*            1 — 65535  
                   *4byte-asnumber*            0 — 4294967295

**import** *ext-community* — Specify communities allowed to be accepted from remote PE neighbors.  
**export** *ext-community* — Specify communities allowed to be sent to remote PE neighbors.

## export

**Syntax**     **export** {**unicast** | *ext-community*}

**Context**     config>service>vprn>mvpn>vrf-target

**Description**     This command specifies communities to be sent to peers.

**Parameters**     **unicast** — Specifies to use unicast vrf-target ext-community for the multicast VPN.  
*ext-comm* — An extended BGP community in the **type:x:y** format. The value **x** can be an integer or IP address. The **type** can be the target or origin. **x** and **y** are 16-bit integers.

**Values**     target: {*ip-address:comm-val* | *2byte-asnumber:ext-comm-val* | *4byte-asnumber:comm-val*}  
                   *ip-address:*                    a.b.c.d  
                   *comm-val:*                      0 — 65535

|                        |                |
|------------------------|----------------|
| <i>2byte-asnumber:</i> | 1 — 65535      |
| <i>4byte-asnumber</i>  | 0 — 4294967295 |

import

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |         |                  |           |                        |           |                       |                |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------|------------------|-----------|------------------------|-----------|-----------------------|----------------|
| <b>Syntax</b>          | <b>import</b> { <b>unicast</b>   <i>ext-community</i> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    |         |                  |           |                        |           |                       |                |
| <b>Context</b>         | config>service>vprn>mvpn>vrf-target                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |         |                  |           |                        |           |                       |                |
| <b>Description</b>     | This command specifies communities to be accepted from peers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |         |                  |           |                        |           |                       |                |
| <b>Parameters</b>      | <p><b>unicast</b> — Specifies to use unicast vrf-target ext-community for the multicast VPN.</p> <p><i>ext-comm</i> — An extended BGP community in the <b>type:x:y</b> format. The value <b>x</b> can be an integer or IP address. The <b>type</b> can be the target or origin. <b>x</b> and <b>y</b> are 16-bit integers.</p> <p><b>Values</b> target:{<i>ip-address:comm-val</i>  <i>2byte-asnumber:ext-comm-val</i> <i>4byte-asnumber:comm-val</i>}</p> <table> <tr> <td><i>ip-address:</i></td><td>a.b.c.d</td></tr> <tr> <td><i>comm-val:</i></td><td>0 — 65535</td></tr> <tr> <td><i>2byte-asnumber:</i></td><td>1 — 65535</td></tr> <tr> <td><i>4byte-asnumber</i></td><td>0 — 4294967295</td></tr> </table> | <i>ip-address:</i> | a.b.c.d | <i>comm-val:</i> | 0 — 65535 | <i>2byte-asnumber:</i> | 1 — 65535 | <i>4byte-asnumber</i> | 0 — 4294967295 |
| <i>ip-address:</i>     | a.b.c.d                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    |         |                  |           |                        |           |                       |                |
| <i>comm-val:</i>       | 0 — 65535                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |         |                  |           |                        |           |                       |                |
| <i>2byte-asnumber:</i> | 1 — 65535                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |         |                  |           |                        |           |                       |                |
| <i>4byte-asnumber</i>  | 0 — 4294967295                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |         |                  |           |                        |           |                       |                |

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## Network Time Protocol Commands

### ntp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ntp</b>                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command enables the context to configure Network Time Protocol (NTP) and its operation. This protocol defines a method to accurately distribute and maintain time for network elements. Furthermore this capability allows for the synchronization of clocks between the various network elements. Use the <b>no</b> form of the command to stop the execution of NTP and remove its configuration. |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                     |

### authentication-check

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] authentication-check</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>ntp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command provides the option to skip the rejection of NTP PDUs that do not match the authentication key-id, type or key requirements. The default behavior when authentication is configured is to reject all NTP protocol PDUs that have a mismatch in either the authentication key-id, type or key.</p> <p>When <b>authentication-check</b> is enabled, NTP PDUs are authenticated on receipt. However, mismatches cause a counter to be increased, one counter for type and one for key-id, one for type, value mismatches. These counters are visible in a <b>show</b> command.</p> <p>The <b>no</b> form of this command allows authentication mismatches to be accepted; the counters however are maintained.</p> |
| <b>Default</b>     | authentication-check — Rejects authentication mismatches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

### authentication-key

|                    |                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-key</b> <i>key-id</i> { <b>key</b> <i>key</i> } [ <b>hash</b>   <b>hash2</b> ] <b>type</b> { <b>des</b>   <b>message-digest</b> }<br><b>no authentication-key</b> <i>key-id</i>                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>ntp                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command sets the authentication key-id, type and key used to authenticate NTP PDUs sent to or received by other network elements participating in the NTP protocol. For authentication to work, the authentication key-id, type and key value must match.</p> <p>The <b>no</b> form of the command removes the authentication key.</p> |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b> | <p><i>key-id</i> — Configure the authentication key-id that will be used by the node when transmitting or receiving Network Time Protocol packets.</p> <p>Entering the authentication-key command with a key-id value that matches an existing configuration key will result in overriding the existing entry.</p> <p>Recipients of the NTP packets must have the same authentication key-id, type, and key value in order to use the data transmitted by this node. This is an optional parameter.</p> <p><b>Default</b>      None</p> <p><b>Values</b>      1 — 255</p> <p><b>key</b> — The authentication key associated with the configured key-id, the value configured in this parameter is the actual value used by other network elements to authenticate the NTP packet.</p> <p>The key can be any combination of ASCII characters up to 8 characters in length (unencrypted). If spaces are used in the string, enclose the entire string in quotation marks (“ ”).</p> <p><b>hash</b> — Specifies the key is entered in an encrypted form. If the hash or hash2 parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the hash or hash2 parameter specified.</p> <p><b>hash2</b> — Specifies the key is entered in a more complex encrypted form that involves more variables than the key value alone, this means that hash2 encrypted variable can’t be copied and pasted. If the hash or hash2 parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the hash or hash2 parameter specified.</p> <p><b>type</b> — This parameter determines if DES or message-digest authentication is used.</p> <p>This is a required parameter; either DES or message-digest must be configured.</p> <p><b>Values</b>      des — Specifies that DES authentication is used for this key<br/> message-digest — Specifies that MD5 authentication in accordance with RFC 2104 is used for this key.</p> |

## broadcast

|                    |                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>broadcast</b> { <b>interface</b> <i>ip-int-name</i> } [ <b>key-id</b> <i>key-id</i> ] [ <b>version</b> <i>version</i> ] [ <b>tll</b> <i>tll</i> ]<br><b>no broadcast</b> { <b>interface</b> <i>ip-int-name</i> }                                                               |
| <b>Context</b>     | config>service>vprn>ntp                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command configures the node to transmit NTP packets on a given interface. Broadcast and multicast messages can easily be spoofed, thus, authentication is strongly recommended.</p> <p>The <b>no</b> form of this command removes the address from the configuration.</p> |
| <b>Parameters</b>  | <p><i>ip-int-name</i> — Specifies the local interface on which to transmit NTP broadcast packets. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p><b>Values</b>      32 character maximum</p>    |

**key-id** *key-id* — Identifies the configured authentication key and authentication type used by this node to receive and transmit NTP packets to and from an NTP server and peers. If an NTP packet is received by this node both authentication key and authentication type must be valid otherwise the packet will be rejected and an event/trap generated.

**Values** 1 — 255

**Default** none

**version** *version* — Specifies the NTP version number that is generated by this node. This parameter does not need to be configured when in client mode in which case all versions will be accepted.

**Values** 1 — 4

**Default** 4

**ttl** *ttl* — Specifies the IP Time To Live (TTL) value.

**Values** 1 — 255

**Default** none

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## Redundant Interface Commands

### redundant-interface

|                    |                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] redundant-interface</b> <i>ip-int-name</i>                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vpn                                                                                                                                                                                                                                  |
| <b>Description</b> | This command configures a redundant interface.                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the name of the IP interface. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. |

### address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>address</b> { <i>ip-address/mask</i>   <i>ip-address netmask</i> } [ <b>remote-ip</b> <i>ip-address</i> ]<br><b>no address</b>                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vpn>redundant-interface                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command assigns an IP address mask or netmask and a remote IP address to the interface.                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>ip-address/mask</i> — Assigns an IP address/IP subnet format to the interface.<br><i>ip-address netmask</i> — Specifies a string of 0s and 1s that mask or screen out the network part of an IP address so that only the host computer part of the address remains.<br>Assigns an IP address netmask to the interface.<br><b>remote-ip ip-address</b> — Assigns a remote IP to the interface. |



## SDP Commands

### spoke-sdp

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>[no] spoke-sdp</b> <i>sdp-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>       | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>   | <p>This command binds a service to an existing Service Distribution Point (SDP). A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received.</p> <p>The SDP has an operational state which determines the operational state of the SDP within the service. For example, if the SDP is administratively or operationally down, the SDP for the service will be down.</p> <p>The SDP must already be defined in the <b>config&gt;service&gt;sdp</b> context in order to associate an SDP with a VPRN service. If the <b>sdp</b> <i>sdp-id</i> is not already configured, an error message is generated. If the <i>sdp-id</i> does exist, a binding between that <i>sdp-id</i> and the service is created.</p> <p>SDPs must be explicitly associated and bound to a service. If an SDP is not bound to a service, no far-end 7750 SR devices can participate in the service.</p> <p>The <b>no</b> form of this command removes the SDP binding from the service. The SDP configuration is not affected; only the binding of the SDP to a service. Once removed, no packets are forwarded to the far-end router.</p> |
| <b>Default</b>       | No <i>sdp-id</i> is bound to a service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Special Cases</b> | <b>VPRN</b> — Several SDPs can be bound to a VPRN service. Each SDP must be destined to a different 7750 SR router. If two <i>sdp-id</i> bindings terminate on the same 7750 SR, an error occurs and the second SDP binding is rejected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>    | <p><i>sdp-id</i> — The SDP identifier. Allowed values are integers in the range of 1 and 17407 for existing SDPs.</p> <p><i>vc-id</i> — The virtual circuit identifier.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Values</b>        | 1 — 4294967295                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## spoke-sdp

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>spoke-sdp</b> <i>sdp-id</i> [: <i>vc-id</i> ] <i>vc-type</i> { <b>ether</b>   <b>ipipe</b> } [ <b>create</b> ]<br><b>no spoke-sdp</b> <i>sdp-id</i> [: <i>vc-id</i> ] <i>vc-type</i> { <b>ether</b>   <b>ipipe</b> } [ <b>create</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>       | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>   | <p>This command binds a service to an existing Service Distribution Point (SDP).</p> <p>A spoke SDP is treated like the equivalent of a traditional bridge “port” where flooded traffic received on the spoke SDP is replicated on all other “ports” (other spoke and mesh SDPs or SAPs) and not transmitted on the port it was received.</p> <p>The SDP has an operational state which determines the operational state of the SDP within the service. For example, if the SDP is administratively or operationally down, the SDP for the service will be down.</p> <p>The SDP must already be defined in the <b>config&gt;service&gt;sdp</b> context in order to associate an SDP with a service. If the <b>sdp</b> <i>sdp-id</i> is not already configured, an error message is generated. If the <i>sdp-id</i> does exist, a binding between that <i>sdp-id</i> and the service is created.</p> <p>SDPs must be explicitly associated and bound to a service. If an SDP is not bound to a service, no far-end 7750 SR devices can participate in the service.</p> <p>Class-based forwarding is not supported on a spoke SDP used for termination on an IES or VPRN services. All packets are forwarded over the default LSP.</p> <p>The <b>no</b> form of this command removes the SDP binding from the service. The SDP configuration is not affected; only the binding of the SDP to a service. Once removed, no packets are forwarded to the far-end router.</p> |
| <b>Default</b>       | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Special Cases</b> | <p><b>VPRN</b> — Several SDPs can be bound to a VPRN service. Each SDP must be destined to a different 7750 SR router. If two <i>sdp-id</i> bindings terminate on the same 7750 SR, an error occurs and the second SDP is binding is rejected.</p> <p><i>sdp-id</i> — The SDP identifier.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit identifier.</p> <p><b>Values</b> 1 — 4294967295</p> <p><i>vc-type</i> — The encapsulation and PW type for the spoke-sdp.</p> <p><b>Values</b> ether—Ethernet PW. This is the default.<br/>ipipe—IP PW..</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## egress

|                    |                                                                           |
|--------------------|---------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress</b>                                                             |
| <b>Context</b>     | cconfig>service>vprn>if>spoke-sdp<br>config>service>vprn>red-if>spoke-sdp |
| <b>Description</b> | This command configures an SDP context.                                   |

## hash-label

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] hash-label</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn<br>config>service>vprn>spoke-sdp<br>config>service>vprn>interface>spoke-sdp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command enables the use of the hash label on a VLL, VPLS, or VPRN service bound to LDP or RSVP SDP as well as to a VPRN service using the autobind mode with the with the ldp, rsvp-te, or mpls options. This feature is not supported on a service bound to a GRE SDP or for a VPRN service using the autobind mode with the gre option..</p> <p>When this feature is enabled, the ingress data path is modified such that the result of the hash on the packet header is communicated to the egress data path for use as the value of the label field of the hash label. The egress data path appends the hash label at the bottom of the stack (BoS) and sets the S-bit to 1 to indicate that.</p> <p>In order to allow for applications whereby the egress LER infers the presence of the Hash Label implicitly from the value of the label, the Most Significant Bit (MSB) of the result of the hash is set before copying into the Hash Label. This means that the value of the hash label will always be in the range [524,288 - 1,048,575] and will not overlap with the signaled/static LSP and signaled/static service label ranges. This also guarantees that the hash label will not match a value in the reserved label range.</p> <p>The (unmodified) result of the hash continues to be used for the purpose of ECMP and LAG spraying of packets locally on the ingress LER. Note however that for VLL services, the result of the hash is overwritten and the ECMP and LAG spraying will be based on service-id when ingress SAP shared queuing is not enabled. However, the hash label will still reflect the result of the hash such that an LSR can use it to perform fine grained load balancing of VLL PW packets.</p> <p>Packets that are generated in CPM and forwarded labeled within the context of a service (for example, OAM packets) must also include a Hash Label at the BoS and set the S-bit accordingly.</p> <p>The TTL of the Hash Label is set to a value of 1.</p> <p>The <b>no</b> form of this command disables the use of the hash label.</p> |
| <b>Default</b>     | no hash-label                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## ingress

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress</b>                                                           |
| <b>Context</b>     | config>service>vprn>if>spoke-sdp<br>config>service>vprn>red-if>spoke-sdp |
| <b>Description</b> | This command configures the SDP context.                                 |

## vc-label

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vc-label</b> <i>egress-vc-label</i><br><b>no vc-label</b> [ <i>egress-vc-label</i> ]                 |
| <b>Context</b>     | config>service>vprn>if>spoke-sdp>egress<br>config>service>vprn>red-if>spoke-sdp>egress                  |
| <b>Description</b> | This command configures the egress VC label.                                                            |
| <b>Parameters</b>  | <i>vc-label</i> — A VC egress value that indicates a specific connection.<br><b>Values</b> 16 — 1048575 |

## vc-label

|                    |                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vc-label</b> <i>ingress-vc-label</i><br><b>no vc-label</b> [ <i>ingress-vc-label</i> ]                |
| <b>Context</b>     | config>service>vprn>>if>spoke-sdp>ingress<br>config>service>vprn>red-if>spoke-sdp>ingress                |
| <b>Description</b> | This command configures the ingress VC label.                                                            |
| <b>Parameters</b>  | <i>vc-label</i> — A VC ingress value that indicates a specific connection.<br><b>Values</b> 2048 — 18431 |

## filter

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>filter ip</b> <i>ip-filter-id</i><br><b>filter ipv6</b> <i>ipv6-filter-id</i><br><b>no filter</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>if>spoke-sdp>egress<br>config>service>vprn>if>spoke-sdp>ingress<br>config>service>vprn>red-if>spoke-sdp>ingress<br>config>service>vprn>red-if>spoke-sdp>egress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command associates an IP filter policy with an ingress or egress Service Access Point (SAP) or IP interface. An IP filter policy can be associated with spoke SDPs. Filter policies control the forwarding and dropping of packets based on IP or MAC matching criteria.</p> <p>The filter command is used to associate a filter policy with a specified ip-filter-id with an ingress or egress SAP. The ip-filter-id must already be defined before the filter command is executed. If the filter policy does not exist, the operation will fail and an error message returned.</p> <p>In general, filters applied to SAPs (ingress or egress) apply to all packets on the SAP. One exception is non-IP packets are not applied to IP match criteria, so the default action in the filter policy applies to these packets.</p> <p>The no form of this command removes any configured filter ID association with the SAP or IP interface. The filter ID itself is not removed from the system unless the scope of the created filter is set to local. To avoid deletion of the filter ID and only break the association with the service object, use scope command within the filter definition to change the scope to local or global. The default scope of a filter is local.</p> |
| <b>Parameters</b>  | <b>ip</b> <i>ip-filter-id</i> — Specifies IP filter policy. The filter ID must already exist within the created IP filters.<br><br><b>Values</b> 1 — 65535                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Interface Commands

### interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> <i>ip-int-name</i><br><b>no interface</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command creates a logical IP routing interface for a Virtual Private Routed Network (VPRN). Once created, attributes like an IP address and service access point (SAP) can be associated with the IP interface.</p> <p>The <b>interface</b> command, under the context of services, is used to create and maintain IP routing interfaces within VPRN service IDs. The <b>interface</b> command can be executed in the context of an VPRN service ID. The IP interface created is associated with the service core network routing instance and default routing table. The typical use for IP interfaces created in this manner is for subscriber internet access.</p> <p>Interface names are case sensitive and must be unique within the group of defined IP interfaces defined for <b>config router interface</b> and <b>config service vprn interface</b>. Interface names must not be in the dotted decimal notation of an IP address. For example, the name “1.1.1.1” is not allowed, but “int-1.1.1.1” is allowed. Show commands for router interfaces use either interface names or the IP addresses. Use unique IP address values and IP address names to maintain clarity. It could be unclear to the user if the same IP address and IP address name values are used. Although not recommended, duplicate interface names can exist in different router instances.</p> <p>The available IP address space for local subnets and routes is controlled with the <b>config router service-prefix</b> command. The <b>service-prefix</b> command administers the allowed subnets that can be defined on service IP interfaces. It also controls the prefixes that may be learned or statically defined with the service IP interface as the egress interface. This allows segmenting the IP address space into <b>config router</b> and <b>config service</b> domains.</p> <p>When a new name is entered, a new logical router interface is created. When an existing interface name is entered, the user enters the router interface context for editing and configuration.</p> <p>By default, there are no default IP interface names defined within the system. All VPRN IP interfaces must be explicitly defined. Interfaces are created in an enabled state.</p> <p>The <b>no</b> form of this command removes the interface and all the associated configuration. The interface must be administratively shutdown before issuing the <b>no interface</b> command.</p> <p>For VPRN services, the IP interface must be shutdown before the SAP on that interface may be removed. VPRN services do not have the <b>shutdown</b> command in the SAP CLI context. VPRN service SAPs rely on the interface status to enable and disable them.</p> |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the name of the IP interface. Interface names must be unique within the group of defined IP interfaces for <b>config router interface</b> and <b>config service vprn interface</b> commands. An interface name cannot be in the form of an IP address. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

If *ip-int-name* already exists within the service ID, the context will be changed to maintain that IP interface. If *ip-int-name* already exists within another service ID or is an IP interface defined within the **config router** commands, an error will occur and context will not be changed to that IP interface. If *ip-int-name* does not exist, the interface is created and context is changed to that interface for further command processing.

## active-cpm-protocols

|                    |                                                       |
|--------------------|-------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] active-cpm-protocols</b>                      |
| <b>Context</b>     | config>service>vprn>interface                         |
| <b>Description</b> | This command enables CPM protocols on this interface. |

## address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>address</b> <i>ip-address/mask</i>   <i>ip-address netmask</i> } [ <b>broadcast</b> [ <b>all-ones</b>   <b>host-ones</b> ]<br><b>no address</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>Assigns an IP address, IP subnet, and broadcast address format to a VPRN IP router interface. Only one IP address can be associated with an IP interface.</p> <p>An IP address must be assigned to each VPRN IP interface. An IP address and a mask are used together to create a local IP prefix. The defined IP prefix must be unique within the context of the routing instance. It cannot overlap with other existing IP prefixes defined as local subnets on other IP interfaces in the same routing context within the 7750 SR.</p> <p>The local subnet that the <b>address</b> command defines must be part of the services address space within the routing context using the <b>config router service-prefix</b> command. The default is to disallow the complete address space to services. Once a portion of the address space is allocated as a service prefix, that portion can be made unavailable for IP interfaces defined within the <b>config router interface</b> CLI context for network core connectivity with the <b>exclude</b> option in the <b>config router service-prefix</b> command.</p> <p>The IP address for the interface can be entered in either CIDR (Classless Inter-Domain Routing) or traditional dotted decimal notation. The show commands display CIDR notation and is stored in configuration files.</p> <p>By default, no IP address or subnet association exists on an IP interface until it is explicitly created.</p> <p>Use the <b>no</b> form of this command to remove the IP address assignment from the IP interface. When the <b>no address</b> command is entered, the interface becomes operationally down.</p> |

| Address    | Admin state | Oper state |
|------------|-------------|------------|
| No address | up          | down       |
| No address | down        | down       |
| 1.1.1.1    | up          | up         |
| 1.1.1.1    | down        | down       |

The operational state is a read-only variable and the only controlling variables are the address and admin states. The address and admin states are independent and can be set independently. If an interface is in an administratively up state and an address is assigned, it becomes operationally up and the protocol interfaces and the MPLS LSPs associated with that IP interface will be reinitialized.

*ip-address* — The IP address of the IP interface. The *ip-address* portion of the **address** command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).

*/* — The forward slash is a parameter delimiter and separates the *ip-address* portion of the IP address from the mask that defines the scope of the local subnet. No spaces are allowed between the *ip-address*, the “/” and the *mask-length* parameter. If a forward slash is not immediately following the *ip-address*, a dotted decimal mask must follow the prefix.

*mask-length* — The subnet mask length when the IP prefix is specified in CIDR notation. When the IP prefix is specified in CIDR notation, a forward slash (/) separates the *ip-address* from the *mask-length* parameter. The mask length parameter indicates the number of bits used for the network portion of the IP address; the remainder of the IP address is used to determine the host portion of the IP address. Allowed values are integers in the range 0 – 30. Note that a mask length of 32 is reserved for system IP addresses.

*mask* — The subnet mask in dotted decimal notation. When the IP prefix is not specified in CIDR notation, a space separates the *ip-address* from a traditional dotted decimal mask. The *mask* parameter indicates the complete mask that will be used in a logical ‘AND’ function to derive the local subnet of the IP address. Allowed values are dotted decimal addresses in the range 128.0.0.0 – 255.255.255.252. Note that a mask of 255.255.255.255 is reserved for system IP addresses.

**broadcast** — The optional **broadcast** parameter overrides the default broadcast address used by the IP interface when sourcing IP broadcasts on the IP interface. If no broadcast format is specified for the IP address, the default value is **host-ones** which indicates a subnet broadcast address. Use this parameter to change the broadcast address to **all-ones** or revert back to a broadcast address of **host-ones**.

The broadcast format on an IP interface can be specified when the IP address is assigned or changed.

This parameter does not affect the type of broadcasts that can be received by the IP interface. A host sending either the local broadcast (**all-ones**) or the valid subnet broadcast address (**host-ones**) will be received by the IP interface.

**Default**      host-ones



**all-ones** — The **all-ones** keyword following the **broadcast** parameter specifies the broadcast address used by the IP interface for this IP address will be 255.255.255.255, also known as the local broadcast.

**host-ones** — The **host-ones** keyword following the **broadcast** parameter specifies that the broadcast address used by the IP interface for this IP address will be the subnet broadcast address. This is an IP address that corresponds to the local subnet described by the *ip-address* and the *mask-length* or *mask* with all the host bits set to binary one. This is the default broadcast address used by an IP interface.

The **broadcast** parameter within the **address** command does not have a negate feature, which is usually used to revert a parameter to the default value. To change the **broadcast** type to **host-ones** after being changed to **all-ones**, the **address** command must be executed with the **broadcast** parameter defined.

## allow-directed-broadcasts

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] allow-directed-broadcasts</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command controls the forwarding of directed broadcasts out of the IP interface.</p> <p>A directed broadcast is a packet received on a local router interface destined for the subnet broadcast address on another IP interface. The <b>allow-directed-broadcasts</b> command on an IP interface enables or disables the transmission of packets destined to the subnet broadcast address of the egress IP interface.</p> <p>When enabled, a frame destined to the local subnet on this IP interface will be sent as a subnet broadcast out this interface. Care should be exercised when allowing directed broadcasts as it is a well-known mechanism used for denial-of-service attacks.</p> <p>When disabled, directed broadcast packets discarded at this egress IP interface will be counted in the normal discard counters for the egress SAP.</p> <p>By default, directed broadcasts are not allowed and will be discarded at this egress IP interface.</p> <p>The <b>no</b> form of this command disables the forwarding of directed broadcasts out of the IP interface.</p> |
| <b>Default</b>     | <b>no allow-directed-broadcasts</b> — Directed broadcasts are dropped.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

# bfd

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------|----------------|-----|---------------|---------------------------------------------------------|----------------|-----|---------------|--------|----------------|---|---------------|---------------------------------------------------------|----------------|-----|
| <b>Syntax</b>      | <b>bfd</b> <i>transmit-interval</i> [ <b>receive</b> <i>receive-interval</i> ] [ <b>multiplier</b> <i>multiplier</i> ] [ <b>echo-receive</b> <i>echo-interval</i> ] [ <b>type cpm-np</b> ]<br><b>no bfd</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Description</b> | <p>This command specifies the BFD parameters for the associated IP interface. If no parameters are defined the default value are used.</p> <p>The multiplier specifies the number of consecutive BFD messages that must be missed from the peer before the BFD session state is changed to down and the upper level protocols (OSPF, IS-IS, BGP or PIM) is notified of the fault.</p> <p>The <b>no</b> form of the command removes BFD from the associated IGP protocol adjacency.</p> <p><b>Important notes:</b> On the 7750-SR, the <i>transmit-interval</i>, <b>receive</b> <i>receive-interval</i>, and <b>echo-receive</b> <i>echo-interval</i> values can only be modified to a value less than 100 when:</p> <ol style="list-style-type: none"> <li>1. The <b>type cpm-np option</b> is explicitly configured.</li> <li>2. The service is shut down (<b>shutdown</b>)</li> <li>3. The interval is specified 10 — 100000.</li> <li>4. The service is re-enabled (<b>no shutdown</b>)</li> </ol> <p>To remove the <b>type cpm-np</b> option, re-issue the <b>bfd</b> command without specifying the <b>type</b> parameter.</p> |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Default</b>     | no bfd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Parameters</b>  | <p><i>transmit-interval</i> — Sets the transmit interval for the BFD session.</p> <table> <tr> <td><b>Values</b></td><td>100 — 100000<br/>10 — 100000 (see Important Notes above)</td></tr> <tr> <td><b>Default</b></td><td>100</td></tr> </table> <p><b>receive</b> <i>receive-interval</i> — Sets the receive interval for the BFD session.</p> <table> <tr> <td><b>Values</b></td><td>100 — 100000<br/>10 — 100000 (see Important Notes above)</td></tr> <tr> <td><b>Default</b></td><td>100</td></tr> </table> <p><b>multiplier</b> <i>multiplier</i> — Set the multiplier for the BFD session.</p> <table> <tr> <td><b>Values</b></td><td>3 — 20</td></tr> <tr> <td><b>Default</b></td><td>3</td></tr> </table> <p><b>echo-receive</b> <i>echo-interval</i> — Sets the minimum echo receive interval, in milliseconds, for the BFD session.</p> <table> <tr> <td><b>Values</b></td><td>100 — 100000<br/>10 — 100000 (see Important Notes above)</td></tr> <tr> <td><b>Default</b></td><td>100</td></tr> </table> <p><b>type cpm-np</b> — Specifies that the type is cpm-np.</p>                                                | <b>Values</b> | 100 — 100000<br>10 — 100000 (see Important Notes above) | <b>Default</b> | 100 | <b>Values</b> | 100 — 100000<br>10 — 100000 (see Important Notes above) | <b>Default</b> | 100 | <b>Values</b> | 3 — 20 | <b>Default</b> | 3 | <b>Values</b> | 100 — 100000<br>10 — 100000 (see Important Notes above) | <b>Default</b> | 100 |
| <b>Values</b>      | 100 — 100000<br>10 — 100000 (see Important Notes above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Default</b>     | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Values</b>      | 100 — 100000<br>10 — 100000 (see Important Notes above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Default</b>     | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Values</b>      | 3 — 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Default</b>     | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Values</b>      | 100 — 100000<br>10 — 100000 (see Important Notes above)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |
| <b>Default</b>     | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |                                                         |                |     |               |                                                         |                |     |               |        |                |   |               |                                                         |                |     |

## cflowd

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cflowd {acl   interface}</b><br><b>no cflowd</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command enables <b>cflowd</b> to collect traffic flow samples through a router for analysis. <b>cflowd</b> is used for network planning and traffic engineering, capacity planning, security, application and user profiling, performance monitoring, usage-based billing, and SLA measurement. When <b>cflowd</b> is enabled at the interface level, all packets forwarded by the interface are subjected to analysis according to the <b>cflowd</b> configuration. |
| <b>Default</b>     | no cflowd                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <b>acl</b> — <i>cflowd</i> configuration associated with a filter.<br><b>interface</b> — <i>cflowd</i> configuration associated with an IP interface.                                                                                                                                                                                                                                                                                                                     |

## cpu-protection

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cpu-protection <i>policy-id</i></b><br><b>no cpu-protection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command assigns an existing CPU protection policy to the associated service interface. For these interface types, the per-source rate limit is not applicable. The CPU protection policies are configured in the <b>config&gt;sys&gt;security&gt;cpu-protection&gt;policy <i>cpu-protection-policy-id</i></b> context.</p> <p>If no CPU protection policy is assigned to a service interface, then a the default policy is used to limit the overall-rate. The default policy is policy number 1 and can be viewed in the <b>show&gt;system&gt;security&gt;cpu-protection&gt;policy 1</b> command output.</p> <p>The <b>no</b> form of the command removes CPU protection policy association from the interface, resulting in no default rate limiting of control packets.</p> |
| <b>Default</b>     | <p>cpu-protection 254 (for access interfaces)</p> <p>cpu-protection 255 (for network interfaces)</p> <p>none (for video-interfaces (where applicable), shown as <b>no cpu-protection</b> in CLI)</p> <p>The configuration of <b>no cpu-protection</b> returns the interface/SAP to the default policies as shown above.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>policy-id</i> — Specifies an existing CPU protection policy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Values</b>      | 1 — 255                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## cpu-protection

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cpu-protection</b> <i>policy-id</i> [ <b>mac-monitoring</b> ]<br><b>no cpu-protection</b>                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command assigns an existing CPU protection policy to the associated service group interface SAP, interface or MSAP policy. The CPU protection policies are configured in the <b>config&gt;sys&gt;security&gt;cpu-protection&gt;policy</b> <i>cpu-protection-policy-id</i> context.</p> <p>If no CPU protection policy is assigned to a service group interface SAP, then a the default policy is used to limit the overall-rate.</p> |
| <b>Default</b>     | <p>cpu-protection 254 (for access interfaces)</p> <p>cpu-protection 255 (for network interfaces)</p> <p>none (for video-interfaces (where applicable), shown as <b>no cpu-protection</b> in CLI)</p> <p>The configuration of <b>no cpu-protection</b> returns the interface/SAP to the default policies as shown above.</p>                                                                                                                  |
| <b>Parameters</b>  | <p><i>policy-id</i> — Specifies an existing CPU protection policy.</p> <p><b>Values</b>      1 — 255</p> <p><b>mac-monitoring</b> — When specified, the per MAC rate limiting should be performed, using the per-source-rate from the associated cpu-protection policy.</p>                                                                                                                                                                  |

## ip-mtu

|                    |                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ip-mtu</b> <i>octets</i><br><b>no ip-mtu</b>                                                                                                       |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                         |
| <b>Description</b> | <p>This command configures the IP maximum transmit unit (packet) for this interface. The <b>no</b> form of the command returns the default value.</p> |
| <b>Default</b>     | no ip-mtu                                                                                                                                             |

## ipcp

|                    |                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ipcp</b>                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command creates allows access to the IPCP context within the interface configuration. Within this context, IPCP extensions can be configured to define such things as the remote IP address and DNS IP address to be signaled via IPCP on the associated PPP interface.</p> <p>This command is only applicable if the associated SAP/port is a PPP/MLPPP interface.</p> |

**Default** none

## dns

**Syntax** **dns** *ip-address* [**secondary** *ip-address*]  
**dns secondary** *ip-address*  
**no dns** [*ip-address*] [**secondary** *ip-address*]

**Context** config>service>vprn>if>ipcp

**Description** This command defines the dns address(es) to be assigned to the far-end of the associated PPP/MLPPP link via IPCP extensions.

This command is only applicable if the associated SAP/port is a PPP/MLPPP interface with an IPCP encapsulation.

The **no** form of the command deletes either the specified primary DNS address, secondary DNS address or both addresses from the IPCP extension peer-ip-address configuration.

**Default** no dns

**Parameters** *ip-address* — This parameter specifies a unicast IPv4 address for the primary DNS server to be signaled to the far-end of the associate PPP/MLPPP link via IPCP extensions.

**secondary** *ip-address* — This parameter specifies a unicast IPv4 address for the secondary DNS server to be signaled to the far-end of the associate PPP/MLPPP link via IPCP extensions.

## peer-ip-address

**Syntax** **peer-ip-address** *ip-address*  
**no peer-ip-address**

**Context** config>service>vprn>if>ipcp

**Description** This command defines the remote IP address to be assigned to the far-end of the associated PPP/MLPPP link via IPCP extensions.

This command is only applicable if the associated SAP/port is a PPP/MLPPP interface with an IPCP encapsulation.

The interface must be shut down to modify the IPCP configuration.

The **no** form of the command deletes the IPCP extension peer-ip-address configuration.

**Default** no peer-ip-address (0.0.0.0)

**Parameters** *ip-address* — Specifies a unicast IPv4 address to be signaled to the far-end of the associated PPP/MLPPP link by IPCP extensions.

## ipv6

|                    |                                            |
|--------------------|--------------------------------------------|
| <b>Syntax</b>      | <b>[no] ipv6</b>                           |
| <b>Context</b>     | config>service>vprn>interface              |
| <b>Description</b> | This command configures an IPv6 interface. |

## address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                           |                                                 |                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>address</b> <i>ipv6-address/mask</i> [ <b>eui-64</b> ] [ <b>preferred</b> ]<br><b>no address</b> <i>ipv6-address/prefix-length</i>                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                           |                                                 |                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>interface>ipv6                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                           |                                                 |                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command assigns an IPv6 address to the VPRN interface.                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                           |                                                 |                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>ipv6-address/prefix-length</i> — Specifies the IPv6 address on the interface. <table><tr><td><b>Values</b></td><td><i>ipv6-address/prefix:</i> <i>ipv6-address</i></td><td><i>x</i>:<i>x</i>:<i>x</i>:<i>x</i>:<i>x</i>:<i>x</i>:<i>x</i>:<i>x</i> (eight 16-bit pieces)<br/><i>x</i>:<i>x</i>:<i>x</i>:<i>x</i>:<i>x</i>:<i>x</i>:<i>d</i>.<i>d</i>.<i>d</i>.<i>d</i><br/><i>x</i> [0 — FFFF]H<br/><i>d</i> [0 — 255]D<br/><i>prefix-length</i> 1 — 128</td></tr></table> | <b>Values</b>                                                                                                                                                                                                                                                                                             | <i>ipv6-address/prefix:</i> <i>ipv6-address</i> | <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> (eight 16-bit pieces)<br><i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>d</i> . <i>d</i> . <i>d</i> . <i>d</i><br><i>x</i> [0 — FFFF]H<br><i>d</i> [0 — 255]D<br><i>prefix-length</i> 1 — 128 |
| <b>Values</b>      | <i>ipv6-address/prefix:</i> <i>ipv6-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                               | <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> (eight 16-bit pieces)<br><i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>x</i> : <i>d</i> . <i>d</i> . <i>d</i> . <i>d</i><br><i>x</i> [0 — FFFF]H<br><i>d</i> [0 — 255]D<br><i>prefix-length</i> 1 — 128 |                                                 |                                                                                                                                                                                                                                                                                                           |
|                    | <b>eui-64</b> — When the <b>eui-64</b> keyword is specified, a complete IPv6 address from the supplied prefix and 64-bit interface identifier is formed. The 64-bit interface identifier is derived from MAC address on Ethernet interfaces. For interfaces without a MAC address, for example ATM interfaces, the Base MAC address of the chassis is used.                                                                                                                   |                                                                                                                                                                                                                                                                                                           |                                                 |                                                                                                                                                                                                                                                                                                           |
|                    | <b>preferred</b> — specifies that the IPv6 address is the preferred IPv6 address for this interface. Preferred address is an address assigned to an interface whose use by upper layer protocols is unrestricted. Preferred addresses maybe used as the source (or destination) address of packets sent from (or to) the interface. Preferred address doesn't go through the DAD process.                                                                                     |                                                                                                                                                                                                                                                                                                           |                                                 |                                                                                                                                                                                                                                                                                                           |

## dhcp6-relay

|                    |                                                                         |
|--------------------|-------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dhcp6-relay</b>                                                 |
| <b>Context</b>     | config>service>vprn>interface>ipv6                                      |
| <b>Description</b> | This command configures DHCPv6 relay parameters for the VPRN interface. |

## dhcp6-server

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dhcp6-server</b>                                                 |
| <b>Context</b>     | config>service>vprn>interface>ipv6                                       |
| <b>Description</b> | This command configures DHCPv6 server parameters for the VPRN interface. |

## icmp6

|                    |                                                   |
|--------------------|---------------------------------------------------|
| <b>Syntax</b>      | <b>icmp6</b>                                      |
| <b>Context</b>     | config>service>vprn>interface>ipv6                |
| <b>Description</b> | This command configures ICMPv6 for the interface. |

## local-proxy-nd

|                    |                                                                       |
|--------------------|-----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] local-proxy-nd</b>                                            |
| <b>Context</b>     | config>service>vprn>interface>ipv6                                    |
| <b>Description</b> | This command enables or disables neighbor discovery on the interface. |

## neighbor

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>neighbor</b> <i>ipv6-address mac-address</i><br><b>no neighbor</b> <i>ipv6-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                                                                                                                 |
| <b>Context</b>     | config>service>vprn>interface>ipv6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                                                                                 |
| <b>Description</b> | This command configures IPv6-to-MAC address mapping on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                                                                                                                 |
| <b>Parameters</b>  | <p><i>ipv6-address</i> — Specifies the IPv6 address on the interface.</p> <table> <tr> <td><b>Values</b></td><td> <i>ipv6-address</i>      x:x:x:x:x:x:x (eight 16-bit pieces)<br/> x:x:x:x:x:x:d.d.d.d<br/> x [0 — FFFF]H<br/> d [0 — 255]D </td></tr> </table> <p><i>mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i>, <i>bb</i>, <i>cc</i>, <i>dd</i>, <i>ee</i> and <i>ff</i> are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.</p> | <b>Values</b> | <i>ipv6-address</i> x:x:x:x:x:x:x (eight 16-bit pieces)<br>x:x:x:x:x:x:d.d.d.d<br>x [0 — FFFF]H<br>d [0 — 255]D |
| <b>Values</b>      | <i>ipv6-address</i> x:x:x:x:x:x:x (eight 16-bit pieces)<br>x:x:x:x:x:x:d.d.d.d<br>x [0 — FFFF]H<br>d [0 — 255]D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |                                                                                                                 |

## proxy-nd-policy

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>proxy-nd-policy</b> <i>policy-name [policy-name...(up to 5 max)]</i><br><b>no proxy-nd-policy</b> |
| <b>Context</b>     | config>service>vprn>interface>ipv6                                                                   |
| <b>Description</b> | This command configures a proxy neighbor discovery policy for the interface.                         |
| <b>Parameters</b>  | <i>policy-name</i> — Specifies the existing policy name(s).                                          |

## local-proxy-arp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] local-proxy-arp</b>                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vpn>interface<br>config>service>vpn>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command enables local proxy ARP. When local proxy ARP is enabled on an IP interface, the system responds to all ARP requests for IP addresses belonging to the subnet with its own MAC address, and thus will become the forwarding point for all traffic between hosts in that subnet. When local-proxy-arp is enabled, ICMP redirects on the ports associated with the service are automatically blocked. |
| <b>Default</b>     | no local-proxy-arp                                                                                                                                                                                                                                                                                                                                                                                               |

## loopback

|                    |                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] loopback</b>                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vpn>interface<br>config>service>vpn>interface                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command specifies that the associated interface is a loopback interface that has no associated physical interface. As a result, the associated interface cannot be bound to a SAP.<br><br>When using mtrace/mstat in a Layer 3 VPN context then the configuration for the VPN should have a loopback address configured which has the same address as the core instance's system address (BGP next-hop). |
| <b>Default</b>     | None                                                                                                                                                                                                                                                                                                                                                                                                          |

## mac

|                    |                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac <i>ieee-mac-address</i></b>                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vpn>interface<br>config>service>vpn>if>vrrp<br>config>service>vpn>sub-if>grp-if                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command assigns a specific MAC address to a VPN IP interface.<br><br>The <b>no</b> form of this command returns the MAC address of the IP interface to the default value.                                                                                                                                                                     |
| <b>Default</b>     | The physical MAC address associated with the Ethernet interface that the SAP is configured on.                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>ieee-mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i> , <i>bb</i> , <i>cc</i> , <i>dd</i> , <i>ee</i> and <i>ff</i> are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses. |



## proxy-arp-policy

|                    |                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] proxy-arp</b> <i>policy-name</i> [ <i>policy-name...</i> (up to 5 max)]                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>interface<br>config>service>vprn>sub-if>grp-if                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command enables a proxy ARP policy for the interface.<br>The no form of this command disables the proxy ARP capability.                                                                                                                                                                                                         |
| <b>Default</b>     | no proxy-arp                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>policy-name</i> — The export route policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.<br>The specified name(s) must already be defined. |

## redundant-interface

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>redundant-interface</b> <i>red-ip-int-name</i><br><b>no redundant-interface</b> |
| <b>Context</b>     | config>service>vprn<br>config>service>vprn>sub-if>grp-if                           |
| <b>Description</b> | This command configures a redundant interface used for dual homing.                |
| <b>Parameters</b>  | <i>red-ip-int-name</i> — Specifies the redundant IP interface name.                |

## remote-proxy-arp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] remote-proxy-arp</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>interface<br>config>service>vprn>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command enables remote proxy ARP on the interface.<br><br>Remote proxy ARP is similar to proxy ARP. It allows the router to answer an ARP request on an interface for a subnet that is not provisioned on that interface. This allows the router to forward to the other subnet on behalf of the requester. To distinguish remote proxy ARP from local proxy ARP, local proxy ARP performs a similar function but only when the requested IP is on the receiving interface. |
| <b>Default</b>     | no remote-proxy-arp                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## secondary

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>secondary</b> { <i>ip-address/mask</i>   <i>ip-address netmask</i> } [ <b>broadcast all-ones</b>   <b>host-ones</b> ] [ <b>igp-inhibit</b> ]<br><b>no secondary</b> { <i>ip-address/mask</i>   <i>ip-address netmask</i> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command assigns an secondary IP address/IP subnet/broadcast address format to the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><i>ip-address</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> <p><i>mask</i> — The subnet mask in dotted decimal notation. When the IP prefix is not specified in CIDR notation, a space separates the <i>ip-address</i> from a traditional dotted decimal mask. The <i>mask</i> parameter indicates the complete mask that will be used in a logical ‘AND’ function to derive the local subnet of the IP address. Allowed values are dotted decimal addresses in the range 128.0.0.0 – 255.255.255.252. Note that a mask of 255.255.255.255 is reserved for system IP addresses.</p> <p><i>netmask</i> — Specifies a string of 0s and 1s that mask or screen out the network part of an IP address so that only the host computer part of the address remains.</p> <p><b>broadcast</b> — The optional <b>broadcast</b> parameter overrides the default broadcast address used by the IP interface when sourcing IP broadcasts on the IP interface. If no broadcast format is specified for the IP address, the default value is <b>host-ones</b> which indicates a subnet broadcast address. Use this parameter to change the broadcast address to <b>all-ones</b> or revert back to a broadcast address of <b>host-ones</b>.</p> <p>The broadcast format on an IP interface can be specified when the IP address is assigned or changed. This parameter does not affect the type of broadcasts that can be received by the IP interface. A host sending either the local broadcast (<b>all-ones</b>) or the valid subnet broadcast address (<b>host-ones</b>) will be received by the IP interface. (<i>Default: host-ones</i>)</p> <p><b>all-ones</b> — The <b>all-ones</b> keyword following the <b>broadcast</b> parameter specifies the broadcast address used by the IP interface for this IP address will be 255.255.255.255, also known as the local broadcast.</p> <p><b>host-ones</b> — The <b>host-ones</b> keyword following the <b>broadcast</b> parameter specifies that the broadcast address used by the IP interface for this IP address will be the subnet broadcast address. This is an IP address that corresponds to the local subnet described by the <i>ip-address</i> and the <i>mask-length</i> or <i>mask</i> with all the host bits set to binary one. This is the default used by an IP interface. The <b>broadcast</b> parameter within the <b>address</b> command does not have a negate feature, which is usually used to revert a parameter to the default value. To change the <b>broadcast</b> type to <b>host-ones</b> after being changed to <b>all-ones</b>, the <b>address</b> command must be executed with the <b>broadcast</b> parameter defined.</p> <p><b>igp-inhibit</b> — The optional <b>igp-inhibit</b> parameter signals that the given secondary IP interface should not be recognized as a local interface by the running IGP. For OSPF and IS-IS, this means that the specified secondary IP interfaces will not be injected and used as passive interfaces and</p> |

will not be advertised as internal IP interfaces into the IGP's link state database. For RIP, this means that these secondary IP interfaces will not source RIP updates.

## static-arp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] static-arp</b> <i>ip-address</i> <i>ieee-mac-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures a static address resolution protocol (ARP) entry associating a subscriber IP address with a MAC address for the core router instance. This static ARP will appear in the core routing ARP table. A static ARP can only be configured if it exists on the network attached to the IP interface. If an entry for a particular IP address already exists and a new MAC address is configured for the IP address, the existing MAC address will be replaced with the new MAC address.</p> <p>The <b>no</b> form of this command removes a static ARP entry.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><i>ip-address</i> — Specifies the IP address for the static ARP in IP address dotted decimal notation.</p> <p><i>ieee-mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i>, <i>bb</i>, <i>cc</i>, <i>dd</i>, <i>ee</i> and <i>ff</i> are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.</p>                                                                                                                    |

## tos-marking-state

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tos-marking-state {trusted   untrusted}</b><br><b>no tos-marking-state</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command is used to alter the default trusted state to a non-trusted state. When unset or reverted to the trusted default, the ToS field will not be remarked by egress network IP interfaces unless the egress network IP interface has the remark-trusted state set, in which case the egress network interface treats all VPRN and network IP interface as untrusted.</p> <p>When the ingress interface is set to untrusted, all egress network IP interfaces will remark IP packets received on the network interface according to the egress marking definitions on each network interface. The egress network remarking rules also apply to the ToS field of IP packets routed using IGP shortcuts (tunneled to a remote next-hop). However, the tunnel QoS markings are always derived from the egress network QoS definitions.</p> <p>Egress marking and remarking is based on the internal forwarding class and profile state of the packet once it reaches the egress interface. The forwarding class is derived from ingress classification functions. The profile of a packet is either derived from ingress classification or ingress policing.</p> <p>The default marking state for network IP interfaces is trusted. This is equivalent to declaring no tos-marking-state on the network IP interface. When undefined or set to tos-marking-state trusted, the trusted state of the interface will not be displayed when using show config or show info unless the</p> |

detail parameter is given. The **save config** command will not store the default tos-marking-state trusted state for network IP interfaces unless the detail parameter is also specified.

The **no** tos-marking-state command is used to restore the trusted state to a network IP interface. This is equivalent to executing the tos-marking-state trusted command.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | trusted                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b> | <p><b>trusted</b> — The default prevents the ToS field to not be remarked by egress network IP interfaces unless the egress network IP interface has the remark-trusted state set.</p> <p><b>untrusted</b> — Specifies that all egress network IP interfaces will remark IP packets received on the network interface according to the egress marking definitions on each network interface.</p> |

### ipv6

|                    |                                                                   |
|--------------------|-------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ipv6</b>                                                  |
| <b>Context</b>     | config>service>vprn>sub-if<br>config>service>vprn>sub-if>group-if |
| <b>Description</b> | This command configures IPv6 parameters.                          |

### dhcp6

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dhcp6</b>                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>ipv6                                                                                                             |
| <b>Description</b> | This command allows access to the DHCP6 context within the group interface configuration. Within this context, DHCP6 parameters can be configured. |
| <b>Default</b>     | no dhcp6                                                                                                                                           |

### proxy-server

|                    |                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] proxy-server</b>                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>ipv6>dhcp6                                                                                                              |
| <b>Description</b> | This command allows access to the DHCP6 proxy server context. Within this context, DHCP6 proxy server parameters of the group interface can be configured |
| <b>Default</b>     | no proxy-server.                                                                                                                                          |

## renew-timer

|                    |                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>renew-timer</b> <i>seconds</i><br><b>no renew-timer</b>                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                                                                                                                                                |
| <b>Description</b> | This command configures the renew-timer (T1), the time at which the client contacts the server from which the addresses in the IA_NA or IA_PD were obtained to extend the lifetimes of the addresses or prefixes assigned to the client. |
| <b>Default</b>     | 1800                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the time duration relative to the current time, expressed in units of seconds. A value of zero leaves the renew-time at the discretion of the client.                                                         |
| <b>Values</b>      | 0-604,800                                                                                                                                                                                                                                |

## rebind-timer

|                    |                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rebind-timer</b> <i>seconds</i><br><b>no rebind-timer</b>                                                                                                                           |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                                                                                              |
| <b>Description</b> | This command configures the rebind-timer (T2), the time at which the client contacts any available server to extend the lifetimes of the addresses or prefixes assigned to the client. |
| <b>Default</b>     | 2880                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>seconds</i> — T2 is a time duration relative to the current time. A value of zero leaves the rebind-time at the discretion of the client.                                           |
| <b>Values</b>      | 0-1,209,600                                                                                                                                                                            |

## preferred-lifetime

|                    |                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>preferred-lifetime</b> [ <i>seconds</i>   <i>infinite</i> ]<br><b>no preferred-lifetime</b>                                                                                 |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                                                                                      |
| <b>Description</b> | The preferred lifetime for the IPv6 prefix or address in the option, expressed in units of seconds. When the preferred lifetime expires, any derived addresses are deprecated. |
| <b>Default</b>     | 3600                                                                                                                                                                           |
| <b>Parameters</b>  | <i>seconds</i> — Specifies a decimal time interval in seconds.                                                                                                                 |
| <b>Values</b>      | 600-4294967295                                                                                                                                                                 |
|                    | <b>infinite</b> — Specifies a 0xffffffff value, Dec = 4294967295                                                                                                               |

## valid-lifetime

|                    |                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>valid-lifetime</b> [ <i>seconds</i>   <b>infinite</b> ]<br><b>no valid-lifetime</b>                                                                            |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                                                                         |
| <b>Description</b> | The valid lifetime for the IPv6 prefix or address in the option, expressed in units of seconds.                                                                   |
| <b>Default</b>     | 86,400                                                                                                                                                            |
| <b>Parameters</b>  | <i>seconds</i> — Specifies a decimal time interval in seconds.<br><b>Values</b> 600-424967295<br><b>infinite</b> — Specifies a 0xffffffff value, Dec = 4294967295 |

## client-applications

|                    |                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>client-applications</b> [ <b>dhcp</b> ] [ <b>pppoe</b> ]<br><b>no client-applications</b>                  |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>ipv6>dhcp6>proxy-server                                                     |
| <b>Description</b> | This command configures the client host types to which the DHCP6 proxy server is allowed to assign addresses. |
| <b>Parameters</b>  | <b>dhcp</b> — Specifies IP over Ethernet hosts.<br><b>pppoe</b> — Specifies PPP over Ethernet hosts.          |

## router-advertisements

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] router-advertisements</b>                                               |
| <b>Context</b>     | config>service>vprn>sub-if>group-if>ipv6                                        |
| <b>Description</b> | This command enables Router Advertisement transmission on this group interface. |
| <b>Default</b>     | router-advertisements                                                           |

## current-hop-limit

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>current-hop-limit</b> <i>hop-count</i><br><b>no current-hop-limit</b>           |
| <b>Context</b>     | config>service>vprn>sub-if>group-if>ipv6>router-ad                                 |
| <b>Description</b> | This command specifies the hop-limit advertised to hosts in router advertisements. |
| <b>Default</b>     | 64                                                                                 |

**Parameters** *hop-count* — Specifies the current hop limit (decimal) inserted into router advertisements.  
**Values** 0-255

## managed-configuration

**Syntax** **[no] managed-configuration**  
**Context** config>service>vpn>sub-if>group-if>ipv6>router-ad  
**Description** This command sets the managed address configuration flag. This flag indicates that DHCPv6 is available for address configuration in addition to any address auto-configured using stateless address auto-configuration. See RFC 3315, Dynamic Host Configuration Protocol (DHCP) for IPv6.  
**Default** no managed-configuration

## max-advertisement-interval

**Syntax** **max-advertisement-interval** *seconds*  
**no max-advertisement-interval**  
**Context** config>service>vpn>sub-if>group-if>ipv6>router-ad  
**Description** This command configures the maximum interval between sending router advertisement messages.  
**Default** 1800  
**Parameters** *seconds* — Specifies the maximum interval in seconds between sending router advertisement messages.  
**Values** 900-1800

## min-advertisement-interval

**Syntax** **min-advertisement-interval** *seconds*  
**no min-advertisement-interval**  
**Context** config>service>vpn>sub-if>group-if>ipv6>router-ad  
**Description** This command configures the minimum interval between sending router advertisement messages.  
**Default** 900  
**Parameters** *seconds* — Specifies the minimum interval, in seconds, between sending router advertisement messages.  
**Values** 900-1350

### mtu

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>bytes</i><br><b>no mtu</b>                                           |
| <b>Context</b>     | config>service>vprn>sub-if>group-if>ipv6>router-ad                                 |
| <b>Description</b> | This command configures the MTU for the nodes to use to send packets on the link.  |
| <b>Default</b>     | no mtu                                                                             |
| <b>Parameters</b>  | <i>bytes</i> — Specifies the MTU for the nodes to use to send packets on the link. |
|                    | <b>Values</b> 1280-9212                                                            |

### other-stateful-configuration

|                    |                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] other-stateful-configuration</b>                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>sub-if>group-if>ipv6>router-ad                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command sets the “Other configuration” flag. This flag indicates that DHCPv6 is available for auto-configuration of other (non-address) information such as DNS-related information or information on other servers in the network. See RFC 3736, Stateless Dynamic Host Configuration Protocol (DHCP) for IPv6. |
| <b>Default</b>     | no other-stateful-configuration                                                                                                                                                                                                                                                                                       |

### prefix-options

|                    |                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] prefix-options</b>                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>sub-if>group-if>ipv6>router-ad                                                                                                                          |
| <b>Description</b> | This command configures router advertisement parameters for IPv6 prefixes returned via RADIUS Framed-IPv6-Prefix. All prefixes will inherit these configuration parameters. |
| <b>Default</b>     | no prefix-options                                                                                                                                                           |

### autonomous

|                    |                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] autonomous</b>                                                                          |
| <b>Context</b>     | config>services>vprn>sub-if>group-if>ipv6>router-ad>prefix-op                                   |
| <b>Description</b> | This command specifies whether the prefix can be used for stateless address auto-configuration. |
| <b>Default</b>     | no autonomous                                                                                   |



## preferred-lifetime

|                    |                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>preferred-lifetime</b> [ <i>seconds</i>   <i>infinite</i> ]<br><b>no preferred-lifetime</b>                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>sub-if>group-if>ipv6>router-ad>prefix-op<br>config>service>vprn>sub-if>group-if>ipv6>dhcp6>proxy-server                                                                                                                                                                                                        |
| <b>Description</b> | This command configures the remaining length of time in seconds that this prefix will continue to be preferred, such as, time until deprecation. The address generated from a deprecated prefix should not be used as a source address in new communications, but packets received on such an interface are processed as expected. |
| <b>Default</b>     | 3600                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <i>seconds</i> — Specifies a decimal time interval in seconds.<br><b>Values</b> 0-4,294,967,295<br><b>infinite</b> — Sepcifies a 0xffffffff value. Dec = 4,294,967,295.                                                                                                                                                            |

## valid-lifetime

|                    |                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>valid-lifetime</b> [ <i>seconds</i>   <i>infinite</i> ]<br><b>no valid-lifetime</b>                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>sub-if>group-if>ipv6>router-ad>prefix-op<br>config>service>vprn>sub-if>group-if>ipv6>dhcp6>proxy-server                                                                                                                                                                              |
| <b>Description</b> | This command specifies the length of time, in seconds, that the prefix is valid for the purpose of on-link determination. A value of all one bits (0xffffffff) represents infinity. The address generated from an invalidated prefix should not appear as the destination or source address of a packet. |
| <b>Default</b>     | 86400                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <i>seconds</i> — Specifies a decimal time interval in seconds.<br><b>Values</b> 0-4,294,967,295<br><b>infinite</b> — Sepcifies a 0xffffffff value. Dec = 4,294,967,295.                                                                                                                                  |

## reachable-time

|                    |                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>reachable-time</b> <i>milliseconds</i><br><b>no reachable-time</b>                                                                               |
| <b>Context</b>     | config>services>vprn>sub-if>group-if>ipv6>router-ad                                                                                                 |
| <b>Description</b> | This command configures how long this router should be considered reachable by other nodes on the link after receiving a reachability confirmation. |
| <b>Default</b>     | no reachable-time                                                                                                                                   |

## VPRN Service Configuration Commands

**Parameters**     *milliseconds* — The length of time the router should be considered reachable for default router selection.

**Values**        0-3,600,000

### retransmit-time

**Syntax**        **retransmit-time** *milliseconds*  
**no retransmit-time**

**Context**        config>services>vprn>sub-if>group-if>ipv6>router-ad

**Description**    This command configures the retransmission frequency of neighbor solicitation messages.

**Default**        no retransmit-time

**Parameters**    *milliseconds* — Specifies how often the retransmission should occur.

**Values**        0-1,800,000

### router-lifetime

**Syntax**        **router-lifetime** *seconds*  
**router-lifetime no-default-router**  
**no router-lifetime**

**Context**        config>services>vprn>sub-if>group-if>ipv6>router-ad

**Description**    This command sets the router lifetime. A value of zero indicates this router should not be used by hosts as a default router.

**Default**        4500

**Parameters**    *seconds* — Specifies how long this router is valid for default router selection.

**Values**        2700-9000

### renew-timer

**Syntax**        **renew-timer** *seconds*  
**no renew-timer**

**Context**        config>services>vprn>sub-if>group-if>ipv6>dhcpcv6

**Description**    This command configures the renew-timer (T1). The time at which the client contacts the server from the addresses in the IA\_NA or IA\_PD were obtained to extend the lifetimes of the addresses or prefixes assigned to the client.

**Default**        1800

**Parameters** *seconds* — Time duration relative to the current time expressed in units of seconds. A value of zero (0) leaves the renew-time at the discretion of the client.

**Values** 0-604,800

## rebind-timer

**Syntax** **rebind-timer** *seconds*  
**no rebind-timer**

**Context** config>services>vprn>sub-if>group-if>ipv6>dhcpcv6

**Description** This command configures the rebind-timer (T2), the time at which the client contacts any available server to extend the lifetimes of the addresses or prefixes assigned to the client.

**Default** 2880

**Parameters** *seconds* — T2 is a time duration relative to the current time expressed in units of seconds. A value of zero (0) leaves the rebind-time at the discretion of the client.

**Values** 0-1,209,600

## delegated-prefix-length

**Syntax** [**no**] **delegated-prefix-length** *prefix-length*

**Context** config>service>vprn>sub-if>ipv6

**Description** This command defines the prefix-length used for all DHCPv6 prefix delegations on this subscriber interface.

**Parameters** *prefix-length* — Specifies the prefix length in use on this subscriber interface for DHCPv6 IA\_PD.

**Values** 48..64

**Default** 64

## subscriber-prefixes

**Syntax** **subscriber-prefixes**

**Context** config>service>vprn>sub-if>ipv6

**Description** This command specifies aggregate off-link subscriber prefixes associated with this subscriber interface. Individual prefixes are specified under the prefix context list aggregate routes in which the next-hop is indirect via the subscriber interface.

## prefix

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>prefix</b> <i>ipv6-address/prefix-length</i> [ <b>pd</b> ] [ <b>wan-host</b> ]<br><b>no prefix</b> <i>ipv6-address/prefix-length</i>                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>sub-if>ipv6>sub-prefixes                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command allows a list of prefixes(using the prefix command multiple times) to be routed to hosts associated with this subscriber interface. Each prefix will be represented in the associated FIB with a reference to the subscriber interface. Prefixes are defined as being for prefix delegation (pd) or use on a WAN interface or host (wan-host).                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>ipv6-address</i> — Specifies the 128-bit IPv6 address.</p> <p><b>Values</b> 128-bit hexadecimal IPv6 address in compressed form</p> <p><i>prefix-length</i> — Specifies the length of any associated aggregate prefix.</p> <p><b>Values</b> 32-63</p> <p><b>pd</b> — Specifies that this aggregate is used by IPv6 ESM hosts for DHCPv6 prefix-delegation.</p> <p><b>wan-host</b> — Specifies that this aggregate is used by IPv6 ESM hosts for local addressing or by a routing gateway's WAN interface.</p> |

## private-retail-subnets

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>private-retail-subnets</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>sub-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command controls the export of subnets to the forwarding service. When this attribute is configured, subnets defined on this retail subscriber interface will no longer be exported to the associated wholesale VPRN and will remain private to the retail VPRN. This is useful in a PPPoE business service context as it allows retail services to use overlapping IP address spaces even if these services are associated with the same wholesale service.</p> <p>PPPoE sessions are actually terminated in the retail service although their traffic transits on a SAP belonging to the wholesale service. This configuration is incompatible, however, with IPoE host management (DHCP, static-host and ARP-host) as these host types require that the retail subnets are exported to the wholesale VPRN. Thus, if PPPoE sessions need to coexist with IPoE hosts, this attribute should not be configured on this retail interface.</p> <p>This command will fail if the subscriber interface is not associated with a wholesale service.</p> <p>If the retail VPRN is of the type <b>hub</b>, this attribute is mandatory. Then, it will be enabled by default and it will not be possible to deconfigure it.</p> |

## unnumbered

|                    |                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>unnumbered</b> [ <i>ip-int-name</i>   <i>ip-address</i> ]<br><b>no unnumbered</b>                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                         |
| <b>Description</b> | This command configures the interface as an unnumbered interface. Unnumbered IP interface is supported on a Sonet/SDH access port with the PPP, ATM, or Frame Relay encapsulation. It is not supported on a TDM port or channel.      |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the name of an IP interface. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.<br><i>ip-address</i> — Specifies an IP address. |

## urpf-check

|                    |                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] urpf-check</b>                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                              |
| <b>Description</b> | This command enables unicast RPF (uRPF) check on this interface.<br>The <b>no</b> form of the command disables unicast RPF (uRPF) Check on this interface. |
| <b>Default</b>     | disabled                                                                                                                                                   |

## mode

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode {strict   loose}</b><br><b>no mode</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>interface>urfp-check                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command specifies the mode of unicast RPF check.<br>The <b>no</b> form of the command reverts to the default (strict) mode.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Default</b>     | strict                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <b>strict</b> — When specified, uRPF checks whether incoming packet has a source address that matches a prefix in the routing table, and whether the interface expects to receive a packet with this source address prefix.<br><b>loose</b> — In <b>loose</b> mode, uRPF checks whether incoming packet has source address with a corresponding prefix in the routing table. However, the loose mode does not check whether the interface expects to receive a packet with a specific source address prefix. This object is valid only when <b>urpf-check</b> is enabled. |

## DHCP Commands

### dhcp

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                                                                    |
| <b>Context</b>     | config>service>vprn>interface<br>config>service>vprn>subscriber-interface<br>config>service>vprn>sub-if>grp-if |
| <b>Description</b> | This command enables the context to configure DHCP parameters.                                                 |

### client-applications

|                    |                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>client-applications dhcp</b><br><b>client-applications pppoe</b><br><b>client-applications dhcp pppoe</b><br><b>no client-applications</b>                                                                                              |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>dhcp                                                                                                                                                                                                     |
| <b>Description</b> | This command enables the clients that will try to contact the DHCP server(s).<br>The <b>no</b> form of the command removes the server client type from the configuration.                                                                  |
| <b>Parameters</b>  | <b>dhcp</b> — Specifies that the DHCP relay will forward requests to the DHCP server(s).<br><b>pppoe</b> — Specifies that PPPoE will attempt to request an IP address for a PPPoE client from the DHCP server(s)ly assigned to PPPoE node. |

### action

|                    |                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>action {replace   drop   keep}</b><br><b>no action</b>                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>if>dhcp>option<br>config>service>vprn>sub-if>grp-if>dhcp>option                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command configures the processing required when the SR-Series router receives a DHCP request that already has a Relay Agent Information Option (Option 82) field in the packet.<br>The <b>no</b> form of this command returns the system to the default value.                                                                             |
| <b>Default</b>     | Per RFC 3046, <i>DHCP Relay Agent Information Option</i> , section 2.1.1, <i>Reforwarded DHCP requests</i> , the default is to keep the existing information intact. The exception to this is if the giaddr of the received packet is the same as the ingress address on the router. In that case the packet is dropped and an error is logged. |

- Parameters**
- replace** — In the upstream direction (from the user), the existing Option 82 field is replaced with the Option 82 field from the router. In the downstream direction (towards the user) the Option 82 field is stripped (in accordance with RFC 3046).
  - drop** — The packet is dropped, and an error is logged.
  - keep** — The existing information is kept in the packet and the router does not add any additional information. In the downstream direction the Option 82 field is not stripped and is sent on towards the client.
- The behavior is slightly different in case of Vendor Specific Options (VSOs). When the keep parameter is specified, the router will insert his own VSO into the Option 82 field. This will only be done when the incoming message has already an Option 82 field.
- If no Option 82 field is present, the router will not create the Option 82 field. In this in that case, no VSO will be added to the message.

## circuit-id

- Syntax** **circuit-id [ascii-tuple | ifindex | sap-id | vlan-ascii-tuple]**  
**no circuit-id**
- Context** config>service>vprn>if>dhcp>option  
 config>service>vprn>sub-if>grp-if>dhcp>option
- Description** When enabled, the router sends the interface index (If Index) in the **circuit-id** suboption of the DHCP packet. The If Index of a router interface can be displayed using the command `show>router>interface>detail`. This option specifies data that must be unique to the router that is relaying the circuit.
- If disabled, the **circuit-id** suboption of the DHCP packet will be left empty.
- The **no** form of this command returns the system to the default.
- Default** circuit-id
- Parameters**
- ascii-tuple** — Specifies that the ASCII-encoded concatenated tuple will be used which consists of the access-node-identifier, service-id, and interface-name, separated by “|”.
  - ifindex** — Specifies that the interface index will be used. The If Index of a router interface can be displayed using the command `show>router>interface>detail`.
  - sap-id** — Specifies that the SAP ID will be used.
  - vlan-ascii-tuple** — Specifies that the format will include VLAN-id and dot1p bits in addition to what is included in ascii-tuple already. The format is supported on dot1q and qinq ports only. Thus, when the Option 82 bits are stripped, dot1p bits will be copied to the Ethernet header of an outgoing packet.

## gi-address

|                    |                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>gi-address</b> <i>ip-address</i> [ <i>src-ip-addr</i> ]<br><b>no gi-address</b>                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>if>dhcp<br>config>service>vprn>sub-if>dhcp<br>config>service>vprn>sub-if>grp-if>dhcp                                                                                                                                                                                                                                         |
| <b>Description</b> | This command configures the gateway interface address for the DHCP relay. A subscriber interface can include multiple group interfaces with multiple SAPs. The GI address is needed, when the router functions as a DHCP relay, to distinguish between the different subscriber interfaces and potentially between the group interfaces defined. |
| <b>Default</b>     | no gi-address                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the host IP address to be used for DHCP relay packets.<br><i>src-ip-address</i> — Specifies the source IP address to be used for DHCP relay packets.                                                                                                                                                               |

## lease-populate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-populate</b> [ <i>nbr-of-entries</i> ]<br><b>lease-populate</b> [ <i>nbr-of-entries</i> ] <b>l2-header</b> [ <i>mac ieee-address</i> ]<br><b>no lease-populate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>if>dhcp<br>config>service>vprn>sub-if>dhcp<br>config>service>vprn>sub-if>grp-if>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables dynamic host lease state management for VPLS SAPs and VPRN or IES IP interfaces. Lease state information is extracted from snooped or relayed DHCP ACK messages to populate lease state table entries for the SAP or IP interface.</p> <p>The optional <i>number-of-entries</i> parameter defines the number lease state table entries allowed for this SAP or IP interface. If <i>number-of-entries</i> is not specified, only a single entry is allowed. Once the maximum number of entries has been reached, subsequent lease state entries are not allowed. If lease state population is enabled and an entry cannot be retained in the table, the DHCP Relay or DHCP snoop function will prevent the far-end host from receiving the DHCP ACK message.</p> <p>The retained lease state information representing dynamic hosts may be used to populate a SAP based anti-spoof filter table to provide dynamic anti-spoof filtering. Anti-spoof filtering is only available on VPLS SAPs, IES IP interfaces terminated on a SAP or VPRN IP interfaces terminated on a SAP.</p> <p>The retained lease state information representing dynamic hosts may be used to populate the system's ARP cache based the arp-populate feature. ARP-populate functionality is only available for static and dynamic hosts associated with IES and VPRN SAP bound IP interfaces.</p> <p>The retained lease state information representing dynamic hosts may be used to populate managed entries into a VPLS forwarding database. VPLS forwarding database population is an implicit feature that automatically places the dynamic host's MAC address into the VPLS FDB. When a dynamic host's MAC address is placed in the lease state table, it will automatically be populated into the VPLS forwarding database associated with the SAP on which the host is learned. The dynamic host MAC address will override any static MAC entries using the same MAC and prevent dynamic learning of</p> |



the MAC on another interface. Existing static MAC entries with the same MAC address as the dynamic host are marked as inactive but not deleted. If all entries in the lease state table associated with the MAC address are removed, the static MAC may be populated. New static MAC definitions for the VPLS instance may be created while a dynamic host exists associated with the static MAC address.

|                   |                                                                                                                                                                                                                                                                                                                    |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | not enabled                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b> | <i>nbr-of-entries</i> — Defines the number lease state table entries allowed for this interface. If this parameter is omitted, only a single entry is allowed. Once the maximum number of entries has been reached, subsequent lease state entries are not allowed and subsequent DHCP ACK messages are discarded. |
| <b>Values</b>     | 1 — 8000                                                                                                                                                                                                                                                                                                           |

## match-circuit-id

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] match-circuit-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables Option 82 circuit ID on relayed DHCP packet matching. For routed CO, the group interface DHCP relay process is stateful. When packets are relayed to the server the virtual router ID, transaction ID, SAP ID, and client hardware MAC address of the relayed packet are tracked.</p> <p>When a response is received from the server the virtual router ID, transaction ID, and client hardware MAC address must be matched to determine the SAP on which to send the packet out. In some cases, the virtual router ID, transaction ID, and client hardware MAC address are not guaranteed to be unique.</p> <p>When the <b>match-circuit-id</b> command is enabled we use this as part of the key to guarantee correctness in our lookup. This is really only needed when we are dealing with an IP aware DSLAM that proxies the client hardware MAC address.</p> |
| <b>Default</b>     | no match-circuit-id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## option

|                    |                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] option</b>                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>if>dhcp<br>config>service>vprn>sub-if>dhcp<br>config>service>vprn>sub-if>grp-if>dhcp                                                                                                                                     |
| <b>Description</b> | <p>This command enables DHCP Option 82 (Relay Agent Information Option) parameters processing and enters the context for configuring Option 82 sub-options.</p> <p>The <b>no</b> form of this command returns the system to the default.</p> |
| <b>Default</b>     | no option                                                                                                                                                                                                                                    |

### remote-id

|                    |                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>remote-id</b> [ <b>mac</b>   <b>string</b> <i>string</i> ]<br><b>no remote-id</b>                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>dhcp>option                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>When enabled, the router sends the MAC address of the remote end (typically the DHCP client) in the <b>remote-id</b> suboption of the DHCP packet. This command identifies the host at the other end of the circuit. If disabled, the <b>remote-id</b> suboption of the DHCP packet will be left empty.</p> <p>The <b>no</b> form of this command returns the system to the default.</p> |
| <b>Default</b>     | remote-id                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <b>mac</b> — This keyword specifies the MAC address of the remote end is encoded in the suboption.<br><b>string</b> <i>string</i> — Specifies the remote-id.                                                                                                                                                                                                                                |

### vendor-specific-option

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] vendor-specific-option</b>                                                             |
| <b>Context</b>     | config>service>vprn>if>dhcp>option<br>config>service>vprn>sub-if>grp-if>dhcp>option            |
| <b>Description</b> | This command configures the Alcatel-Lucent vendor specific suboption of the DHCP relay packet. |

### client-mac-address

|                    |                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] client-mac-address</b>                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>if>dhcp>option<br>config>service>vprn>if>dhcp>option>vendor<br>config>service>vprn>sub-if>grp-if>dhcp>option>vendor                                                                                                                                                         |
| <b>Description</b> | <p>This command enables the sending of the MAC address in the Alcatel-Lucent vendor specific suboption of the DHCP relay packet.</p> <p>The <b>no</b> form of the command disables the sending of the MAC address in the Alcatel-Lucent vendor specific suboption of the DHCP relay packet.</p> |

## sap-id

|                    |                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap-id</b>                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>if>dhcp>option>vendor<br>config>service>vprn>sub-if>grp-if>dhcp>option>vendor                                                                                                                                                                              |
| <b>Description</b> | This command enables the sending of the SAP ID in the Alcatel-Lucent vendor specific suboption of the DHCP relay packet.<br><br>The <b>no</b> form of the command disables the sending of the SAP ID in the Alcatel-Lucent vendor specific suboption of the DHCP relay packet. |

## service-id

|                    |                                                                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] service-id</b>                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>if>dhcp>option>vendor<br>config>service>vprn>sub-if>grp-if>dhcp>option>vendor                                                                                                                                                                                      |
| <b>Description</b> | This command enables the sending of the service ID in the Alcatel-Lucent vendor specific suboption of the DHCP relay packet.<br><br>The <b>no</b> form of the command disables the sending of the service ID in the Alcatel-Lucent vendor specific suboption of the DHCP relay packet. |

## string

|                    |                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] string text</b>                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>if>dhcp>option>vendor<br>config>service>vprn>sub-if>grp-if>dhcp>option>vendor                                                                                        |
| <b>Description</b> | This command specifies the vendor specific suboption string of the DHCP relay packet.<br><br>The <b>no</b> form of the command returns the default value.                                |
| <b>Parameters</b>  | <i>text</i> — The string can be any combination of ASCII characters up to 32 characters in length. If spaces are used in the string, enclose the entire string in quotation marks (“ ”). |

## system-id

|                    |                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] system-id</b>                                                                                                 |
| <b>Context</b>     | config>service>vprn>if>dhcp>option>vendor<br>config>service>vprn>sub-if>grp-if>dhcp>option>vendor                     |
| <b>Description</b> | This command specifies whether the system-id is encoded in the Alcatel-Lucent vendor specific suboption of Option 82. |

**Default**     None

### proxy-server

**Syntax**     **proxy-server**

**Context**     config>service>if>dhcp  
config>service>vpn>sub-if>grp-if>dhcp

**Description**     This command configures the DHCP proxy server.

### emulated-server

**Syntax**     **emulated-server** *ip-address*  
**no emulated-server**

**Context**     config>service>vpn>if>dhcp>proxy  
config>service>vpn>sub-if>grp-if>dhcp>proxy-server

**Description**     This command configures the IP address to be used as the DHCP server address in the context of this service. Typically, the configured address should be in the context of the subnet.

The **no** form of this command reverts to the default setting. The local proxy server will not become operational without a specified emulated server address.

**Parameters**     *ip-address* — Specifies the emulated server address.

**Default**     Note that for a retail interface, the default is the local interface.

### lease-time

**Syntax**     **lease-time** [*days days*] [*hrs hours*] [*min minutes*] [*sec seconds*] [*radius-override*]  
**no lease-time**

**Context**     config>service>vpn>if>dhcp>proxy  
config>service>vpn>sub-if>grp-if>dhcp>proxy-server

**Description**     This command defines the length of lease-time that will be provided to DHCP clients. By default the local-proxy-server will always make use of the lease-time information provide by either a RADIUS or DHCP server.

The no form of this command disables the use of the lease-time command. The local-proxy-server will use the lease-time offered by either a RADIUS or DHCP server.

**Default**     7 days 0 hours 0 seconds

**Parameters**     **radius-override** — Specifies that the local-proxy-server will use the configured lease-time information to provide DHCP clients.

*days* — Specifies the number of days that the given IP address is valid.

**Values** 0 — 3650

*hours* — Specifies the number of hours that the given IP address is valid.

**Values** 0 — 23

*minutes* — Specifies the number of minutes that the given IP address is valid.

**Values** 0 — 59

*seconds* — Specifies the number of seconds that the given IP address is valid.

**Values** 0 — 59

## server

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>server</b> <i>server1</i> [ <i>server2</i> ...(up to 8 max)]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>if>dhcp<br>config>service>vprn>sub-if>grp-if>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command specifies a list of servers where requests will be forwarded. The list of servers can entered as either IP addresses or fully qualified domain names. There must be at least one server specified for DHCP relay to work. If there are multiple servers then the request is forwarded to all of the servers in the list. There can be a maximum of 8 DHCP servers configured.</p> <p>The flood command is applicable only in the VPLS case. There is a scenario with VPLS where the VPLS node only wants to add Option 82 information to the DHCP request to provider per-subscriber information, but it does not do full DHCP relay. In this case, the server is set to "flood". This means the DHCP request is still a broadcast and is sent through the VPLS domain. A node running at L3 further upstream then can perform the full L3 DHCP relay function.</p> |
| <b>Default</b>     | no server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <i>server</i> — Specifies the DHCP server IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## relay-plain-bootp

|                    |                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] relay-plain-bootp</b>                                                                                                                           |
| <b>Context</b>     | config>service>vprn>if>dhcp                                                                                                                             |
| <b>Description</b> | <p>This command enables the relaying of plain BOOTP packets.</p> <p>The <b>no</b> form of the command disables the relaying of plain BOOTP packets.</p> |

## trusted

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] trusted</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>if>dhcp<br>config>service>vprn>sub-if>grp-if>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>According to RFC 3046, <i>DHCP Relay Agent Information Option</i>, a DHCP request where the giaddr is 0.0.0.0 and which contains a Option 82 field in the packet, should be discarded, unless it arrives on a "trusted" circuit.</p> <p>If trusted mode is enabled on an IP interface, the relay agent (the SR-Series) will modify the request's giaddr to be equal to the ingress interface and forward the request.</p> <p>Note that this behavior only applies when the action in the Relay Agent Information Option is "keep". In the case where the Option 82 field is being replaced by the relay agent (action = "replace"), the original Option 82 information is lost anyway, and there is thus no reason for enabling the trusted option.</p> <p>The <b>no</b> form of this command returns the system to the default.</p> |
| <b>Default</b>     | not enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## use-arp

|                    |                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] use-arp</b>                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>if>dhcp                                                                                                                                                                              |
| <b>Description</b> | <p>This command enables the use of ARP to determine the destination hardware address.</p> <p>The <b>no</b> form of the command disables the use of ARP to determine the destination hardware address</p> |

## user-db

|                    |                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>user-db local-user-db-name</b><br><b>no user-db</b>                                                                                                               |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>dhcp                                                                                                                               |
| <b>Description</b> | <p>This command configures the local user database to use for authentication.</p> <p>The <b>no</b> form of the command removes the value from the configuration.</p> |
| <b>Default</b>     | no user-db                                                                                                                                                           |
| <b>Parameters</b>  | <i>local-user-db-name</i> — Specifies the local user database to use for authentication.                                                                             |

## host-connectivity-verify

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host-connectivity-verify</b> [ <b>interval</b> <i>interval</i> ] [ <b>action</b> { <b>remove</b>   <b>alarm</b> }]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if<br>config>service>vprn>sub-if>grp-if>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables enables subscriber host connectivity verification on a given SAP within a service.</p> <p>This tool will periodically scan all known hosts (from dhcp-state) and perform a UC ARP request. The subscriber host connectivity verification will maintain state (connected vs. not-connected) for all hosts.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Default</b>     | no host-connectivity-verify                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><b>interval</b> <i>interval</i> — The interval, expressed in minutes, which specifies the time interval which all known sources should be verified. The actual rate is then dependent on number of known hosts and interval.</p> <p><b>Values</b> 1— 6000 ) Note that a zero value can be used by the SNMP agent to disable host-connectivity-verify.)</p> <p><b>action</b> {<b>remove</b>   <b>alarm</b>} — Defines the action taken on a subscriber host connectivity verification failure for a given host. The <b>remove</b> keyword raises an alarm and removes dhcp-state and releases all allocated resources (queues, table entries, etc.). DHCP-RELEASE will be signaled to corresponding DHCP server. Static hosts will never be removed. The <b>alarm</b> keyword raises an alarm indicating that the host is disconnected.</p> |

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## Router Advertisement Commands

### router-advertisement

|                    |                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] router-advertisement</b>                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures router advertisement properties. By default, it is disabled for all IPv6 enabled interfaces.</p> <p>The <b>no</b> form of the command disables all IPv6 interface. However, the <b>no interface interface-name</b> command disables a specific interface.</p> |
| <b>Default</b>     | disabled                                                                                                                                                                                                                                                                                 |

### interface

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] interface ip-int-name</b>                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>router-advertisement                                                                                                                                   |
| <b>Description</b> | This command configures router advertisement properties on a specific interface. The interface must already exist in the <b>config&gt;router&gt;interface</b> context.     |
| <b>Default</b>     | No interfaces are configured by default.                                                                                                                                   |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specify the interface name. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. |

### current-hop-limit

|                    |                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>current-hop-limit number</b><br><b>no current-hop-limit</b>                                                                                                            |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                                                                      |
| <b>Description</b> | This command configures the current-hop-limit in the router advertisement messages. It informs the nodes on the subnet about the hop-limit when originating IPv6 packets. |
| <b>Default</b>     | 64                                                                                                                                                                        |
| <b>Parameters</b>  | <i>number</i> — Specifies the hop limit.<br><b>Values</b> 0 — 255. A value of zero means there is an unspecified number of hops.                                          |



## managed-configuration

|                    |                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] managed-configuration</b>                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command sets the managed address configuration flag. This flag indicates that DHCPv6 is available for address configuration in addition to any address autoconfigured using stateless address autoconfiguration. See RFC 3315, <i>Dynamic Host Configuration Protocol (DHCP) for IPv6</i> . |
| <b>Default</b>     | no managed-configuration                                                                                                                                                                                                                                                                         |

## max-advertisement-interval

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] max-advertisement-interval</b> <i>seconds</i>                                                     |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                      |
| <b>Description</b> | This command configures the maximum interval between sending router advertisement messages.               |
| <b>Default</b>     | 600                                                                                                       |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the maximum interval in seconds between sending router advertisement messages. |
| <b>Values</b>      | 4 — 1800                                                                                                  |

## min-advertisement-interval

|                    |                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] min-advertisement-interval</b> <i>seconds</i>                                                                             |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                              |
| <b>Description</b> | This command configures the minimum interval between sending ICMPv6 neighbor discovery router advertisement messages.             |
| <b>Default</b>     | 200                                                                                                                               |
| <b>Parameters</b>  | <i>seconds</i> — Specify the minimum interval in seconds between sending ICMPv6 neighbor discovery router advertisement messages. |
| <b>Values</b>      | 3 — 1350                                                                                                                          |

## mtu

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mtu mtu-bytes</b>                                                         |
| <b>Context</b>     | config>service>vprn>router-advert>if                                              |
| <b>Description</b> | This command configures the MTU for the nodes to use to send packets on the link. |
| <b>Default</b>     | no mtu — The MTU option is not sent in the router advertisement messages.         |
| <b>Parameters</b>  | mtu-bytes — Specify the MTU for the nodes to use to send packets on the link.     |
| <b>Values</b>      | 1280 — 9212                                                                       |

## other-stateful-configuration

|                    |                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] other-stateful-configuration</b>                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command sets the "Other configuration" flag. This flag indicates that DHCPv6lite is available for autoconfiguration of other (non-address) information such as DNS-related information or information on other servers in the network. See RFC 3736, <i>Stateless Dynamic Host Configuration Protocol (DHCP) for IPv6</i> . |
| <b>Default</b>     | no other-stateful-configuration                                                                                                                                                                                                                                                                                                  |

## prefix

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------|--------------------|--------|-------------|-------------------------------------|--|-------------------|--|----------------|--|---------------|--------------------|---------|
| <b>Syntax</b>        | <b>[no] prefix [ipv6-prefix/prefix-length]</b>                                                                                                                                                                                                                                                                                                                                                                 |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| <b>Context</b>       | config>service>vprn>router-advert>if                                                                                                                                                                                                                                                                                                                                                                           |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| <b>Description</b>   | This command configures an IPv6 prefix in the router advertisement messages. To support multiple IPv6 prefixes, use multiple prefix statements. No prefix is advertised until explicitly configured using prefix statements.                                                                                                                                                                                   |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| <b>Default</b>       | none                                                                                                                                                                                                                                                                                                                                                                                                           |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| <b>Parameters</b>    | ip-prefix — The IP prefix for prefix list entry in dotted decimal notation.                                                                                                                                                                                                                                                                                                                                    |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| <b>Values</b>        | <table> <tr> <td>ipv4-prefix</td><td>a.b.c.d (host bits must be 0)</td></tr> <tr> <td>ipv4-prefix-length</td><td>0 — 32</td></tr> <tr> <td>ipv6-prefix</td><td>x:x:x:x:x:x:x (eight 16-bit pieces)</td></tr> <tr> <td></td><td>x:x:x:x:x:d.d.d.d</td></tr> <tr> <td></td><td>x: [0 — FFFF]H</td></tr> <tr> <td></td><td>d: [0 — 255]D</td></tr> <tr> <td>ipv6-prefix-length</td><td>0 — 128</td></tr> </table> | ipv4-prefix | a.b.c.d (host bits must be 0) | ipv4-prefix-length | 0 — 32 | ipv6-prefix | x:x:x:x:x:x:x (eight 16-bit pieces) |  | x:x:x:x:x:d.d.d.d |  | x: [0 — FFFF]H |  | d: [0 — 255]D | ipv6-prefix-length | 0 — 128 |
| ipv4-prefix          | a.b.c.d (host bits must be 0)                                                                                                                                                                                                                                                                                                                                                                                  |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| ipv4-prefix-length   | 0 — 32                                                                                                                                                                                                                                                                                                                                                                                                         |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| ipv6-prefix          | x:x:x:x:x:x:x (eight 16-bit pieces)                                                                                                                                                                                                                                                                                                                                                                            |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
|                      | x:x:x:x:x:d.d.d.d                                                                                                                                                                                                                                                                                                                                                                                              |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
|                      | x: [0 — FFFF]H                                                                                                                                                                                                                                                                                                                                                                                                 |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
|                      | d: [0 — 255]D                                                                                                                                                                                                                                                                                                                                                                                                  |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| ipv6-prefix-length   | 0 — 128                                                                                                                                                                                                                                                                                                                                                                                                        |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| <b>prefix-length</b> | — Specifies a route must match the most significant bits and have a prefix length.                                                                                                                                                                                                                                                                                                                             |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |
| <b>Values</b>        | 1 — 128                                                                                                                                                                                                                                                                                                                                                                                                        |             |                               |                    |        |             |                                     |  |                   |  |                |  |               |                    |         |

## autonomous

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] autonomous</b>                                                                         |
| <b>Context</b>     | config>service>vprn>router-advert>if>prefix                                                    |
| <b>Description</b> | This command specifies whether the prefix can be used for stateless address autoconfiguration. |
| <b>Default</b>     | enabled                                                                                        |

## on-link

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] on-link</b>                                                             |
| <b>Context</b>     | config>service>vprn>router-advert>if>prefix                                     |
| <b>Description</b> | This command specifies whether the prefix can be used for onlink determination. |
| <b>Default</b>     | enabled                                                                         |

## preferred-lifetime

|                    |                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] preferred-lifetime</b> { <i>seconds</i>   <b>infinite</b> }                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command configures the remaining length of time in seconds that this prefix will continue to be preferred, such as, time until deprecation. The address generated from a deprecated prefix should not be used as a source address in new communications, but packets received on such an interface are processed as expected. |
| <b>Default</b>     | 604800                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>seconds</i> — Specifies the remaining length of time in seconds that this prefix will continue to be preferred.</p> <p><b>infinite</b> — Specifies that the prefix will always be preferred. A value of 4,294,967,295 represents infinity.</p>                                                                               |

## valid-lifetime

|                    |                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>valid-lifetime</b> { <i>seconds</i>   <b>infinite</b> }                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command specifies the length of time in seconds that the prefix is valid for the purpose of on-link determination. A value of all one bits (0xffffffff) represents infinity.</p> <p>The address generated from an invalidated prefix should not appear as the destination or source address of a packet.</p> |
| <b>Default</b>     | 2592000                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><i>seconds</i> — Specifies the remaining length of time in seconds that this prefix will continue to be valid.</p> <p><b>infinite</b> — Specifies that the prefix will always be valid. A value of 4,294,967,295 represents infinity.</p>                                                                         |

## reachable-time

|                    |                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>reachable-time</b> <i>milli-seconds</i><br><b>no reachable-time</b>                                                                              |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                                                |
| <b>Description</b> | This command configures how long this router should be considered reachable by other nodes on the link after receiving a reachability confirmation. |
| <b>Default</b>     | no reachable-time                                                                                                                                   |
| <b>Parameters</b>  | <p><i>milli-seconds</i> — Specifies the length of time the router should be considered reachable.</p> <p><b>Values</b>      0 — 3600000</p>         |

## retransmit-time

|                    |                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>retransmit-timer</b> <i>milli-seconds</i><br><b>no retransmit-timer</b>                                               |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                     |
| <b>Description</b> | This command configures the retransmission frequency of neighbor solicitation messages.                                  |
| <b>Default</b>     | no retransmit-time                                                                                                       |
| <b>Parameters</b>  | <p><i>milli-seconds</i> — Specifies how often the retransmission should occur.</p> <p><b>Values</b>      0 — 1800000</p> |

## router-lifetime

|                    |                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>router-lifetime</b> <i>seconds</i><br><b>no router-lifetime</b>                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                                                                                                                                             |
| <b>Description</b> | This command sets the router lifetime.                                                                                                                                                                                                           |
| <b>Default</b>     | 1800                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <i>seconds</i> — The length of time, in seconds, (relative to the time the packet is sent) that the prefix is valid for route determination.<br><b>Values</b> 0, 4 — 9000 seconds. 0 means that the router is not a default router on this link. |

## use-virtual-mac

|                    |                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] use-virtual-mac</b>                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>router-advert>if                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command enables sending router advertisement messages using the VRRP virtual MAC address, provided that the virtual router is currently the master.<br>If the virtual router is not the master, no router advertisement messages are sent.<br>The <b>no</b> form of the command disables sending router advertisement messages. |
| <b>Default</b>     | no use-virtual-mac                                                                                                                                                                                                                                                                                                                   |

## Subscriber Interface Commands

### subscriber-interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subscriber-interface</b> <i>ip-int-name</i> [ <b>fwd-service</b> <i>service-id</i> <b>fwd-subscriber-interface</b> <i>ip-int-name</i> ]<br><b>no subscriber-interface</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command allows the operator to create special subscriber-based interfaces. It is used to contain multiple group interfaces. Multiple subnets associated with the subscriber interface can be applied to any of the contained group interfaces in any combination. The subscriber interface allows subnet sharing between group interfaces.</p> <p>Use the <b>no</b> form of the command to remove the subscriber interface.</p>                                                                                                                    |
| <b>Parameters</b>  | <p><i>ip-int-name</i> — Specifies the name of the IP interface. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p><b>fwd-service</b> <i>service-id</i> — Specifies the forwarding service ID for a subscriber interface in a retailer context.</p> <p><b>fwd-subscriber-interface</b> <i>ip-int-name</i> — Specifies the forwarding subscriber interface for a subscriber interface in a retailer context.</p> |

### address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>address</b> { <i>ip-address/mask</i>   <i>ip-address netmask</i> } [ <b>gw-ip-address</b> <i>ip-address</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>subscriber-interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command configures the local subscriber subnets available on a subscriber IP interface. The configured <i>ip-address</i> and <i>mask</i> define the address space associated with the subscriber subnet. Up to 16 IP subnets can be created on a single subscriber IP interface. Each subnet supports a locally owned IP host address within the subnet that is not expected to appear on other routers that may be servicing the same subscriber subnet. For redundancy purposes, the keyword <b>gw-address</b> defines a separate IP address within the subnet for Subscriber Routed Redundancy Protocol (SRRP) routing. This IP address must be the same on the local and remote routers participating in a common SRRP instance.</p> <p>In SRRP, a single SRRP instance is tied to a group IP interface. The group IP interface is contained directly within a subscriber IP interface context and thus directly associated with the subscriber subnets on the subscriber IP interface. The SRRP instance is also indirectly associated with any subscriber subnets tied to the subscriber interface through wholesale/retail VPRN configurations. With the directly-associated and the indirectly-associated subscriber interface subnets, a single SRRP instance can manage hundreds of SRRP gateway IP addresses. This automatic subnet association to the SRRP instance is different from VRRP where the redundant IP address is defined within the VRRP context.</p> |

Defining an SRRP gateway IP address on a subscriber subnet is not optional when the subnet is associated with a group IP interface with SRRP enabled. Enabling SRRP (**no shutdown**) will fail if one or more subscriber subnets do not have an SRRP gateway IP address defined. Creating a new subscriber subnet without an SRRP gateway IP address defined will fail when the subscriber subnet is associated with a group IP interface with an active SRRP instance. Once SRRP is enabled on a group interface, the SRRP instance will manage the ARP response and routing behavior for all subscriber hosts reachable through the group IP interface.

The `no` form of the command removes the address from a subscriber subnet. The address command for the specific subscriber subnet must be executed without the `gw-address` parameter. To succeed, all SRRP instances associated with the subscriber subnet must be removed or shutdown.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><i>ip-address/mask</i>   <i>ip-address netmask</i> — Specifies the address space associated with the subscriber subnet</p> <p><b>gw-ip-address</b> <i>ip-address</i> — Specifies a separate IP address within the subnet for SRRP routing purposes. This parameter must be followed by a valid IP interface that exists within the subscriber subnet created by the address command. The defined gateway IP address cannot currently exist as a subscriber host (static or dynamic). If the defined <i>ip-address</i> already exists as a subscriber host address, the address command will fail. The specified <i>ip-address</i> must be unique within the system.</p> <p>The <code>gw-address</code> parameter may be specified at anytime. If the subscriber subnet was created previously, executing the address command with a <code>gw-address</code> parameter will simply add the SRRP gateway IP address to the existing subnet.</p> <p>If the address command is executed without the <code>gw-address</code> parameter when the subscriber subnet is associated with an active SRRP instance, the address will fail. If the SRRP instance is inactive or removed, executing the address command without the <code>gw-address</code> parameter will remove the SRRP gateway IP address from the specified subscriber subnet.</p> <p>If the address command is executed with a new <code>gw-address</code>, all SRRP instances currently associated with the specified subscriber subnet will be updated with the new SRRP gateway IP address.</p> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## group-interface

|                    |                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group-interface</b> <i>ip-int-name</i>                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>subscriber-interface                                                                                                                                                                                              |
| <b>Description</b> | This command enables the context to configure a group interface. A group interface is an interface that may contain one or more SAPs. This interface is used in triple-play services where multiple SAPs are part of the same subnet. |
| <b>Default</b>     | none                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>ip-int-name</i> — Configures the interface group name. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                   |

## arp-host

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-host</b>                                                    |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if                                  |
| <b>Description</b> | This command enables the context to configure ARP host parameters. |

## host-limit

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host-limit</b> <i>max-num-hosts</i><br><b>no host-limit</b>                               |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>arp-host                                                   |
| <b>Description</b> | This command configures the maximum number of ARP hosts.                                     |
| <b>Parameters</b>  | <i>max-num-hosts</i> — Specifies the maximum number of ARP hosts.<br><b>Values</b> 1 — 32767 |

## min-auth-interval

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>min-auth-interval</b> <i>min-auth-interval</i><br><b>no min-auth-interval</b>                    |
| <b>Context</b>     | onfig>service>vprn>sub-if>grp-if>arp-host                                                           |
| <b>Description</b> | This command configures the minimum authentication interval.                                        |
| <b>Parameters</b>  | <i>min-auth-interval</i> — Specifies the minimum authentication interval.<br><b>Values</b> 1 — 6000 |

## sap-host-limit

|                    |                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap-host-limit</b> <i>max-num-hosts-sap</i><br><b>no sap-host-limit</b>                                                             |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>arp-host                                                                                             |
| <b>Description</b> | This command configures the maximum number of ARP hosts per SAP.                                                                       |
| <b>Parameters</b>  | <i>max-num-hosts-sap</i> — Specifies the maximum number of ARP hosts per SAP allowed on this IES interface.<br><b>Values</b> 1 — 32767 |



## PPPoE Commands

### pppoe

|                    |                                                                 |
|--------------------|-----------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] pppoe</b>                                               |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if                               |
| <b>Description</b> | This command enables the context to configure PPPoE parameters. |

### dhcp-client

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp-client</b>                                                       |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>pppoe                                  |
| <b>Description</b> | This command enables the context to configure the PPPoE-to-DHCP options. |

### ccag-use-origin-sap

|                    |                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ccag-use-origin-sap</b>                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>pppoe>dhcp-client                                                                                                                                                                                        |
| <b>Description</b> | This command enables the original VPLS SAP to be included in the circuit-id option to send to the DHCP server (in case this interface is connected to a VPLS by a CCA MDA).<br><br>The <b>no</b> form of the command disables the feature. |
| <b>Default</b>     | no ccag-use-origin-sap                                                                                                                                                                                                                     |

### pap-chap-user-db

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pap-chap-user-db</b> <i>local-user-db-name</i><br><b>no pap-chap-user-db</b>                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>pppoe                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command configures the local user database to use for PPP Challenge-Handshake Authentication Protocol/Password Authentication Protocol (PAP/CHAP) authentication.<br><br>If an authentication policy is also configured, <b>pppoe-access-method</b> must be set to none in this authentication policy to use the local user database (in that case RADIUS authentication will not be used for PPPoE hosts). |
| <b>Parameters</b>  | <i>local-user-db-name</i> — Specifies the local user database to use for authentication.                                                                                                                                                                                                                                                                                                                         |

## pppoe-policy

|                    |                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pppoe-policy</b> <i>pppoe-policy-name</i><br><b>no pppoe-policy</b>                                 |
| <b>Context</b>     | config>service>vpnrn>sub-if>grp-if>pppoe                                                               |
| <b>Description</b> | This command associates a PPPoE policy on this interface.                                              |
| <b>Default</b>     | default                                                                                                |
| <b>Parameters</b>  | <i>pppoe-policy-name</i> — Specifies a a PPPoE policy up to 32 characters in length on this interface. |

## sap-session-limit

|                    |                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap-session-limit</b> <i>sap-session-limit</i><br><b>no sap-session-limit</b>                           |
| <b>Context</b>     | config>service>vpnrn>sub-if>grp-if>pppoe                                                                   |
| <b>Description</b> | This command specifies the number of PPPoE hosts per SAP allowed for this group-interface.                 |
| <b>Default</b>     | 1                                                                                                          |
| <b>Parameters</b>  | <i>sap-session-limit</i> — Specifies the number of PPPoE hosts per SAP allowed.<br><b>Values</b> 1 — 20000 |

## session-limit

|                    |                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>session-limit</b> <i>session-limit</i><br><b>no session-limit</b>                          |
| <b>Context</b>     | config>service>vpnrn>sub-if>grp-if>pppoe                                                      |
| <b>Description</b> | This command specifies the number of PPPoE hosts allowed for this group interface.            |
| <b>Default</b>     | 1                                                                                             |
| <b>Parameters</b>  | <i>session-limit</i> — Specifies the number of PPPoE hosts allowed<br><b>Values</b> 1 — 20000 |

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## Interface ICMP Commands

### icmp

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>icmp</b>                                                                                    |
| <b>Context</b>     | config>service>vprn>interface<br>config>service>vprn>sub-if>grp-if                             |
| <b>Description</b> | This command configures Internet Control Message Protocol (ICMP) parameters on a VPRN service. |

### mask-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mask-reply</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>if>icmp<br>config>service>vprn>sub-if>grp-if>icmp                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command enables responses to Internet Control Message Protocol (ICMP) mask requests on the router interface.</p> <p>If a local node sends an ICMP mask request to the router interface, the <b>mask-reply</b> command configures the router interface to reply to the request.</p> <p>By default, the router instance will reply to mask requests.</p> <p>The <b>no</b> form of this command disables replies to ICMP mask requests on the router interface.</p> |
| <b>Default</b>     | <b>mask-reply</b> — Reply to ICMP mask requests.                                                                                                                                                                                                                                                                                                                                                                                                                         |

### redirects

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>redirects</b> [ <i>number seconds</i> ]<br><b>no redirects</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>if>icmp<br>config>service>vprn>sub-if>grp-if>icmp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures the rate for Internet Control Message Protocol (ICMP) redirect messages issued on the router interface.</p> <p>When routes are not optimal on this router and another router on the same subnetwork has a better route, the router can issue an ICMP redirect to alert the sending node that a better route is available.</p> <p>The <b>redirects</b> command enables the generation of ICMP redirects on the router interface. The rate at which ICMP redirects is issued can be controlled with the optional <i>number</i> and <i>seconds</i> parameters by indicating the maximum number of redirect messages that can be issued on the interface for a given time interval.</p> |

By default, generation of ICMP redirect messages is enabled at a maximum rate of 100 per 10 second time interval.

The **no** form of this command disables the generation of icmp redirects on the router interface.

|                   |                                                                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>redirects 100 10</b> — Maximum of 100 redirect messages in 10 seconds.                                                                                                                                                                                                                                                                    |
| <b>Parameters</b> | <p><i>number</i> — The maximum number of ICMP redirect messages to send. This parameter must be specified with the <i>seconds</i> parameter.</p> <p><b>Values</b> 10 — 1000</p> <p><i>seconds</i> — The time frame in seconds used to limit the <i>seconds</i> of ICMP redirect messages that can be issued.</p> <p><b>Values</b> 1 — 60</p> |

### ttl-expired

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ttl-expired</b> <i>number seconds</i><br><b>no ttl-expired</b>                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>if>icmp<br>config>service>vprn>sub-if>grp-if>icmp                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>Configures the rate Internet Control Message Protocol (ICMP) TTL expired messages are issued by the IP interface.</p> <p>By default, generation of ICMP TTL expired messages is enabled at a maximum rate of 100 per 10 second time interval.</p> <p>The <b>no</b> form of this command disables the limiting the rate of TTL expired messages on the router interface.</p>                                    |
| <b>Default</b>     | ttl-expired 100 10                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>number</i> — The maximum number of ICMP TTL expired messages to send, expressed as a decimal integer. This parameter must be specified with the <i>seconds</i> parameter.</p> <p><b>Values</b> 10 — 1000</p> <p><i>seconds</i> — The time frame in seconds used to limit the <i>number</i> of ICMP TTL expired messages that can be issued, expressed as a decimal integer.</p> <p><b>Values</b> 1 — 60</p> |

## unreachables

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>unreachables</b> [ <i>number seconds</i> ]<br><b>no unreachables</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>if>icmp<br>config>service>vprn>sub-if>grp-if>icmp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command enables and configures the rate for ICMP host and network destination unreachable messages issued on the router interface.</p> <p>The <b>unreachables</b> command enables the generation of ICMP destination unreachables on the router interface. The rate at which ICMP unreachables is issued can be controlled with the optional <i>number</i> and <i>seconds</i> parameters by indicating the maximum number of destination unreachable messages which can be issued on the interface for a given time interval.</p> <p>By default, generation of ICMP destination unreachable messages is enabled at a maximum rate of 10 per 10 second time interval.</p> <p>The <b>no</b> form of this command disables the generation of icmp destination unreachable messages on the router interface.</p> |
| <b>Default</b>     | <b>unreachables 100 10</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><i>number</i> — The maximum number of ICMP unreachable messages to send. This parameter must be specified with the <i>seconds</i> parameter.</p> <p><b>Values</b>      10 — 1000</p> <p><i>seconds</i> — The time frame in seconds used to limit the <i>number</i> of ICMP unreachable messages that can be issued.</p> <p><b>Values</b>      1 — 60</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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## Interface SAP Commands

### sap

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>sap</b> <i>sap-id</i> [ <b>create</b> ]<br><b>no sap</b> <i>sap-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>       | config>service>vprn>interface<br>config>service>vprn>sub-if>grp-if<br>config>service>vprn>ipsec-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>   | <p>This command creates a Service Access Point (SAP) within a service. A SAP is a combination of port and encapsulation parameters which identifies the service access point on the interface and within the 7750. Each SAP must be unique.</p> <p>All SAPs must be explicitly created. If no SAPs are created within a service or on an IP interface, a SAP will not exist on that object.</p> <p>Enter an existing SAP without the <b>create</b> keyword to edit SAP parameters. The SAP is owned by the service in which it was created.</p> <p>A SAP can only be associated with a single service. A SAP can only be defined on a port that has been configured as an access port using the <b>config interface port-type port-id mode access</b> command. Channelized TDM ports are always access ports.</p> <p>If a port is shutdown, all SAPs on that port become operationally down. When a service is shutdown, SAPs for the service are not displayed as operationally down although all traffic traversing the service will be discarded. The operational state of a SAP is relative to the operational state of the port on which the SAP is defined.</p> <p>The <b>no</b> form of this command deletes the SAP with the specified port. When a SAP is deleted, all configuration parameters for the SAP will also be deleted.</p> |
| <b>Default</b>       | No SAPs are defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Special Cases</b> | <p><b>VPRN</b> — A VPRN SAP must be defined on an Ethernet interface.</p> <p><b>sap ipsec-id.private   public:tag</b> — This parameter associates an IPsec group SAP with this interface. This is the public side for an IPsec tunnel. Tunnels referencing this IPsec group in the private side may be created if their local IP is in the subnet of the interface subnet and the routing context specified matches with the one of the interface.</p> <p>This context will provide a SAP to the tunnel. The operator may associate an ingress and egress QoS policies as well as filters and virtual scheduling contexts. Internally this creates an Ethernet SAP that will be used to send and receive encrypted traffic to and from the MDA. Multiple tunnels can be associated with this SAP. The “tag” will be a dot1q value. The operator may see it as an identifier. The range is limited to 1 — 4094.</p>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>    | <p><i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><i>port-id</i> — Specifies the physical port ID in the <i>slot/mda/port</i> format.</p> <p>If the card in the slot has Media Dependent Adapters (MDAs) installed, the <i>port-id</i> must be in the <i>slot_number/MDA_number/port_number</i> format. For example 6/2/3 specifies port 3 on MDA 2 in slot 6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

The *port-id* must reference a valid port type. When the *port-id* parameter represents SONET/SDH and TDM channels the port ID must include the channel ID. A period “.” separates the physical port from the *channel-id*. The port must be configured as an access port.

If the SONET/SDH port is configured as clear-channel then only the port is specified.

**create** — Keyword used to create a SAP instance.

**split-horizon-group** *group-name* — Specifies the name of the split horizon group to which the SAP belongs.

## tod-suite

|                    |                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tod-suite</b> <i>tod-suite-name</i><br><b>no tod-suite</b>                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>if>sap                                                                                                                                                                                   |
| <b>Description</b> | This command applies a time-based policy (filter or QoS policy) to the SAP. The suite name must already exist in the <b>config&gt;cron</b> context.                                                          |
| <b>Default</b>     | no tod-suite                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>tod-suite-name</i> — Specifies collection of policies (ACLs, QoS) including time-ranges that define the full or partial behavior of a SAP or a subscriber. The suite can be applied to more than one SAP. |

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## Interface Billing Commands

### accounting-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>accounting-policy</b> <i>acct-policy-id</i><br><b>no accounting-policy</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>if>spoke-sdp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command creates the accounting policy context that can be applied to an interface SAP or interface SAP spoke SDP.</p> <p>An accounting policy must be defined before it can be associated with a SAP. If the <i>policy-id</i> does not exist, an error message is generated.</p> <p>A maximum of one accounting policy can be associated with a SAP at one time. Accounting policies are configured in the <b>config&gt;log&gt;accounting-policy</b> context.</p> <p>The <b>no</b> form of this command removes the accounting policy association from the SAP, and the accounting policy reverts to the default.</p> |
| <b>Default</b>     | Default accounting policy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>acct-policy-id</i> — Enter the accounting <i>policy-id</i> as configured in the <b>config&gt;log&gt;accounting-policy</b> context.</p> <p><b>Values</b>      1 to 99</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### app-profile

|                    |                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>app-profile</b> <i>app-profile-name</i><br><b>no app-profile</b>                                             |
| <b>Context</b>     | config>service>vprn>interface>spoke-sdp                                                                         |
| <b>Description</b> | This command configures the application profile name.                                                           |
| <b>Parameters</b>  | <p><i>app-profile-name</i> — Specifies the application profile name.</p> <p><b>Values</b>      32 chars max</p> |



## collect-stats

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] collect-stats</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>if>spoke-sdp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command enables accounting and statistical data collection for either an interface SAP or interface SAP spoke SDP, or network port. When applying accounting policies the data, by default, is collected in the appropriate records and written to the designated billing file.</p> <p>When the <b>no collect-stats</b> command is issued the statistics are still accumulated by the IOM cards. However, the CPU will not obtain the results and write them to the billing file. If a subsequent <b>collect-stats</b> command is issued then the counters written to the billing file include all the traffic while the <b>no collect-stats</b> command was in effect.</p> |
| <b>Default</b>     | collect-stats                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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## Interface SAP ATM Commands

### atm

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>atm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables the context to configure ATM-related attributes. This command can only be used when a given context (for example, a channel or SAP) supporting ATM functionality such as:</p> <ul style="list-style-type: none"> <li>Configuring ATM port or ATM port-related functionality on MDAs supporting ATM functionality.</li> <li>Configuring ATM-related configuration for ATM-based SAPs that exist on MDAs supporting ATM functionality.</li> </ul> <p>If ATM functionality is not supported for a given context, the command returns an error.</p> |

### egress

|                    |                                                                             |
|--------------------|-----------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress</b>                                                               |
| <b>Context</b>     | config>service>vprn>if>sap>atm<br>config>service>vprn>sub-if>grp-if>sap>atm |
| <b>Description</b> | This command configures egress ATM attributes for the SAP.                  |

### encapsulation

|                    |                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>encapsulation</b> <i>atm-encap-type</i>                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>if>sap>atm<br>config>service>vprn>sub-if>grp-if>sap>atm                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command configures RFC 2684, <i>Multiprotocol Encapsulation over ATM AAL5</i>, encapsulation for an ATM PVCC delimited SAP. This command specifies the data encapsulation for an ATM PVCC delimited SAP. The definition also references the ATM Forum LAN Emulation specification. Ingress traffic that does not match the configured encapsulation will be dropped.</p> |
| <b>Default</b>     | The encapsulation is driven by the services for which the SAP is configured. For VPRN service SAPs, the default is <b>aal5snap-routed</b> .                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>atm-encap-type</i> — Specify the encapsulation type.                                                                                                                                                                                                                                                                                                                          |
| <b>Values</b>      | <b>aal5snap-routed</b> — Routed encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684.                                                                                                                                                                                                                                        |

**aal5mux-ip** — Routed IP encapsulation for VC multiplexed circuit as defined in RFC 2684.

**aal5snap-bridged** — Bridged encapsulation for LLC encapsulated circuit (LLC/ SNAP precedes protocol datagram) as defined in RFC 2684.

**aal5mux-bridged-eth-nofcs** — Bridged IP encapsulation for VC multiplexed circuit as defined in RFC 2684.

## ingress

|                    |                                                                             |
|--------------------|-----------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress</b>                                                              |
| <b>Context</b>     | config>service>vprn>if>sap>atm<br>config>service>vprn>sub-if>grp-if>sap>atm |
| <b>Description</b> | This command configures ingress ATM attributes for the SAP.                 |

## traffic-desc

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>traffic-desc</b> <i>traffic-desc-profile-id</i><br><b>no traffic-desc</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>if>sap>atm>egress<br>config>service>vprn>if>sap>atm>ingress<br>config>service>vprn>sub-if>grp-if>sap>atm>egress<br>config>service>vprn>sub-if>grp-if>sap>atm>ingress                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command assigns an ATM traffic descriptor profile to a given context (for example, a SAP). When configured under the ingress context, the specified traffic descriptor profile defines the traffic contract in the forward direction. When configured under the egress context, the specified traffic descriptor profile defines the traffic contract in the backward direction.<br><br>The <b>no</b> form of the command reverts the traffic descriptor to the default traffic descriptor profile. |
| <b>Default</b>     | The default traffic descriptor (trafficDescProfileId. = 1) is associated with newly created PVCC-delimited SAPs.                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>traffic-desc-profile-id</i> — Specify a defined traffic descriptor profile (see the QoS atm-td-profile command).                                                                                                                                                                                                                                                                                                                                                                                      |

## oam

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>oam</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>interface >sap>atm<br>config>service>vprn>sub-if>grp-if>sap>atm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command enables the context to configure OAM functionality for a PVCC delimiting a SAP. The ATM-capable MDAs support F5 end-to-end OAM functionality (AIS, RDI, Loopback):</p> <ul style="list-style-type: none"> <li>• ITU-T Recommendation I.610 - B-ISDN Operation and Maintenance Principles and Functions version 11/95</li> <li>• GR-1248-CORE - Generic Requirements for Operations of ATM Network Elements (NEs). Issue 3 June 1996</li> <li>• GR-1113-CORE - Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994</li> </ul> |

## alarm-cells

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] alarm-cells</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>if>sap>atm>oam<br>config>service>vprn>sub-if>grp-if>sap>atm>oam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command configures AIS/RDI fault management on a PVCC. Fault management allows PVCC termination to monitor and report the status of their connection by propagating fault information through the network and by driving PVCC's operational status.</p> <p>When alarm-cells functionality is enabled, a PVCC's operational status is affected when a PVCC goes into an AIS or RDI state because of an AIS/RDI processing (assuming nothing else affects PVCC's operational status, for example, if the PVCC goes DOWN, or enters a fault state and comes back UP, or exits that fault state). RDI cells are generated when PVCC is operationally DOWN. No OAM-specific SNMP trap is raised whenever an endpoint enters/exits an AIS or RDI state, however, if as result of an OAM state change, the PVCC changes operational status, then a trap is expected from an entity the PVCC is associated with (for example a SAP).</p> <p>The <b>no</b> command disables alarm-cells functionality for a PVCC. When alarm-cells functionality is disabled, a PVCC's operational status is no longer affected by a PVCC's OAM state changes due to AIS/RDI processing (note that when alarm-cells is disabled, a PVCC will change operational status to UP due to alarm-cell processing) and RDI cells are not generated as result of the PVCC going into AIS or RDI state. The PVCC's OAM status, however, will record OAM faults as described above.</p> |
| <b>Default</b>     | Enabled for PVCCs delimiting VPRN SAPs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## periodic-loopback

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] periodic-loopback</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>if >sap>atm>oam<br>config>service>vprn>sub-if>grp-if>sap>atm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command enables periodic OAM loopbacks on this SAP. This command is only configurable on VPRN SAPs. When enabled, an ATM OAM loopback cell is transmitted every period as configured in the <code>config&gt;system&gt;atm&gt;oam&gt;loopback-period <i>period</i></code> context.</p> <p>If a response is not received and consecutive retry-down retries also result in failure, the endpoint will transition to an alarm indication signal/loss of clock state. Then, an ATM OAM loopback cell will be transmitted every period as configured in the <code>loopback-period <i>period</i></code>. If a response is received for the periodic loopback and consecutive retry-up retries also each receive a response, the endpoint will transition back to the up state.</p> <p>The <b>no</b> form of the command sets the value back to the default.</p> |
| <b>Default</b>     | no periodic-loopback                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

---

## Interface Anti-Spoofing Commands

### anti-spoof

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>anti-spoof {ip   mac   ip-mac   nh-mac}</b><br><b>no anti-spoof-type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command enables anti-spoof filtering and optionally changes the anti-spoof matching type for the interface.</p> <p>The type of anti-spoof filtering defines what information in the incoming packet is used to generate the criteria to lookup an entry in the anti-spoof filter table. The type parameter (<b>ip</b>, <b>mac</b>, <b>ip-mac</b>, <b>nh-mac</b>) defines the anti-spoof filter type enforced by the SAP when anti-spoof filtering is enabled.</p> <p>The <b>no</b> form of the command disables anti-spoof filtering on the SAP.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Default</b>     | <p>Filter type default types:</p> <ul style="list-style-type: none"> <li>• Non-Ethernet encapsulation default anti-spoof filter type — When enabled on a non-Ethernet encapsulated SAP, the anti-spoof filter default type is <b>ip</b>.</li> <li>• Ethernet encapsulated default anti-spoof filter type — When enabled on an Ethernet encapsulated SAP, the anti-spoof default type is <b>ip-mac</b>.</li> <li>• Default anti-spoof filter state — Anti-spoof filtering is disabled by default on the SAP.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><b>ip</b> — Configures SAP anti-spoof filtering to use only the source IP address in its lookup. If a static host exists on the SAP without an IP address specified, the anti-spoof type <b>ip</b> command will fail.</p> <p><b>mac</b> — Configures SAP anti-spoof filtering to use only the source MAC address in its lookup. Setting the anti-spoof filter type to <b>mac</b> is not allowed on non-Ethernet encapsulated SAPs. If a static host exists on the SAP without a specified MAC address, the anti-spoof type <b>mac</b> command will fail. The anti-spoof type <b>mac</b> command will also fail if the SAP does not support Ethernet encapsulation.</p> <p><b>ip-mac</b> — Configures SAP anti-spoof filtering to use both the source IP address and the source MAC address in its lookup. If a static host exists on the SAP without both the IP address and MAC address specified, the anti-spoof type <b>ip-mac</b> command will fail. This is also true if the default anti-spoof filter type of the SAP is <b>ip-mac</b> and the default is not overridden. The anti-spoof type <b>ip-mac</b> command will also fail if the SAP does not support Ethernet encapsulation.</p> <p><b>nh-mac</b> — Indicates that the ingress anti-spoof is based on the source MAC address and the egress anti-spoof is based on the nh-ip-address.</p> |

## app-profile

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>app-profile</b> <i>app-profile-name</i><br><b>no app-profile</b>                                                                                |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if>sap                                                                                |
| <b>Description</b> | This command configures the application profile name.                                                                                              |
| <b>Parameters</b>  | <i>app-profile-name</i> — Specifies an existing application profile name configured in the <b>config&gt;app-assure&gt;group&gt;policy</b> context. |

## arp-populate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] arp-populate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>if<br>config>service>vprn>sub-if>subscriber-interface<br>config>service>vprn>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command enables populating static and dynamic hosts into the system ARP cache. When enabled, the host's IP address and MAC address are placed in the system ARP cache as a managed entry. Static hosts must be defined on the interface using the <b>host</b> command. Dynamic hosts are enabled on the system through enabling lease-populate in the IP interface DHCP context. In the event that both a static host and a dynamic host share the same IP and MAC address, the system's ARP cache retains the host information until both the static and dynamic information are removed. Both static and dynamic hosts override static ARP entries. Static ARP entries are marked as inactive when they conflict with static or dynamic hosts and will be repopulated once all static and dynamic host information for the IP address are removed. Since static ARP entries are not possible when static subscriber hosts are defined or when DHCP lease state table population is enabled, conflict between static ARP entries and the arp-populate function is not an issue.</p> <p>The <b>arp-populate</b> command will fail if an existing static subscriber host on the SAP does not have both MAC and IP addresses specified.</p> <p>Once <b>arp-populate</b> is enabled, creating a static subscriber host on the SAP without both an IP address and MAC address will fail.</p> <p><b>arp-populate</b> can only be enabled on VPRN interfaces supporting Ethernet encapsulation.</p> <p>Use the <b>no</b> form of the command to disable ARP cache population functions for static and dynamic hosts on the interface. All static and dynamic host information in the systems ARP cache will be removed. Any existing static ARP entries previously inactive due to static or dynamic hosts will be populated in the system ARP cache.</p> <p>When <b>arp-populate</b> is enabled, the system will not send out ARP Requests for hosts that are not in the ARP cache. Only statically configured and DHCP learned hosts are reachable through an IP interface with arp-populate enabled.</p> |
| <b>Default</b>     | not enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## arp-timeout

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-timeout</b> <i>seconds</i><br><b>no arp-timeout</b>                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>interface<br>config>service>vprn>sub-if>grp-if                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command configures the minimum time in seconds an ARP entry learned on the IP interface will be stored in the ARP table. ARP entries are automatically refreshed when an ARP request or gratuitous ARP is seen from an IP host, otherwise, the ARP entry is aged from the ARP table. If <b>arp-timeout</b> is set to a value of zero seconds, ARP aging is disabled.<br><br>The <b>no</b> form of this command restores <b>arp-timeout</b> to the default value. |
| <b>Default</b>     | 14400 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>seconds</i> — The minimum number of seconds a learned ARP entry will be stored in the ARP table, expressed as a decimal integer. A value of zero specifies that the timer is inoperative and learned ARP entries will not be aged.<br><br><b>Values</b> 0 — 65535                                                                                                                                                                                                  |

## authentication-policy

|                    |                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-policy</b> <i>name</i><br><b>no authentication-policy</b>                                                                                                       |
| <b>Context</b>     | config>service>vprn>if<br>config>service>vprn>sub-if>grp-if                                                                                                                       |
| <b>Description</b> | This command assigns an authentication policy to the interface.<br><br>The <b>no</b> form of this command removes the policy name from the group interface configuration.         |
| <b>Default</b>     | no authentication-policy                                                                                                                                                          |
| <b>Parameters</b>  | <i>name</i> — Specifies the authentication policy name. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. |

## delayed-enable

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>delayed-enable</b> <i>seconds</i> [ <b>init-only</b> ]<br><b>no delayed-enable</b>                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>sub-if                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command delays making interface operational by the specified number of seconds.<br><br>In environments with many subscribers, it can take time to synchronize the subscriber state between peers when the subscriber-interface is enabled (perhaps, after a reboot). To ensure that the state has time to be synchronized, the <b>delayed-enable</b> timer can be specified. The optional parameter <b>init-only</b> can be added to use this timer only after a reboot. |



|                   |                                                                                                                                                                                                                                                                                  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no delayed-enable                                                                                                                                                                                                                                                                |
| <b>Parameters</b> | <i>seconds</i> — Specifies the number of seconds to delay before the interface is operational.                                                                                                                                                                                   |
| <b>Values</b>     | 1 — 1200                                                                                                                                                                                                                                                                         |
| <b>init-only</b>  | — Delays the initialization of the subscriber-interface to give the rest of the system time to complete necessary tasks such as allowing routing protocols to converge and/or to allow MCS to sync the subscriber information. The delay only occurs immediately after a reboot. |

## calling-station-id

|                    |                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>calling-station-id</b> <i>calling-station-id</i><br><b>no calling-station-id</b>                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap                                                                                                                                                                                                                         |
| <b>Description</b> | This command enables the inclusion of the <b>calling-station-id</b> attribute in RADIUS authentication requests and RADIUS accounting messages. The value inserted is set at the SAP level. If no value is set at the SAP level, an empty string is included. |
| <b>Default</b>     | This attribute is not sent by default.                                                                                                                                                                                                                        |

## cpu-protection

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cpu-protection</b> <i>policy-id</i> [ <b>mac-monitoring</b> ]<br><b>no cpu-protection</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command assigns an existing CPU protection policy to the associated group interface SAP. The CPU protection policies are configured in the <b>config&gt;sys&gt;security&gt;cpu-protection&gt;policy</b> <i>cpu-protection-policy-id</i> context.</p> <p>If no <b>cpu-protection policy</b> is assigned to a SAP, then the default policy is used to limit the overall-rate. The default policy is policy number 254 for access interfaces and 255 for network interfaces.</p> <p>The <b>no</b> form of the command removes the association of the CPU protection policy from the associated interface and reverts to the default policy values.</p> |
| <b>Default</b>     | <p>cpu-protection 254 (for access interfaces)</p> <p>cpu-protection 255 (for network interfaces)</p> <p>none (for video-interfaces (where applicable), shown as <b>no cpu-protection</b> in CLI)</p> <p>The configuration of <b>no cpu-protection</b> returns the interface/SAP to the default policies as shown above.</p>                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><i>policy-id</i> — Specifies an existing CPU protection policy.</p> <p><b>Values</b> 1 — 255</p> <p><b>mac-monitoring</b> — When specified, the per MAC rate limiting should be performed, using the per-source-rate from the associated cpu-protection policy.</p>                                                                                                                                                                                                                                                                                                                                                                                      |

## host

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <p><b>[no] host</b> {[<b>ip</b> <i>ip-address</i> [<b>mac</b> <i>ieee-address</i>]} [<b>subscriber</b> <i>sub-ident-string</i>] [<b>sub-profile</b> <i>sub-profile-name</i>] [<b>sla-profile</b> <i>sla-profile-name</i>]</p> <p><b>no host</b> {[<b>ip</b> <i>ip-address</i>] [<b>mac</b> <i>ieee-address</i>]}</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command creates a static host for the SAP. Applications within the system that make use of static host entries include anti-spoof, and source MAC population into the VPLS forwarding database.</p> <p>Multiple static hosts can be defined on the SAP. Each host is identified by a source IP address, a source MAC address, or both a source IP and source MAC address. When anti-spoof is enabled on the SAP, the host information will be populated into the SAP's anti-spoof table, allowing ingress packets matching the entry access to the SAP. When the MAC address exists in the host definition, the MAC address is populated into the VPLS forwarding database and associates it with the SAP. The static host definition overrides any static MAC entries using the same MAC and prevents dynamic learning of the MAC on another interface.</p> <p>Defining a static host identical to an existing static host has no effect and will not generate a log or error message.</p> <p>Every static host definition must have at least one address defined, IP or MAC.</p> <p>Static hosts may exist on the SAP even with anti-spoof and <b>arp-populate</b> (VPRN) features disabled. When enabled, each feature has different requirements for static hosts.</p> <p><b>anti-spoof</b> — When enabled, this feature uses static and dynamic host information to populate entries into an anti-spoof filter table. The anti-spoof filter entries generated will be of the same type as specified in the anti-spoof type parameter. If the SAP anti-spoof filter is defined as mac, each static host definition must specify a MAC address. If the SAP anti-spoof filter is defined as ip, each static host definition must specify an IP address. If the SAP anti-spoof filter is defined as ip-mac, each static host definition must specify both an IP address and MAC address. If definition of a static host is attempted without the appropriate addresses specified for the enabled anti-spoof filter, the static host definition will fail.</p> <p><b>arp-populate</b> — When enabled, this feature uses static and dynamic host information to populate entries into the system's ARP cache. This is only available on the VPRN service SAPs. Both a MAC address and IP address are required to populate an ARP entry in the system. If definition of a static host is attempted without both a MAC and IP address specified when arp -populate is enabled, the static host definition will fail.</p> <p><b>fdb-populate</b> — This is an implicit feature that uses the static host definition as a static MAC in the VPLS forwarding database. It cannot be enabled or disabled and has no effect on the ability to create static hosts without a MAC address specified. When a MAC address is specified for a static host, it will automatically be populated into the VPLS forwarding database associated with the SAP on which the host is created. The static host MAC address will override any static MAC entries using the same MAC and prevent dynamic learning of the MAC on another interface. Existing static MAC entries with the same MAC address as a static host are marked as inactive but not deleted. If all static hosts are removed from the SAP, the static MAC may be populated. New static MAC definitions for the VPLS instance may be created while a static host exists associated with the static MAC address.</p> <p>The <b>no</b> form of the command removes a static entry from the system. The specified <b>ip address</b> and <b>mac address</b> must match the host's exact IP and MAC addresses as defined when it was created.</p> |

When a static host is removed from the SAP, the affect of its removal on the anti-spoof filter, ARP cache or the VPLS forwarding database is also evaluated.

**Default** There are no default static entries.

**Parameters** **ip ip-address** — Specify this optional parameter when defining a static host. The IP address must be specified for **anti-spoof ip** and **anti-spoof ip-mac** commands. Only one static host can be configured on the SAP with a given IP address.

The following rules apply to configure static hosts using an IP address:

- Only one static host can be defined using a specific IP address.
- Defining a static host with the same IP address as a previous static host overwrites the previous static host.
- If a static host has an IP address assigned, the MAC address for the host is optional (depending on the features enabled on the SAP).

**mac mac-address** — Specify this optional parameter when defining a static host. The MAC address must be specified for **anti-spoof mac** and **anti-spoof ip-mac**. Multiple static hosts may be configured with the same MAC address given that each definition is distinguished by a unique IP address. The following rules apply to configuring static hosts using a MAC address:

- Multiple static hosts may share the same MAC address.
- Executing the host command with the same MAC address but a different IP address as an existing static host will create a new static host.
- If a static host has a MAC address assigned, the IP address for the host is optional (depending on the features enabled on the SAP).

**Values** 8k static and dynamic hosts per 10G forwarding complex. 64k per system.

**subscriber sub-ident-string** — Specify this optional parameter to specify an existing subscriber identification profile to be associated with the static subscriber host. The subscriber identification profile is configured in the **config>subscr-mgmt>sub-ident-policy** context. The subscriber information is used by the VPRN SAP arp-reply-agent to determine the proper handling of received ARP requests from subscribers.

- For VPRN SAPs with **arp-reply-agent** enabled with the optional *sub-ident* parameter, the static subscriber host's sub-ident-string is used to determine whether an ARP request received on the SAP is sourced from a host belonging to the same subscriber as the destination host. When both the destination and source hosts from the ARP request are known on the SAP and the subscriber identifications do not match, the ARP request may be forwarded to the rest of the VPRN destinations.

If the static subscriber host's *sub-ident* string is not defined, the host is not considered to belong to the same subscriber as another host on the SAP.

If source or destination host is unknown, the hosts are not considered to belong to the same subscriber. ARP messages from unknown hosts are subject to anti-spoof filtering rules applied at the SAP.

If *sub-ident* is not enabled on the SAP arp-reply-agent, subscriber identification matching is not performed on ARP requests received on the SAP.

ARP requests are never forwarded back to the same SAP or within the receiving SAP's split horizon group.

**sub-profile** *sub-profile-name* — Specify this optional parameter to specify an existing subscriber profile name to be associated with the static subscriber host. The subscriber profile is configured in the **config>subscr-mgmt>sub-profile** context.

**sla-profile** *sla-profile-name* — Specify this optional parameter to specify an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the **config>subscr-mgmt>sla-profile** context.

### frame-relay

|                    |                                                                                  |
|--------------------|----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>frame-relay</b>                                                               |
| <b>Context</b>     | config>service>vprn>if>sap                                                       |
| <b>Description</b> | This command enables the context to configure Frame Relay parameters on the SAP. |

### frf-12

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] frf-12</b>                                                                                                     |
| <b>Context</b>     | config>service>vprn>if>sap                                                                                             |
| <b>Description</b> | This command enables the use of FRF12 headers.<br>The <b>no</b> form of the command disables the use of FRF12 headers. |

### ete-fragment-threshold

|                    |                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ete-fragment-threshold</b> <i>threshold</i><br><b>no ete-fragment-threshold</b>                                                      |
| <b>Context</b>     | config>service>vprn>if>sap>frf-12                                                                                                       |
| <b>Description</b> | This command specifies the maximum length of a fragment to be transmitted.<br>The <b>no</b> form of the command reverts to the default. |
| <b>Parameters</b>  | <i>threshold</i> — Specifies the maximum length of a fragment to be transmitted.                                                        |
| <b>Values</b>      | 128 — 512                                                                                                                               |
| <b>Default</b>     | 0                                                                                                                                       |

### interleave

|                |                                                      |
|----------------|------------------------------------------------------|
| <b>Syntax</b>  | <b>interleave</b><br><b>no interleave</b>            |
| <b>Context</b> | config>service>vprn>interface>sap>frame-relay>frf.12 |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | <p>This command enables interleaving of high priority frames and low-priority frame fragments within a FR SAP using FRF.12 end-to-end fragmentation.</p> <p>When this option is enabled, only frames of the FR SAP non expedited forwarding class queues are subject to fragmentation. The frames of the FR SAP expedited queues are interleaved, with no fragmentation header, among the fragmented frames. In effect, this provides a behavior like in MLPPP Link Fragment Interleaving (LFI).</p> <p>When this option is disabled, frames of all the FR SAP forwarding class queues are subject to fragmentation. The fragmentation header is however not included when the frame size is smaller than the user configured fragmentation size. In this mode, the SAP transmits all fragments of a frame before sending the next full or fragmented frame.</p> <p>The receive direction of the FR SAP supports both modes of operation concurrently, with and without fragment interleaving.</p> <p>The <b>no</b> form of this command restores the default mode of operation.</p> |
| <b>Default</b>     | no interleave                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## scheduling-class

|                    |                                                                                                                                                                                          |               |       |                |   |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|----------------|---|
| <b>Syntax</b>      | <b>scheduling-class</b> <i>class-id</i>                                                                                                                                                  |               |       |                |   |
| <b>Context</b>     | config>service>vprn>if>sap                                                                                                                                                               |               |       |                |   |
| <b>Description</b> | This command specifies the scheduling class to use for this SAP.                                                                                                                         |               |       |                |   |
| <b>Parameters</b>  | <p><i>class-id</i> — Specifies the scheduling class to use for this sap.</p> <table> <tr> <td><b>Values</b></td><td>0 — 3</td></tr> <tr> <td><b>Default</b></td><td>0</td></tr> </table> | <b>Values</b> | 0 — 3 | <b>Default</b> | 0 |
| <b>Values</b>      | 0 — 3                                                                                                                                                                                    |               |       |                |   |
| <b>Default</b>     | 0                                                                                                                                                                                        |               |       |                |   |

## Interface SAP Filter and QoS Policy Commands

### egress

|                    |                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress</b>                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if>sap<br>config>service>vprn>ipsec-if>sap                                                                                                                                                                                           |
| <b>Description</b> | This command enables the context to configure egress SAP Quality of Service (QoS) policies and filter policies.<br><br>If no sap-egress QoS policy is defined, the system default sap-egress QoS policy is used for egress processing. If no egress filter is defined, no filtering is performed. |

### ingress

|                    |                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress</b>                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if>sap<br>config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if>sap<br>config>service>vprn>ipsec-if>sap                                                                                                                         |
| <b>Description</b> | This command enables the context to configure ingress SAP Quality of Service (QoS) policies and filter policies.<br><br>If no sap-ingress QoS policy is defined, the system default sap-ingress QoS policy is used for ingress processing. If no ingress filter is defined, no filtering is performed. |

### agg-rate-limit

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>agg-rate-limit</b> <i>agg-rate</i> [ <b>queue-frame-based-accounting</b> ]<br><b>no agg-rate-limit</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>if>sap>egress<br>config>service>vprn>sub-if>grp-if>sap>egress<br>config>service>vprn>ipsec-if>sap>egress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command defines a maximum total rate for all egress queues on a service SAP or multi-service site. The <b>agg-rate-limit</b> command is mutually exclusive with the egress scheduler policy. When an egress scheduler policy is defined, the <b>agg-rate-limit</b> command will fail. If the <b>agg-rate-limit</b> command is specified, an attempt to bind a <b>scheduler-policy</b> to the SAP or multi-service site will fail.<br><br>A multi-service site must have a port scope defined that ensures all queues associated with the site are on the same port or channel. If the scope is not set to a port, the agg-rate-limit command will fail. |

Once an `agg-rate-limit` has been assigned to a multi-service site, the scope cannot be changed to `card` level.

A port scheduler policy must be applied on the egress port or channel the SAP or multi-service site is bound to in order for the defined `agg-rate-limit` to take effect. The egress port scheduler enforces the aggregate queue rate as it distributes its bandwidth at the various port priority levels. The port scheduler stops offering bandwidth to member queues once it has detected that the aggregate rate limit has been reached.

If a port scheduler is not defined on the egress port, the queues are allowed to operate based on their own bandwidth parameters.

The **no** form of the command removes the aggregate rate limit from the SAP or multi-service site.

**Parameters** *agg-rate* — Defines the rate, in kilobits-per-second, that the maximum aggregate rate that the queues on the SAP or multi-service site can operate.

**Values** 1 — 40000000, max

**queue-frame-based-accounting** — This keyword enables frame based accounting on all queues associated with the SAP or Multi-Service Site. If frame based accounting is required when an aggregate limit is not necessary, the `max` keyword should precede the `queue-frame-based-accounting` keyword. If frame based accounting must be disabled, execute `agg-rate-limit` without the `queue-frame-based-accounting` keyword present.

**Default** Frame based accounting is disabled by default

## filter

**Syntax** **filter ip** *ip-filter-id*  
**no filter**

**Context** `config>service>vprn>if>sap>egress`  
`config>service>vprn>if>sap>ingress`  
`config>service>vprn>sub-if>grp-if>sap>egress`  
`config>service>vprn>ipsec-if>sap>egress`  
`config>service>vprn>ipsec-if>sap>ingress`

**Description** This command associates an IP filter policy with an ingress or egress Service Access Point (SAP) or IP interface. Filter policies control the forwarding and dropping of packets based on IP matching criteria.

The **filter** command is used to associate a filter policy with a specified *ip-filter-id* with an ingress or egress SAP. The *ip-filter-id* must already be defined before the **filter** command is executed. If the filter policy does not exist, the operation will fail and an error message returned.

In general, filters applied to SAPs (ingress or egress) apply to all packets on the SAP. One exception is non-IP packets are not applied to IP match criteria, so the default action in the filter policy applies to these packets.

The **no** form of this command removes any configured filter ID association with the SAP or IP interface. The filter ID itself is not removed from the system unless the scope of the created filter is set to `local`. To avoid deletion of the filter ID and only break the association with the service object, use **scope** command within the filter definition to change the scope to **local** or **global**. The default scope of a filter is **local**.

|                   |                                                                                                                             |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <b>ip</b> <i>ip-filter-id</i> — Specifies IP filter policy. The filter ID must already exist within the created IP filters. |
| <b>Values</b>     | 1 — 65535                                                                                                                   |

### hsmda-queue-override

|                    |                                                                         |
|--------------------|-------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] hsmda-queue-override</b>                                        |
| <b>Context</b>     | config>service>vprn>if>sap>egress<br>config>service>vprn>if>sap>ingress |
| <b>Description</b> | This command enables the context to configure HSMDA queue overrides.    |

### queue

|                    |                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>queue</b> <i>queue-id</i> [ <b>create</b> ]<br><b>no queue</b> <i>queue-id</i>                                           |
| <b>Context</b>     | config>service>vprn>if>sap>egress>hsmda-queue-overider<br>config>service>vprn>if>sap>ingress>hsmda-queue-overider           |
| <b>Description</b> | This command configures overrides for a HSMDA queue. The actual valid values are those defined in the given SAP QoS policy. |
| <b>Parameters</b>  | <i>queue-id</i> — Specifies the queue ID to override.                                                                       |
| <b>Values</b>      | 1 — 8                                                                                                                       |
|                    | <b>create</b> — This keyword is mandatory while creating a new queue override.                                              |

### packet-byte-offset

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>packet-byte-offset</b> { <b>add</b> <i>add-bytes</i>   <b>subtract</b> <i>sub-bytes</i> }<br><b>no packet-byte-offset</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>if>sap>egress>hsmda-queue-overider<br>config>service>vprn>if>sap>ingress>hsmda-queue-overider                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command adds or subtracts the specified number of bytes to the accounting function for each packet handled by the HSMDA queue. Normally, the accounting and leaky bucket functions are based on the Ethernet DLC header, payload and the 4 byte CRC (everything except the preamble and inter-frame gap). As an example, the packet-byte-offset command can be used to add the frame encapsulation overhead (20 bytes) to the queues accounting functions.</p> <p>The accounting functions affected include:</p> <ul style="list-style-type: none"> <li>• Offered High Priority / In-Profile Octet Counter</li> <li>• Offered Low Priority / Out-of-Profile Octet Counter</li> <li>• Discarded High Priority / In-Profile Octet Counter</li> </ul> |



- Discarded Low Priority / Out-of-Profile Octet Counter
- Forwarded In-Profile Octet Counter
- Forwarded Out-of-Profile Octet Counter
- Peak Information Rate (PIR) Leaky Bucket Updates
- Committed Information Rate (CIR) Leaky Bucket Updates
- Queue Group Aggregate Rate Limit Leaky Bucket Updates

The secondary shaper leaky bucket, scheduler priority level leaky bucket and the port maximum rate updates are not affected by the configured packet-byte-offset. Each of these accounting functions are frame based and always include the preamble, DLC header, payload and the CRC regardless of the configured byte offset.

The packet-byte-offset command accepts either add or subtract as valid keywords which define whether bytes are being added or removed from each packet traversing the queue. Up to 31 bytes may be added to the packet and up to 32 bytes may be removed from the packet. An example use case for subtracting bytes from each packet is an IP based accounting function. Given a Dot1Q encapsulation, the command packet-byte-offset subtract 14 would remove the DLC header and the Dot1Q header from the size of each packet for accounting functions only. The 14 bytes are not actually removed from the packet, only the accounting size of the packet is affected.

As inferred above, the variable accounting size offered by the packet-byte-offset command is targeted at the queue and queue group level. The packet-byte-offset, when set, applies to all queues in the queue group. The accounting size of the packet is ignored by the secondary shapers, the scheduling priority level shapers and the scheduler maximum rate. The actual on-the-wire frame size is used for these functions to allow an accurate representation of the behavior of the subscriber's packets on an Ethernet aggregation network.

The packet-byte-offset value may be overridden at the queue-group level.

#### Parameters

**add** *add-bytes* — Indicates that the byte value should be added to the packet for queue and queue group level accounting functions. Either the **add** or **subtract** keyword must be specified. The corresponding byte value must be specified when executing the packet-byte-offset command. The **add** keyword is mutually exclusive with the **subtract** keyword.

**Values**      0 — 31

**subtract** *sub-bytes* — Indicates that the byte value should be subtracted from the packet for queue and queue group level accounting functions. The **subtract** keyword is mutually exclusive with the **add** keyword. Either the **add** or **subtract** keyword must be specified. The corresponding byte value must be specified when executing the packet-byte-offset command.

**Values**      1 — 32

## slope-policy

|                    |                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>slope-policy</b> <i>hsmda-slope-policy-name</i><br><b>no slope-policy</b>                                      |
| <b>Context</b>     | config>service>vprn>if>sap>egress>hsmda-queue-overider<br>config>service>vprn>if>sap>ingress>hsmda-queue-overider |
| <b>Description</b> | This command specifies an existing slope policy name.                                                             |

## secondary-shaper

|                    |                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------|
|                    | <b>secondary-shaper</b> <i>secondary-shaper-name</i><br><b>no secondary-shaper</b>                                      |
| <b>Context</b>     | config>service>vprn>if>sap>egress>hsmda-queue-overider                                                                  |
| <b>Description</b> | This command configures an HSMDB secondary shaper. Note that an shaper override can only be configured on an HSMDB SAP. |
| <b>Parameters</b>  | <i>secondary-shaper-name</i> — Specifies a secondary shaper name up to 32 characters in length.                         |

## match-qinq-dot1p

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>match-qinq-dot1p</b> { <b>top</b>   <b>bottom</b> }<br><b>no match-qinq-dot1p</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>if>sap>ingress<br>config>service>vprn>sub-if>grp-if>sap>ingress<br>config>service>vprn>ipsec-if>sap>ingress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command specifies which Dot1Q tag position Dot1P bits in a QinQ encapsulated packet should be used to evaluate Dot1P QoS classification.</p> <p>The <b>match-qinq-dot1p</b> command allows the top or bottom PBits to be used when evaluating the applied sap-ingress QoS policy's Dot1P entries. The <b>top</b> and <b>bottom</b> keywords specify which position should be evaluated for QinQ encapsulated packets.</p> <p>The <b>no</b> form of the command restores the default dot1p evaluation behavior for the SAP.</p> <p>By default, the bottom most service delineating Dot1Q tags Dot1P bits are used. The following table defines the default behavior for Dot1P evaluation when the <b>match-qinq-dot1p</b> command is not executed.</p> |

| Port / SAP Type | Existing Packet Tags | PBits Used for Match |
|-----------------|----------------------|----------------------|
| Null            | None                 | None                 |
| Null            | Dot1P (VLAN-ID 0)    | Dot1P PBits          |
| Null            | Dot1Q                | Dot1Q PBits          |

| Port / SAP Type | Existing Packet Tags          | PBits Used for Match |
|-----------------|-------------------------------|----------------------|
| Null            | TopQ BottomQ                  | TopQ PBits           |
| Null            | TopQ (No BottomQ)             | TopQ PBits           |
| Dot1Q           | None (Default SAP)            | None                 |
| Dot1Q           | Dot1P (Default SAP VLAN-ID 0) | Dot1P PBits          |
| Dot1Q           | Dot1Q                         | Dot1Q PBits          |
| QinQ / TopQ     | TopQ                          | TopQ PBits           |
| QinQ / TopQ     | TopQ BottomQ                  | TopQ PBits           |
| QinQ / QinQ     | TopQ BottomQ                  | BottomQ PBits        |

**Default** no match-qinq-dot1p - No filtering based on p-bits.  
top or bottom must be specified to override the default QinQ dot1p behavior.

**Parameters** **top** — The top parameter is mutually exclusive to the bottom parameter. When the top parameter is specified, the top most PBits are used (if existing) to match any dot1p dot1p-value entries. The following table defines the dot1p evaluation behavior when the top parameter is specified.

| Port / SAP Type | Existing Packet Tags          | PBits Used for Match |
|-----------------|-------------------------------|----------------------|
| Null            | None                          | None                 |
| Null            | Dot1P (VLAN-ID 0)             | Dot1P PBits          |
| Null            | Dot1Q                         | Dot1Q PBits          |
| Null            | TopQ BottomQ                  | TopQ PBits           |
| Null            | TopQ (No BottomQ)             | TopQ PBits           |
| Dot1Q           | None (Default SAP)            | None                 |
| Dot1Q           | Dot1P (Default SAP VLAN-ID 0) | Dot1P PBits          |
| Dot1Q           | Dot1Q                         | Dot1Q PBits          |
| QinQ / TopQ     | TopQ                          | TopQ PBits           |
| QinQ / TopQ     | TopQ BottomQ                  | TopQ PBits           |
| QinQ / TopQ     | TopQ BottomQ                  | TopQ PBits           |

**bottom** — The bottom parameter is mutually exclusive to the top parameter. When the bottom parameter is specified, the bottom most PBits are used (if existing) to match any dot1p dot1p-value entries. The following tables define the bottom position QinQ and TopQ SAP dot1p evaluation and the default dot1p explicit marking actions.

**Table 26: Bottom Position QinQ and TopQ SAP Dot1P Evaluation**

| Port / SAP Type | Existing Packet Tags | PBits Used for Match |
|-----------------|----------------------|----------------------|
| Null            | None                 | None                 |

**Table 26: Bottom Position QinQ and TopQ SAP Dot1P Evaluation (Continued)**

| Port / SAP Type | Existing Packet Tags          | PBits Used for Match |
|-----------------|-------------------------------|----------------------|
| Null            | Dot1P (VLAN-ID 0)             | Dot1P PBits          |
| Null            | Dot1Q                         | Dot1Q PBits          |
| Null            | TopQ BottomQ                  | BottomQ PBits        |
| Null            | TopQ (No BottomQ)             | TopQ PBits           |
| Dot1Q           | None (Default SAP)            | None                 |
| Dot1Q           | Dot1P (Default SAP VLAN-ID 0) | Dot1P PBits          |
| Dot1Q           | Dot1Q                         | Dot1Q PBits          |
| QinQ / TopQ     | TopQ                          | TopQ PBits           |
| QinQ / TopQ     | TopQ BottomQ                  | BottomQ PBits        |
| QinQ / QinQ     | TopQ BottomQ                  | BottomQ PBits        |

| Egress SAP Type | Ingress Packet Preserved Dot1P State                  | Marked (or Remarked) PBits                                   |
|-----------------|-------------------------------------------------------|--------------------------------------------------------------|
| Null            | No preserved Dot1P bits                               | None                                                         |
| Null            | Preserved Dot1P bits                                  | Preserved tag PBits remarked using dot1p-value               |
| Dot1Q           | No preserved Dot1P bits                               | New PBits marked using dot1p-value                           |
| Dot1Q           | Preserved Dot1P bits                                  | Preserved tag PBits remarked using dot1p-value               |
| TopQ            | No preserved Dot1P bits                               | TopQ PBits marked using dot1p-value                          |
| TopQ            | Preserved Dot1P bits (used as TopQ and BottomQ PBits) | TopQ PBits marked using dot1p-value, BottomQ PBits preserved |
| QinQ            | No preserved Dot1P bits                               | TopQ PBits and BottomQ PBits marked using dot1p-value        |
| QinQ            | Preserved Dot1P bits (used as TopQ and BottomQ PBits) | TopQ PBits and BottomQ PBits marked using dot1p-value        |

The dot1p dot1p-value command must be configured without the qinq-mark-top-only parameter to remove the TopQ PBits only marking restriction.

## qinq-mark-top-only

|                    |                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] qinq-mark-top-only</b>                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>if>sap>egress<br>config>service>vprn>sub-if>grp-if>sap>egress<br>config>service>vprn>ipsec-if>sap>egress                                                                                                                                                                        |
| <b>Description</b> | When enabled (the encapsulation type of the access port where this SAP is defined as qinq), the <b>qinq-mark-top-only</b> command specifies which P-bits to mark during packet egress. When disabled, both set of P-bits are marked. When the enabled, only the P-bits in the top Q-tag are marked. |
| <b>Default</b>     | no qinq-mark-top-only                                                                                                                                                                                                                                                                               |

## qos

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>qos policy-id [shared-queuing   multipoint-shared]<br/>no qos</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>if>sap>egress<br>config>service>vprn>if>sap>ingress<br>config>service>vprn>sub-if>grp-if>sap>egress<br>config>service>vprn>sub-if>grp-if>sap>ingress<br>config>service>vprn>ipsec-if>sap>egress<br>config>service>vprn>ipsec-if>sap>ingress                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>Associates a Quality of Service (QoS) policy with an ingress or egress Service Access Point (SAP) or IP interface. QoS ingress and egress policies are important for the enforcement of SLA agreements. The policy ID must be defined prior to associating the policy with a SAP or IP interface. If the <i>policy-id</i> does not exist, an error will be returned.</p> <p>The <b>qos</b> command is used to associate both ingress and egress QoS policies. The <b>qos</b> command only allows ingress policies to be associated on SAP or IP interface ingress and egress policies on SAP or IP interface egress. Attempts to associate a QoS policy of the wrong type returns an error. Only one ingress and one egress QoS policy can be associated with a SAP or IP interface at one time. Attempts to associate a second QoS policy of a given type will return an error.</p> <p>When an ingress QoS policy is defined on an ingress IP interface that is bound to a VPRN, the policy becomes associated with every SAP on the VPRN and augments the QoS policy that is defined on each SAP. Packets that are bridged will be processed using the policy defined on the VPRN SAP; packets that are routed will be processed using the policy defined in the IES IP interface-binding context.</p> <p>When an egress QoS policy is associated with an IP interface that has been bound to a VPRN, the policy becomes associated with every SAP on the VPRN and augments the egress QoS policy that is defined on each SAP. Packets that are bridged will be processed using the policy defined on the VPRN SAP; packets that are routed will be processed using the policy defined in the IP interface-binding context.</p> <p>By default, no specific QoS policy is associated with the SAP or IP interface for ingress or egress, so the default QoS policy is used.</p> |

The **no** form of this command removes the QoS policy association from the SAP or IP interface, and the QoS policy reverts to the default.

**Parameters** *policy-id* — The ingress/egress policy ID to associate with SAP or IP interface on ingress/egress. The policy ID must already exist.

**Values** 1 — 65535

**shared-queuing** — Specify the ingress shared queue policy used by this SAP. When the value of this object is null it means that the SAP will use individual ingress QoS queues instead of the shared ones.

**multipoint-shared** — This keyword specifies that this *queue-id* is for multipoint forwarded traffic only. This *queue-id* can only be explicitly mapped to the forwarding class multicast, broadcast, or unknown unicast ingress traffic. Attempting to map forwarding class unicast traffic to a multipoint queue generates an error; no changes are made to the current unicast traffic queue mapping.

A queue must be created as multipoint. The **multipoint** designator cannot be defined after the queue is created. If an attempt is made to modify the command to include the **multipoint** keyword, an error is generated and the command will not execute.

The **multipoint** keyword can be entered in the command line on a pre-existing multipoint queue to edit *queue-id* parameters.

**Default** Present (the queue is created as non-multipoint).

**Values** Multipoint or not present.

## scheduler-policy

**Syntax** **scheduler-policy** *scheduler-policy-name*  
no scheduler-policy

**Context** config>service>vprn>if>sap>ingress  
config>service>vprn>if>sap>egress  
config>service>vprn>sub-if>grp-if>sap>egress  
config>service>vprn>sub-if>grp-if>sap>ingress  
config>service>vprn>ipsec-if>sap>egress  
config>service>vprn>ipsec-if>sap>ingress

**Description** This command applies an existing scheduler policy to an ingress or egress scheduler used by SAP queues associated with this multi-service customer site. The schedulers defined in the scheduler policy can only be created once the customer site has been appropriately assigned to a chassis port, channel or slot. Scheduler policies are defined in the **config>qos>scheduler-policy** *scheduler-policy-name* context.

The **no** form of this command removes the configured ingress or egress scheduler policy from the multi-service customer site. When the policy is removed, the schedulers created due to the policy are removed also making them unavailable for the ingress SAP queues associated with the customer site. Queues that lose their parent scheduler association are deemed to be orphaned and are no longer subject to a virtual scheduler. The SAPs that have ingress queues reliant on the removed schedulers enter into an operational state depicting the orphaned status of one or more queues. When the **no scheduler-policy** command is executed, the customer site ingress or egress node will not contain an applied scheduler policy.

*scheduler-policy-name*: — The *scheduler-policy-name* parameter applies an existing scheduler policy that was created in the **config>qos>scheduler-policy scheduler-policy-name** context to create the hierarchy of ingress or egress virtual schedulers. The scheduler names defined within the policy are created and made available to any ingress or egress queues created on associated SAPs.

**Values** Any existing valid scheduler policy name.

## ipsec-gw

|                    |                                                                               |
|--------------------|-------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ipsec-gw</b> <i>name</i><br><b>no ipsec-gw</b>                             |
| <b>Context</b>     | config>service>vprn>interface>sap                                             |
| <b>Description</b> | This command configures the IPSec gateway.                                    |
| <b>Parameters</b>  | <i>name</i> — Specifies the IPSec gateway name up to 32 characters in length. |

## default-secure-service

|                    |                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>default-secure-service</b> <i>service-id ipsec-interface ip-int-name</i><br><b>no default-secure-service</b>     |
| <b>Context</b>     | config>service>vprn>interface>sap>ipsec-gw                                                                          |
| <b>Description</b> | This command specifies a service ID or service name of the default security service used by this SAP IPSec gateway. |
| <b>Parameters</b>  | <i>service-id</i> — Specifies a default secure service.<br><b>Values</b> <i>service-id</i> : 1 — 2147483648         |

## default-tunnel-template

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>default-tunnel-template</b> <i>ipsec template identifier</i><br><b>no default-tunnel-template</b> |
| <b>Context</b>     | config>service>vprn>interface>sap>ipsec-gw                                                           |
| <b>Description</b> | This command configures the default tunnel policy template for the gateway.                          |
| <b>Parameters</b>  | <i>ipsec template id*</i> — [1..2048]                                                                |

## ike-policy \*\*\*\*

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ike-policy</b> <i>ike-policy-id</i><br><b>no ike-policy</b>                                       |
| <b>Context</b>     | config>service>vprn>if>sap>ipsec-gw<br>config>service>vprn>ipsec-interface>sap>tunnel>dynamic-keying |
| <b>Description</b> | This command configures the IKE policy for the gateway.                                              |
| <b>Parameters</b>  | <i>ike-policy-id</i> — Specifies the IKE policy ID.                                                  |
| <b>Values</b>      | 1 — 2048                                                                                             |

## local-gateway-address

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-gateway-address</b> <i>ip-address</i><br><b>no local-gateway-address</b> |
| <b>Context</b>     | config>service>vprn>if>sap>ipsec-gw                                               |
| <b>Description</b> | This command configures the ipsec-gateway local address.                          |
| <b>Parameters</b>  | <i>ip-address</i> — Specifies the IP unicast address.                             |

## pre-shared-key

|                    |                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pre-shared-key</b> <i>key</i><br><b>no pre-shared-key</b>                                         |
| <b>Context</b>     | config>service>vprn>if>sap>ipsec-gw<br>config>service>vprn>ipsec-interface>sap>tunnel>dynamic-keying |
| <b>Description</b> | This command specifies the shared secret between the two peers forming the tunnel.                   |
| <b>Parameters</b>  | <i>key</i> — Specifies a pre-shared-key for dynamic-keying.                                          |

## multi-service-site

|                    |                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multi-service-site</b> <i>customer-site-name</i><br><b>no multi-service-site</b> <i>customer-site-name</i>                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if>sap                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command creates a new customer site or edits an existing customer site with the <i>customer-site-name</i> parameter. A customer site is an anchor point to create an ingress and egress virtual scheduler hierarchy. When a site is created, it must be assigned to a chassis slot or port with the exception of the |



7750 SR-1 in which the slot is set to 1. When scheduler policies are defined for ingress and egress, the scheduler names contained in each policy are created according to the parameters defined in the policy. Multi-service customer sites exist for the sole purpose of creating a virtual scheduler hierarchy and making it available to queues on multiple Service Access Points (SAPs).

The scheduler policy association with the customer site normally prevents the scheduler policy from being deleted until after the scheduler policy is removed from the customer site. The multi-service-site object will generate a log message indicating that the association was deleted due to scheduler policy removal.

When the multi-service customer site is created, an ingress and egress scheduler policy association does not exist. This does not prevent the site from being assigned to a chassis slot or prevent service SAP assignment. After the site has been created, the ingress and egress scheduler policy associations can be assigned or removed at any time.

**Default** None — Each customer site must be explicitly created.

**Parameters** *customer-site-name*: — Each customer site must have a unique name within the context of the customer. If *customer-site-name* already exists for the customer ID, the CLI context changes to that site name for the purpose of editing the site scheduler policies or assignment. Any modifications made to an existing site will affect all SAPs associated with the site. Changing a scheduler policy association may cause new schedulers to be created and existing queues on the SAPs to no longer be orphaned. Existing schedulers on the site may cease to exist, causing queues relying on that scheduler to be orphaned.

If the *customer-site-name* does not exist, it is assumed that an attempt is being made to create a site of that name in the customer ID context. The success of the command execution depends on the following:

- The maximum number of customer sites defined for the chassis slot has not been met.
- The *customer-site-name* is valid.
- The **create** keyword is included in the command line syntax (if the system requires it).

When the maximum number of customer sites has been exceeded a configuration error occurs; the command will not execute and the CLI context will not change.

If the *customer-site-name* is invalid, a syntax error occurs; the command will not execute and the CLI context will not change.

**Values** Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.

## static-host

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static-host ip</b> <i>ip/did-address</i> [ <b>mac</b> <i>ieee-address</i> ] [ <b>create</b> ]<br><b>static-host mac</b> <i>ieee-address</i> [ <b>create</b> ]<br><b>no static-host</b> [ <b>ip</b> <i>ip-address</i> >] <b>mac</b> <i>ieee-address</i> ><br><b>no static-host all</b> [ <b>force</b> ]<br><b>no static-host ip</b> <i>ip-address</i>                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>sub-if>grp-if>sap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command configures a static host on this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Syntax</b>      | <p><b>ip</b> <i>ip-address</i> — Specifies the IPv4 unicast address.</p> <p><b>mac</b> <i>ieee-address</i> — Specify this optional parameter when defining a static host. Every static host definition must have at least one address defined, IP or MAC.</p> <p><b>force</b> — Specifies the forced removal of the static host addresses.</p> <p><b>sla-profile</b> <i>sla-profile-name</i></p> <p>This optional parameter is used to specify an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the <b>config&gt;subscr-mgmt&gt;sla-profile</b> context.</p> |

## ancc-string

|                    |                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ancc-string</b> <i>ancc-string</i><br><b>no ancc-string</b>                              |
| <b>Context</b>     | config>service>vprn>if>sap>static-host<br>config>service>vprn>sub-if>grp-if>sap>static-host |
| <b>Description</b> | This command specifies the ANCP string associated to this SAP host.                         |
| <b>Parameters</b>  | <i>ancc-string</i> — Specifies the ANCP string up to 63 characters in length.               |

## app-profile

|                    |                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>app-profile</b> <i>app-profile-name</i><br><b>no app-profile</b>                             |
| <b>Context</b>     | config>service>vprn>if>sap>static-host<br>config>service>vprn>sub-if>grp-if>sap>static-host     |
| <b>Description</b> | This command specifies an application profile name.                                             |
| <b>Parameters</b>  | <i>app-profile-name</i> — Specifies the application profile name up to 32 characters in length. |

## inter-dest-id

|                    |                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>inter-dest-id</b> <i>intermediate-destination-id</i><br><b>no inter-dest-id</b>                |
| <b>Context</b>     | config>service>vprn>if>sap>static-host<br>config>service>vprn>sub-if>grp-if>sap>static-host       |
| <b>Description</b> | This command specifies to which intermediate destination (for example a DSLAM) this host belongs. |
| <b>Parameters</b>  | <i>intermediate-destination-id</i> — Specifies the intermediate destination ID.                   |

## managed-routes

|                    |                                                                  |
|--------------------|------------------------------------------------------------------|
| <b>Syntax</b>      | <b>managed-routes</b>                                            |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap>static-host>managed-routes |
| <b>Description</b> | This command configures managed routes.                          |

## route

|                    |                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>route</b> { <i>ip-prefix/length</i>   <i>ip-prefix netmask</i> } [ <b>create</b> ]<br><b>no route</b> { <i>ip-prefix/length</i>   <i>ip-prefix netmask</i> }                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap>static-host>managed-routes                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command assigns managed-route to a given subscriber-host. As a consequence, a static-route pointing subscriber-host ip address as a next hop will be installed in FIB. Up to 16 managed routes per subscriber-host can be configured.<br><br>The <b>no</b> form of the command removes the respective route. Per default, there are no managed-routes configured. |

## sla-profile

|                    |                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sla-profile</b> <i>sla-profile-name</i><br><b>no sla-profile</b>                                                                                                                             |
| <b>Context</b>     | config>service>vprn>if>sap>static-host<br>config>service>vprn>sub-if>grp-if>sap>static-host                                                                                                     |
| <b>Description</b> | This command specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the <b>config&gt;subscr-mgmt&gt;sla-profile</b> context. |
| <b>Parameters</b>  | <i>sla-profile-name</i> — Specifies the SLA profile name.                                                                                                                                       |

## sub-profile

|                    |                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sub-profile</b> <i>sub-profile-name</i><br><b>no sub-profile</b>                                          |
| <b>Context</b>     | config>service>vprn>if>sap>static-host<br>config>service>vprn>sub-if>grp-if>sap>static-host                  |
| <b>Description</b> | This command specifies an existing subscriber profile name to be associated with the static subscriber host. |
| <b>Parameters</b>  | <i>sub-profile-name</i> — Specifies the sub-profile name.                                                    |

## subscriber

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subscriber</b> <i>sub-ident</i><br><b>no subscriber</b>                                                             |
| <b>Context</b>     | config>service>vprn>if>sap>static-host<br>config>service>vprn>sub-if>grp-if>sap>static-host                            |
| <b>Description</b> | This command specifies an existing subscriber identification profile to be associated with the static subscriber host. |
| <b>Parameters</b>  | <i>sub-ident</i> — Specifies the subscriber identification/                                                            |

## subscriber-sap-id

|                    |                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] subscriber-sap-id</b>                                                               |
| <b>Context</b>     | config>service>vprn>if>sap>static-host<br>config>service>vprn>sub-if>grp-if>sap>static-host |
| <b>Description</b> | This command enables using the SAP ID as subscriber id.                                     |
| <b>Parameters</b>  | <b>subscriber-sap-id</b> — Specifies to use the sap-id as the subscriber-id.                |

## queue-override

|                    |                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] queue-override</b>                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>if>sap>egress<br>config>service>vprn>if>sap>ingress<br>config>service>vprn>ipsec-if>sap>egress<br>config>service>vprn>ipsec-if>sap>ingress                                                              |
| <b>Description</b> | This command enables the context to configure override values for the specified SAP egress or ingress QoS queue. These values override the corresponding ones specified in the associated SAP egress or ingress QoS policy. |

## queue

|                    |                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] queue</b> <i>queue-id</i>                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>if>sap>egress>queue-override<br>config>service>vprn>if>sap>ingress>queue-override<br>config>service>vprn>ipsec-if>sap>egress>queue-override<br>config>service>vprn>ipsec-if>sap>ingress>queue-override |
| <b>Description</b> | This command specifies the ID of the queue whose parameters are to be overridden.                                                                                                                                          |
| <b>Parameters</b>  | <i>queue-id</i> — The queue ID whose parameters are to be overridden.<br><b>Values</b> 1 — 32                                                                                                                              |

## adaptation-rule

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>adaptation-rule</b> [ <b>pir</b> <i>adaptation-rule</i> ] [ <b>cir</b> <i>adaptation-rule</i> ]<br><b>no adaptation-rule</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>if>sap>egress>queue-override>queue<br>config>service>vprn>if>sap>ingress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>egress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>ingress>queue-override>queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified queue's adaptation rule parameters. The adaptation rule controls the method used by the system to derive the operational CIR and PIR settings when the queue is provisioned in hardware. For the CIR and PIR parameters individually, the system attempts to find the best operational rate depending on the defined constraint.</p> <p>The <b>no</b> form of the command removes any explicitly defined constraints used to derive the operational CIR and PIR created by the application of the policy. When a specific <b>adaptation-rule</b> is removed, the default constraints for <b>rate</b> and <b>cir</b> apply.</p>                                                                                                                                                                                                         |
| <b>Default</b>     | no adaptation-rule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><b>pir</b> — The <b>pir</b> parameter defines the constraints enforced when adapting the PIR rate defined within the <b>queue queue-id rate</b> command. The <b>pir</b> parameter requires a qualifier that defines the constraint used when deriving the operational PIR for the queue. When the <b>rate</b> command is not specified, the default applies.</p> <p><b>cir</b> — The <b>cir</b> parameter defines the constraints enforced when adapting the CIR rate defined within the <b>queue queue-id rate</b> command. The <b>cir</b> parameter requires a qualifier that defines the constraint used when deriving the operational CIR for the queue. When the <b>cir</b> parameter is not specified, the default constraint applies.</p> <p><i>adaptation-rule</i> — Specifies the criteria to use to compute the operational CIR and PIR values for this queue, while maintaining a minimum offset.</p> |

- Values**
- max** — The **max** (maximum) keyword is mutually exclusive with the **min** and **closest** options. When **max** is defined, the operational PIR for the queue will be equal to or less than the administrative rate specified using the **rate** command.
  - min** — The **min** (minimum) keyword is mutually exclusive with the **max** and **closest** options. When **min** is defined, the operational PIR for the queue will be equal to or greater than the administrative rate specified using the **rate** command.
  - closest** — The **closest** parameter is mutually exclusive with the **min** and **max** parameter. When **closest** is defined, the operational PIR for the queue will be the rate closest to the rate specified using the **rate** command.

## avg-frame-overhead

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>avg-frame-overhead</b> <i>percent</i><br><b>no avg-frame-overhead</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>if>sap>egress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>egress>queue-override>queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command configures the average frame overhead to define the average percentage that the offered load to a queue will expand during the frame encapsulation process before sending traffic on-the-wire. While the avg-frame-overhead value may be defined on any queue, it is only used by the system for queues that egress a Sonet or SDH port or channel. Queues operating on egress Ethernet ports automatically calculate the frame encapsulation overhead based on a 20 byte per packet rule (8 bytes for preamble and 12 bytes for Inter-Frame Gap).</p> <p>When calculating the frame encapsulation overhead for port scheduling purposes, the system determines the following values:</p> <ul style="list-style-type: none"> <li>Offered-load — The offered-load of a queue is calculated by starting with the queue depth in octets, adding the received octets at the queue and subtracting queue discard octets. The result is the number of octets the queue has available to transmit. This is the packet based offered-load.</li> <li>Frame encapsulation overhead — Using the avg-frame-overhead parameter, the frame encapsulation overhead is simply the queue's current offered-load (how much has been received by the queue) multiplied by the avg-frame-overhead. If a queue had an offered load of 10000 octets and the avg-frame-overhead equals 10%, the frame encapsulation overhead would be 10000 x 0.1 or 1000 octets.</li> </ul> <p>For egress Ethernet queues, the frame encapsulation overhead is calculated by multiplying the number of offered-packets for the queue by 20 bytes. If a queue was offered 50 packets then the frame encapsulation overhead would be 50 x 20 or 1000 octets.</p> <ul style="list-style-type: none"> <li>Frame based offered-load — The frame based offered-load is calculated by adding the offered-load to the frame encapsulation overhead. If the offered-load is 10000 octets and the encapsulation overhead was 1000 octets, the frame based offered-load would equal 11000 octets.</li> <li>Packet to frame factor — The packet to frame factor is calculated by dividing the frame encapsulation overhead by the queue's offered-load (packet based). If the frame encapsulation overhead is 1000 octets and the offered-load is 10000 octets then the packet to frame factor would be 1000 / 10000 or 0.1. When in use, the avg-frame-overhead will be the same as the packet to frame factor making this calculation unnecessary.</li> </ul> |

- **Frame based CIR** — The frame based CIR is calculated by multiplying the packet to frame factor with the queue's configured CIR and then adding that result to that CIR. If the queue CIR is set at 500 octets and the packet to frame factor equals 0.1, the frame based CIR would be 500 x 1.1 or 550 octets.
- **Frame based within-cir offered-load** — The frame based within-cir offered-load is the portion of the frame based offered-load considered to be within the frame-based CIR. The frame based within-cir offered-load is the lesser of the frame based offered-load and the frame based CIR. If the frame based offered-load equaled 11000 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would be limited to 550 octets. If the frame based offered-load equaled 450 octets and the frame based CIR equaled 550 octets, the frame based within-cir offered-load would equal 450 octets (or the entire frame based offered-load).

As a special case, when a queue or associated intermediate scheduler is configured with a CIR-weight equal to 0, the system automatically sets the queue's frame based within-cir offered-load to 0, preventing it from receiving bandwidth during the port scheduler's within-cir pass.

- **Frame based PIR** — The frame based PIR is calculated by multiplying the packet to frame factor with the queue's configured PIR and then adding the result to that PIR. If the queue PIR is set to 7500 octets and the packet to frame factor equals 0.1, the frame based PIR would be 7500 x 1.1 or 8250 octets.
- **Frame based within-pir offered-load** — The frame based within-pir offered-load is the portion of the frame based offered-load considered to be within the frame based PIR. The frame based within-pir offered-load is the lesser of the frame based offered-load and the frame based PIR. If the frame based offered-load equaled 11000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered-load would be limited to 8250 octets. If the frame based offered-load equaled 7000 octets and the frame based PIR equaled 8250 octets, the frame based within-pir offered load would equal 7000 octets.

**Port scheduler operation using frame transformed rates** — The port scheduler uses the frame based rates to determine the maximum rates that each queue may receive during the within-cir and above-cir bandwidth allocation passes. During the within-cir pass, a queue may receive up to its frame based within-cir offered-load. The maximum it may receive during the above-cir pass is the difference between the frame based within-pir offered load and the amount of actual bandwidth allocated during the within-cir pass.

**SAP and subscriber SLA-profile average frame overhead override** — The average frame overhead parameter on a sap-egress may be overridden at an individual egress queue basis. On each SAP and within the sla-profile policy used by subscribers an avg-frame-overhead command may be defined under the queue-override context for each queue. When overridden, the queue instance will use its local value for the average frame overhead instead of the sap-egress defined overhead.

The **no** form of this command restores the average frame overhead parameter for the queue to the default value of 0 percent. When set to 0, the system uses the packet based queue statistics for calculating port scheduler priority bandwidth allocation. If the no avg-frame-overhead command is executed in a queue-override queue id context, the avg-frame-overhead setting for the queue within the sap-egress QoS policy takes effect.

|                   |                                                                                                                                                                                            |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | 0                                                                                                                                                                                          |
| <b>Parameters</b> | <i>percent</i> — This parameter sets the average amount of packet-to-frame encapsulation overhead expected for the queue. This value is not used by the system for egress Ethernet queues. |
| <b>Values</b>     | 0 — 100                                                                                                                                                                                    |

## cbs

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cbs</b> <i>size-in-kbytes</i><br><b>no cbs</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>if>sap>egress>queue-override>queue<br>config>service>vprn>if>sap>ingress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>egress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>ingress>queue-override>queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified queue's CBS parameters.</p> <p>It is permissible, and possibly desirable, to oversubscribe the total CBS reserved buffers for a given access port egress buffer pool. Oversubscription may be desirable due to the potential large number of service queues and the economy of statistical multiplexing the individual queue's CBS setting into the defined reserved total.</p> <p>When oversubscribing the reserved total, it is possible for a queue depth to be lower than its CBS setting and still not receive a buffer from the buffer pool for an ingress frame. As more queues are using their CBS buffers and the total in use exceeds the defined reserved total, essentially the buffers are being removed from the shared portion of the pool without the shared in use average and total counts being decremented. This can affect the operation of the high and low priority RED slopes on the pool, causing them to miscalculate when to start randomly drop packets.</p> <p>If the CBS value is larger than the MBS value, an error will occur, preventing the CBS change.</p> <p>The <b>no</b> form of this command returns the CBS size to the default value.</p> |
| <b>Default</b>     | no cbs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><i>size-in-kbytes</i> — The size parameter is an integer expression of the number of kilobytes reserved for the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that no reserved buffers are required by the queue (a minimal reserved size can still be applied for scheduling purposes).</p> <p><b>Values</b>      0 — 131072 or default</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## high-prio-only

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>high-prio-only</b> <i>percent</i><br><b>no high-prio-only</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>if>sap>egress>queue-override>queue<br>config>service>vprn>if>sap>ingress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>egress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>ingress>queue-override>queue                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified queue's high-prio-only parameters. The <b>high-prio-only</b> command configures the percentage of buffer space for the queue, used exclusively by high priority packets.</p> <p>The priority of a packet can only be set in the SAP ingress QoS policy and is only applicable on the ingress queues for a SAP. The <b>high-prio-only</b> parameter is used to override the default value derived from the <b>network-queue</b> command.</p> |



The defined **high-prio-only** value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the **high-prio-only** value larger than the current MBS size will also result in an error and fail execution.

The **no** form of this command restores the default high priority reserved size.

**Parameters**     *percent* — The *percent* parameter is the percentage reserved for high priority traffic on the queue. If a value of 10KBytes is desired, enter the value 10. A value of 0 specifies that none of the MBS of the queue will be reserved for high priority traffic. This does not affect RED slope operation for packets attempting to be queued.

**Values**         0 — 100 | default

## mbs

**Syntax**         **mbs** {*size-in-kbytes* | **default**}  
**no mbs**

**Context**         config>service>vprn>if>sap>egress>queue-override>queue  
config>service>vprn>ipsec-if>sap>egress>queue-override>queue

**Description**     This command can be used to override specific attributes of the specified queue's MBS parameters. The MBS is a mechanism to override the default maximum size for the queue.

The sum of the MBS for all queues on an egress access port can oversubscribe the total amount of buffering available. When congestion occurs and buffers become scarce, access to buffers is controlled by the RED slope a packet is associated with. A queue that has not exceeded its MBS size is not guaranteed that a buffer will be available when needed or that the packet's RED slope will not force the discard of the packet. Setting proper CBS parameters and controlling CBS oversubscription is one major safeguard to queue starvation (when a queue does not receive its fair share of buffers). Another is properly setting the RED slope parameters for the needs of services on this port or channel.

If the CBS value is larger than the MBS value, an error will occur, preventing the MBS change.

The **no** form of this command returns the MBS size assigned to the queue.

**Default**           default

**Parameters**     *size-in-kbytes* — The *size* parameter is an integer expression of the maximum number of kilobytes of buffering allowed for the queue. For a value of 100 kbps, enter the value 100. A value of 0 causes the queue to discard all packets.

**Values**           0 — 131072 or default

## mbs

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mbs</b> { <i>size-in-kbytes</i>   <b>default</b> }<br><b>no mbs</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>if>sap>ingress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>ingress>queue-override>queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified queue's MBS parameters. The MBS value is used by a queue to determine whether it has exhausted all of its buffers while enqueueing packets. Once the queue has exceeded the amount of buffers allowed by MBS, all packets are discarded until packets have been drained from the queue.</p> <p>The sum of the MBS for all queues on an ingress access port can oversubscribe the total amount of buffering available. When congestion occurs and buffers become scarce, access to buffers is controlled by the RED slope a packet is associated with. A queue that has not exceeded its MBS size is not guaranteed that a buffer will be available when needed or that the packet's RED slope will not force the discard of the packet. Setting proper CBS parameters and controlling CBS oversubscription is one major safeguard to queue starvation (when a queue does not receive its fair share of buffers). Another is properly setting the RED slope parameters for the needs of services on this port or channel.</p> <p>If the CBS value is larger than the MBS value, an error will occur, preventing the MBS change.</p> <p>The defined high-prio-only value cannot be greater than the MBS size of the queue. Attempting to change the MBS to a value smaller than the high priority reserve will generate an error and fail execution. Attempting to set the high-prio-only value larger than the current MBS size will also result in an error and fail execution.</p> <p>The <b>no</b> form of this command returns the MBS size assigned to the queue to the value.</p> |
| <b>Default</b>     | default                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>size-in-kbytes</i> — The size parameter is an integer expression of the maximum number of kilobytes of buffering allowed for the queue. For a value of 100 kbps, enter the value 100. A value of 0 causes the queue to discard all packets.</p> <p><b>Values</b>      0 — 131072 or default</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## rate

|                    |                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rate</b> <i>pir-rate</i> [ <b>cir</b> <i>cir-rate</i> ]<br><b>no rate</b>                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>if>sap>egress>queue-override>queue<br>config>service>vprn>if>sap>ingress>queue-override>queue<br>config>service>vprn>if>sap>egress>hsmda-queue-overider<br>config>service>vprn>ipsec-if>sap>egress>queue-override>queue<br>config>service>vprn>ipsec-if>sap>ingress>queue-override>queue |
| <b>Description</b> | This command can be used to override specific attributes of the specified queue's Peak Information Rate (PIR) and the Committed Information Rate (CIR) parameters. The PIR defines the maximum rate that the queue can transmit packets out an egress interface (for SAP egress queues). Defining a          |

PIR does not necessarily guarantee that the queue can transmit at the intended rate. The actual rate sustained by the queue can be limited by oversubscription factors or available egress bandwidth.

The CIR defines the rate at which the system prioritizes the queue over other queues competing for the same bandwidth. In-profile packets are preferentially queued by the system at egress and at subsequent next hop nodes where the packet can traverse. To be properly handled as in- or out-of-profile throughout the network, the packets must be marked accordingly for profiling at each hop.

The CIR can be used by the queue's parent commands *cir-level* and *cir-weight* parameters to define the amount of bandwidth considered to be committed for the child queue during bandwidth allocation by the parent scheduler.

The **rate** command can be executed at any time, altering the PIR and CIR rates for all queues created through the association of the SAP egress QoS policy with the *queue-id*.

The **no** form of the command returns all queues created with the *queue-id* by association with the QoS policy to the default PIR and CIR parameters (**max**, 0).

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>rate max cir 0</b> — The <b>max</b> default specifies the amount of bandwidth in kilobits per second (thousand bits per second). The <b>max</b> value is mutually exclusive to the <b>pir-rate</b> value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b> | <p><i>pir-rate</i> — Defines the administrative PIR rate, in kilobits, for the queue. When the <b>rate</b> command is executed, a valid PIR setting must be explicitly defined. When the <b>rate</b> command has not been executed, the default PIR of <b>max</b> is assumed.</p> <p>Fractional values are not allowed and must be given as a positive integer.</p> <p>The actual PIR rate is dependent on the queue's <b>adaptation-rule</b> parameters and the actual hardware where the queue is provisioned.</p> <p><b>Values</b>      1 — 100000000</p> <p><b>Default</b>      max</p> <p><i>cir-rate</i> — The <b>cir</b> parameter overrides the default administrative CIR used by the queue. When the <b>rate</b> command is executed, a CIR setting is optional. When the <b>rate</b> command has not been executed or the <b>cir</b> parameter is not explicitly specified, the default CIR (0) is assumed.</p> <p>Fractional values are not allowed and must be given as a positive integer. The <b>sum</b> keyword specifies that the CIR be used as the summed CIR values of the children schedulers or queues.</p> <p><b>Values</b>      0 — 100000000, <b>max</b>, <b>sum</b></p> <p><b>Default</b>      0</p> |

## scheduler-override

|                    |                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] scheduler-override</b>                                                                                                                                                                                                                                |
| <b>Context</b>     | <pre>config&gt;service&gt;vprn&gt;if&gt;sap&gt;egress config&gt;service&gt;vprn&gt;if&gt;sap&gt;ingress config&gt;service&gt;vprn&gt;ipsec-if&gt;sap&gt;egress config&gt;service&gt;vprn&gt;ipsec-if&gt;sap&gt;ingress</pre>                                  |
| <b>Description</b> | This command specifies the set of attributes whose values have been overridden via management on this virtual scheduler. Clearing a given flag will return the corresponding overridden attribute to the value defined on the SAP's ingress scheduler policy. |

## scheduler

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>scheduler</b> <i>scheduler-name</i><br><b>no scheduler</b> <i>scheduler-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>if>sap>egress>sched-override<br>config>service>vprn>if>sap>ingress>sched-override<br>config>service>vprn>ipsec-if>sap>egress>sched-override<br>config>service>vprn>ipsec-if>sap>ingress>sched-override                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified scheduler name.</p> <p>A scheduler defines a bandwidth controls that limit each child (other schedulers and queues) associated with the scheduler. Scheduler objects are created within the hierarchical tiers of the policy. It is assumed that each scheduler created will have queues or other schedulers defined as child associations. The scheduler can be a child (take bandwidth from a scheduler in a higher tier, except for schedulers created in tier 1). A total of 32 schedulers can be created within a single scheduler policy with no restriction on the distribution between the tiers.</p> <p>Each scheduler must have a unique name within the context of the scheduler policy; however the same name can be reused in multiple scheduler policies. If <i>scheduler-name</i> already exists within the policy tier level (regardless of the inclusion of the keyword create), the context changes to that scheduler name for the purpose of editing the scheduler parameters. Modifications made to an existing scheduler are executed on all instantiated schedulers created through association with the policy of the edited scheduler. This can cause queues or schedulers to become orphaned (invalid parent association) and adversely affect the ability of the system to enforce service level agreements (SLAs).</p> <p>If the <i>scheduler-name</i> exists within the policy on a different tier (regardless of the inclusion of the keyword create), an error occurs and the current CLI context will not change.</p> <p>If the <i>scheduler-name</i> does not exist in this or another tier within the scheduler policy, it is assumed that an attempt is being made to create a scheduler of that name. The success of the command execution is dependent on the following:</p> <ol style="list-style-type: none"> <li>1. The maximum number of schedulers has not been configured.</li> <li>2. The provided <i>scheduler-name</i> is valid.</li> <li>3. The <b>create</b> keyword is entered with the command if the system is configured to require it (enabled in the <b>environment create</b> command).</li> </ol> <p>When the maximum number of schedulers has been exceeded on the policy, a configuration error occurs and the command will not execute, nor will the CLI context change.</p> <p>If the provided scheduler-name is invalid according to the criteria below, a name syntax error will occur, the command will not execute, and the CLI context will not change.</p> |
| <b>Parameters</b>  | <p><i>scheduler-name</i> — The name of the scheduler.</p> <p><b>Values</b> Valid names consist of any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p><b>Default</b> None. Each scheduler must be explicitly created.</p> <p><i>create</i> — This optional keyword explicitly specifies that it is acceptable to create a scheduler with the given <i>scheduler-name</i>. If the <b>create</b> keyword is omitted, <b>scheduler-name</b> is not created when the system environment variable create is set to true. This safeguard is meant to avoid accidental</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

creation of system objects (such as schedulers) while attempting to edit an object with a mistyped name or ID. The keyword has no effect when the object already exists.

## rate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rate</b> <i>pir-rate</i> [ <i>cir cir-rate</i> ]<br><b>no rate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>if>sap>egress>sched-override>scheduler<br>config>service>vprn>ipsec-if>sap>egress>sched-override<br>config>service>vprn>ipsec-if>sap>ingress>sched-override                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command can be used to override specific attributes of the specified scheduler rate. The <b>rate</b> command defines the maximum bandwidth that the scheduler can offer its child queues or schedulers. The maximum rate is limited to the amount of bandwidth the scheduler can receive from its parent scheduler. If the scheduler has no parent, the maximum rate is assumed to be the amount available to the scheduler. When a parent is associated with the scheduler, the CIR parameter provides the amount of bandwidth to be considered during the parent scheduler's 'within CIR' distribution phase.</p> <p>The actual operating rate of the scheduler is limited by bandwidth constraints other than its maximum rate. The scheduler's parent scheduler may not have the available bandwidth to meet the scheduler's needs or the bandwidth available to the parent scheduler could be allocated to other child schedulers or child queues on the parent based on higher priority. The children of the scheduler may not need the maximum rate available to the scheduler due to insufficient offered load or limits to their own maximum rates.</p> <p>When a scheduler is defined without specifying a rate, the default rate is <b>max</b>. If the scheduler is a root scheduler (no parent defined), the default maximum rate must be changed to an explicit value. Without this explicit value, the scheduler will assume that an infinite amount of bandwidth is available and allow all child queues and schedulers to operate at their maximum rates.</p> <p>The <b>no</b> form of this command returns all queues created with this <i>queue-id</i> by association with the QoS policy to the default PIR and CIR parameters.</p> |
| <b>Parameters</b>  | <p><i>pir-rate</i> — The <b>pir</b> parameter accepts a step multiplier value that specifies the multiplier used to determine the PIR rate at which the queue will operate. A value of 0 to 100000000 or the keyword <b>max</b> or <b>sum</b> is accepted. Any other value will result in an error without modifying the current PIR rate.</p> <p>To calculate the actual PIR rate, the rate described by the queue's <b>rate</b> is multiplied by the <i>pir-rate</i>.</p> <p>The SAP ingress context for PIR is independent of the defined forwarding class (fc) for the queue. The default <b>pir</b> and definable range is identical for each class. The PIR in effect for a queue defines the maximum rate at which the queue will be allowed to forward packets in a given second, thus shaping the queue's output.</p> <p>The PIR parameter for SAP ingress queues do not have a negate (<b>no</b>) function. To return the queue's PIR rate to the default value, that value must be specified as the PIR value.</p> <p><b>Values</b>      1 — 100000000, <b>max</b></p> <p><b>Default</b>      max</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

*cir cir-rate* — The **cir** parameter accepts a step-multiplier value that specifies the multiplier used to determine the CIR rate at which the queue will operate. A value of 0 to 250 or the keyword **max** is accepted. Any other value will result in an error without modifying the current CIR rate.

To calculate the actual CIR rate, the rate described by the **rate pir** *pir-rate* is multiplied by the *cir cir-rate*. If the **cir** is set to **max**, then the CIR rate is set to infinity.

The SAP ingress context for CIR is dependent on the defined forwarding class (fc) for the queue. The default CIR and definable range is different for each class. The CIR in effect for a queue defines both its profile (in or out) marking level as well as the relative importance compared to other queues for scheduling purposes during congestion periods.

**Values**      0 — 10000000, **max**, **sum**

**Default**     sum

## ETH-CFM Service Commands

### eth-cfm

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>eth-cfm</b>                                                                                          |
| <b>Context</b>     | config>service>vprn>if>sap<br>config>service>vprn>if>spoke-sdp<br>config>service>vprn>sub-if>grp-if>sap |
| <b>Description</b> | This command enables the context to configure ETH-CFM parameters.                                       |

### mep

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mep</b> <i>mep-id</i> <b>domain</b> <i>md-index</i> <b>association</b> <i>ma-index</i> [ <b>direction</b> { <b>up</b>   <b>down</b> }]<br><b>no mep</b> <i>mep-id</i> <b>domain</b> <i>md-index</i> <b>association</b> <i>ma-index</i>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>if>sap>eth-cfm<br>config>service>vprn>if>spoke-sdp>eth-cfm<br>config>service>vprn>sub-if>grp-if>sap>eth-cfm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command configures a SAP or spoke SDP eth-cfm maintenance endpoint (MEP).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><i>mep-id</i> — Specifies the maintenance association end point identifier.</p> <p><b>Values</b> 1 — 8191</p> <p><i>md-index</i> — Specifies the maintenance domain (MD) index value.</p> <p><b>Values</b> 1 — 4294967295</p> <p><i>ma-index</i> — Specifies the MA index value.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>direction up down</b> — Indicates the direction in which the maintenance association (MEP or MIP) faces on the bridge port.</p> <p>down — Sends continuity check messages away from the MAC relay entity.</p> <p>up — Sends continuity check messages towards the MAC relay entity.</p> |

### ccm-enable

|                    |                                                                                        |
|--------------------|----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ccm-enable</b>                                                                 |
| <b>Context</b>     | config>service>vprn>if>sap>eth-cfm>mep<br>config>service>vprn>if>spoke-sdp>eth-cfm>mep |
| <b>Description</b> | This command enables the generation of CCM messages.                                   |

The **no** form of the command disables the generation of CCM messages.

## ccm-ltm-priority

|                    |                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ccm-ltm-priority</b> <i>priority</i><br><b>no ccm-ltm-priority</b>                                                                                                       |
| <b>Context</b>     | config>service>vprn>if>sap>eth-cfm>mep<br>config>service>vprn>if>spoke-sdp>eth-cfm>mep                                                                                      |
| <b>Description</b> | This command specifies the priority value for CCMs and LTMs transmitted by the MEP.<br>The <b>no</b> form of the command removes the priority value from the configuration. |
| <b>Default</b>     | The highest priority on the bridge-port.                                                                                                                                    |
| <b>Parameters</b>  | <i>priority</i> — Specifies the priority of CCM and LTM messages.<br><b>Values</b> 0 — 7                                                                                    |

## fault-propagation-enable

|                    |                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fault-propagation-enable</b> { <i>use-if-tlv</i>   <i>suspend-ccm</i> }<br><b>no fault-propagation-enable</b>                    |
| <b>Context</b>     | config>service>vprn>if>sap>eth-cfm>mep<br>config>service>vprn>if>spoke-sdp>eth-cfm>mep                                              |
| <b>Description</b> | This command configures the fault propagation for the MEP.                                                                          |
| <b>Parameters</b>  | <b>use-if-tlv</b> — Specifies to use the interface TLV.<br><b>suspend-ccm</b> — Specifies to suspend the continuity check messages. |

## low-priority-defect

|                    |                                                                                                                                                                                                                                                                                                                                                                                     |        |                                                                    |               |                                                              |            |                                                |         |                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------|---------------|--------------------------------------------------------------|------------|------------------------------------------------|---------|---------------------------------|
| <b>Syntax</b>      | <b>low-priority-defect</b> { <i>allDef</i>   <i>macRemErrXcon</i>   <i>remErrXcon</i>   <i>errXcon</i>   <i>xcon</i>   <i>noXcon</i> }                                                                                                                                                                                                                                              |        |                                                                    |               |                                                              |            |                                                |         |                                 |
| <b>Context</b>     | config>service>vprn>if>sap>eth-cfm>mep<br>config>service>vprn>if>spoke-sdp>eth-cfm>mep                                                                                                                                                                                                                                                                                              |        |                                                                    |               |                                                              |            |                                                |         |                                 |
| <b>Description</b> | This command specifies the lowest priority defect that is allowed to generate a fault alarm.                                                                                                                                                                                                                                                                                        |        |                                                                    |               |                                                              |            |                                                |         |                                 |
| <b>Default</b>     | remErrXcon                                                                                                                                                                                                                                                                                                                                                                          |        |                                                                    |               |                                                              |            |                                                |         |                                 |
| <b>Values</b>      | <table> <tr> <td>allDef</td><td>DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>macRemErrXcon</td><td>Only DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>remErrXcon</td><td>Only DefRemoteCCM, DefErrorCCM, and DefXconCCM</td></tr> <tr> <td>errXcon</td><td>Only DefErrorCCM and DefXconCCM</td></tr> </table> | allDef | DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM | macRemErrXcon | Only DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM | remErrXcon | Only DefRemoteCCM, DefErrorCCM, and DefXconCCM | errXcon | Only DefErrorCCM and DefXconCCM |
| allDef             | DefRDICCM, DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM                                                                                                                                                                                                                                                                                                                  |        |                                                                    |               |                                                              |            |                                                |         |                                 |
| macRemErrXcon      | Only DefMACstatus, DefRemoteCCM, DefErrorCCM, and DefXconCCM                                                                                                                                                                                                                                                                                                                        |        |                                                                    |               |                                                              |            |                                                |         |                                 |
| remErrXcon         | Only DefRemoteCCM, DefErrorCCM, and DefXconCCM                                                                                                                                                                                                                                                                                                                                      |        |                                                                    |               |                                                              |            |                                                |         |                                 |
| errXcon            | Only DefErrorCCM and DefXconCCM                                                                                                                                                                                                                                                                                                                                                     |        |                                                                    |               |                                                              |            |                                                |         |                                 |



|        |                                                |
|--------|------------------------------------------------|
| xcon   | Only DefXconCCM; or                            |
| noXcon | No defects DefXcon or lower are to be reported |

mac-address

|                    |                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac-address</b> <i>mac-address</i><br><b>no mac-address</b>                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>if>sap>eth-cfm>mep<br>config>service>vprn>if>spoke-sdp>eth-cfm>mep                                                                                                                                                                          |
| <b>Description</b> | This command specifies the MAC address of the MEP.<br><br>The <b>no</b> form of this command reverts the MAC address of the MEP back to that of the port (if the MEP is on a SAP) or the bridge (if the MEP is on a spoke).                                     |
| <b>Parameters</b>  | <i>mac-address</i> — Specifies the MAC address of the MEP.<br><br><b>Values</b> 6-byte MAC address in the form of xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx of the MEP. Must be unicast. Using the all zeros address is equivalent to the no form of this command. |

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## SAP Subscriber Management Commands

### sub-sla-mgmt

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sub-sla-mgmt</b>                                                                     |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap                                                        |
| <b>Description</b> | This command enables the context to configure subscriber management parameters for this SAP. |
| <b>Default</b>     | no sub-sla-mgmt                                                                              |

### def-sla-profile

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>def-sla-profile</b> <i>default-sla-profile-name</i><br><b>no def-sla-profile</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap>sub-sla-mgmt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command specifies a default SLA profile for this SAP. The SLA profile must be defined prior to associating the profile with a SAP in the <b>config&gt;subscriber-mgmt&gt;sla-profile</b> context.</p> <p>An SLA profile is a named group of QoS parameters used to define per service QoS for all subscriber hosts common to the same subscriber within a provider service offering. A single SLA profile may define the QoS parameters for multiple subscriber hosts. SLA profiles are maintained in two locations, the subscriber identification policy and the subscriber profile templates. After a subscriber host is associated with an SLA profile name, either the subscriber identification policy used to identify the subscriber or the subscriber profile associated with the subscriber host must contain an SLA profile with that name. If both the subscriber identification policy and the subscriber profile contain the SLA profile name, the SLA profile in the subscriber profile is used.</p> <p>The <b>no</b> form of the command removes the default SLA profile from the SAP configuration.</p> |
| <b>Default</b>     | no def-sla-profile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>default-sla-profile-name</i> — Specifies a default SLA profile for this SAP. The SLA profile must be defined prior to associating the profile with a SAP in the <b>config&gt;subscriber-mgmt&gt;sla-profile</b> context.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### def-sub-profile

|                    |                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>def-sub-profile</b> <i>default-subscriber-profile-name</i>                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap>sub-sla-mgmt                                                                                                                                                                   |
| <b>Description</b> | This command specifies a default subscriber profile for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the <b>config&gt;subscriber-mgmt&gt;sub-profile</b> context. |

A subscriber profile defines the aggregate QoS for all hosts within a subscriber context. This is done through the definition of the egress and ingress scheduler policies that govern the aggregate SLA for subscriber using the subscriber profile. Subscriber profiles also allow for specific SLA profile definitions when the default definitions from the subscriber identification policy must be overridden.

The **no** form of the command removes the default SLA profile from the SAP configuration.

**Parameters** *default-sub-profile* — Specifies a default subscriber profile for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the **config>subscriber-mgmt>sub-profile** context.

## multi-sub-sap

**Syntax** **multi-sub-sap** [*number-of-sub*]  
**no multi-sub-sap**

**Context** config>service>vprn>sub-if>grp-if>sap>sub-sla-mgmt

**Description** This command configures the maximum number of subscribers for this SAP.  
 The **no** form of this command returns the default value.

**Parameters** *number-of-sub* — Specifies the maximum number of subscribers for this SAP.

**Values** 2 — 8000

## single-sub-parameters

**Syntax** **single-sub-parameters**

**Context** config>service>vprn>sub-if>grp-if>sap>sub-sla-mgmt

**Description** This command enables the context to configure single subscriber parameters for this SAP.

## non-sub-traffic

**Syntax** **non-sub-traffic sub-profile** *sub-profile-name* **sla-profile** *sla-profile-name* [**subscriber** *sub-ident-string*]  
**no non-sub-traffic**

**Context** config>service>vprn>sub-if>grp-if>sap>sub-sla-mgmt>single-sub

**Description** This command configures non-subscriber traffic profiles.  
 The **no** form of the command removes the profiles and disables the feature.

**Parameters** **sub-profile** *sub-profile-name* — Specifies an existing subscriber profile name to be associated with the static subscriber host. The subscriber profile is configured in the **config>subscr-mgmt>sub-profile** context.

**sla-profile** *sla-profile-name* — Specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the **config>subscr-mgmt>sla-profile** context.

**subscriber** *sub-ident-string* — Specifies an existing subscriber identification profile to be associated with the static subscriber host. The subscriber identification profile is configured in the **config>subscr-mgmt>sub-ident-policy** context. The subscriber information is used by the VPRN SAP arp-reply-agent to determine the proper handling of received ARP requests from subscribers.

- For VPRN SAPs with **arp-reply-agent** enabled with the optional *sub-ident* parameter, the static subscriber host's *sub-ident-string* is used to determine whether an ARP request received on the SAP is sourced from a host belonging to the same subscriber as the destination host. When both the destination and source hosts from the ARP request are known on the SAP and the subscriber identifications do not match, the ARP request may be forwarded to the rest of the VPRN destinations.

If the static subscriber host's *sub-ident* string is not defined, the host is not considered to belong to the same subscriber as another host on the SAP.

If source or destination host is unknown, the hosts are not considered to belong to the same subscriber. ARP messages from unknown hosts are subject to anti-spoof filtering rules applied at the SAP.

If *sub-ident* is not enabled on the SAP arp-reply-agent, subscriber identification matching is not performed on ARP requests received on the SAP.

ARP requests are never forwarded back to the same SAP or within the receiving SAP's split horizon group.

### profiled-traffic-only

|                    |                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] profiled-traffic-only</b>                                                                                   |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap>sub-sla-mgmt>single-sub                                                       |
| <b>Description</b> | This command enables profiled traffic only for this SAP.<br>The <b>no</b> form of the command disables the command. |

### sub-ident-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sub-ident-policy</b> <i>sub-ident-policy-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>sap>sub-sla-mgmt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command associates a subscriber identification policy to this SAP. The subscriber identification policy must be defined prior to associating the profile with a SAP in the <b>config&gt;subscriber-mgmt&gt;sub-ident-policy</b> context.<br><br>Subscribers are managed by the system through the use of subscriber identification strings. A subscriber identification string uniquely identifies a subscriber. For static hosts, the subscriber identification string is explicitly defined with each static subscriber host. |

For dynamic hosts, the subscriber identification string must be derived from the DHCP ACK message sent to the subscriber host. The default value for the string is the content of Option 82 CIRCUIT-ID and REMOTE-ID fields interpreted as an octet string. As an option, the DHCP ACK message may be processed by a subscriber identification policy which has the capability to parse the message into an alternative ASCII or octet string value.

When multiple hosts on the same port are associated with the same subscriber identification string they are considered to be host members of the same subscriber.

The **no** form of the command removes the default subscriber identification policy from the SAP configuration.

**Default** no sub-ident-policy

**Parameters** *sub-ident-policy-name* — Specifies a subscriber identification policy for this SAP. The subscriber profile must be defined prior to associating the profile with a SAP in the **config>subscriber-mgmt>sub-ident-policy** context.

## srrp

**Syntax** [**no**] **srrp** *srrp-id*

**Context** config>service>vprn>sub-if>grp-if

**Description** This command creates an SRRP instance on a group IP interface. An SRRP instance manages all subscriber subnets within the group interfaces subscriber IP interface or other subscriber IP interfaces that are associated through a wholesale/retail relationship. Only one unique SRRP instance can be configured per group interface.

The **no** form of the command removes an SRRP instance from a group IP interface. Once removed, the group interface ignores ARP requests for the SRRP gateway IP addresses that may exist on subscriber subnets associated with the group IP interface. Then the group interface stops routing using the redundant IP interface associated with the group IP interface and will stop routing with the SRRP gateway MAC address. Ingress packets destined to the SRRP gateway MAC will also be silently discarded. This is the same behavior as a group IP interface that is disabled (shutdown).

**Default** no srrp

**Parameters** *srrp-id* — Specifies a 32 bit instance ID that must be unique to the system. The instance ID must also match the instance ID used by the remote router that is participating in the same SRRP context. SRRP is intended to perform a function similar to VRRP where adjacent IP hosts within local subnets use a default gateway to access IP hosts on other subnets.

**Values** 1 — 4294967295

## gw-mac

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>gw-mac</b> <i>mac-address</i><br><b>no gw-mac</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command overrides the default SRRP gateway MAC address used by the SRRP instance. Unless specified, the system uses the same base MAC address for all SRRP instances with the last octet overridden by the lower 8 bits of the SRRP instance ID. The same SRRP gateway MAC address should be in-use by both the local and remote routers participating in the same SRRP context.</p> <p>One reason to change the default SRRP gateway MAC address is if two SRRP instances sharing the same broadcast domain are using the same SRRP gateway MAC. The system will use the SRRP instance ID to separate the SRRP messages (by ignoring the messages that does not match the local instance ID), but a unique SRRP gateway MAC is essential to separate the routed packets for each gateway IP address.</p> <p>The <b>no</b> form of the command removes the explicit SRRP gateway MAC address from the SRRP instance. The SRRP gateway MAC address can only be changed or removed when the SRRP instance is shutdown.</p> |
| <b>Parameters</b>  | <p><i>mac-address</i> — Specifies a MAC address that is used to override the default SRRP base MAC address</p> <p><b>Values</b> Any MAC address except all zeros, broadcast or multicast addresses. The offset is expressed in normal Ethernet MAC address notation. The defined gw-mac cannot be 00:00:00:00:00:00, ff:ff:ff:ff:ff:ff or any multicast address.</p> <p>If not specified, the system uses the default SRRP gateway MAC address with the last octet set to the 8 least significant bits of the SRRP instance ID.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## keep-alive-interval

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keep-alive-interval</b> <i>interval</i><br><b>no keep-alive-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command defines the interval between SRRP advertisement messages sent when operating in the master state. The interval is also the basis for setting the master-down timer used to determine when the master is no longer sending. The system uses three times the keep-alive interval to set the timer. Every time an SRRP advertisement is seen that is better than the local priority, the timer is reset. If the timer expires, the SRRP instance assumes that a master does not exist and initiates the attempt to become master.</p> <p>When in backup state, the SRRP instance takes the keep-alive interval of the master as represented in the masters SRRP advertisement message. Once in master state, the SRRP instance uses its own configured keep-alive interval.</p> <p>The keep-alive-interval may be changed at anytime, but will have no effect until the SRRP instance is in the master state.</p> <p>The <b>no</b> form of the command restores the default interval.</p> |

|                   |                                                                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>interval</i> — Specifies the interval, in milliseconds, between SRRP advertisement messages sent when operating in the master state. |
| <b>Values</b>     | 1 — 100                                                                                                                                 |
| <b>Default</b>    | 10 milliseconds                                                                                                                         |

## message-path

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>message-path</b> <i>sap-id</i><br><b>no message-path</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command defines a specific SAP for SRRP in-band messaging. A message-path SAP must be defined prior to activating the SRRP instance. The defined SAP must exist on the SRRP instances group IP interface for the command to succeed and cannot currently be associated with any dynamic or static subscriber hosts. Once a group IP interface SAP has been defined as the transmission path for SRRP Advertisement messages, it cannot be administratively shutdown, will not support static or dynamic subscriber hosts and cannot be removed from the group IP interface.</p> <p>The SRRP instance message-path command may be executed at anytime on the SRRP instance. Changing the message SAP will fail if a dynamic or static subscriber host is associated with the new SAP. Once successfully changed, the SRRP instance will immediately disable anti-spoof on the SAP and start sending SRRP Advertisement messages if the SRRP instance is activated.</p> <p>Changing the current SRRP message SAP on an active pair of routers should be done in the following manner:</p> <ol style="list-style-type: none"> <li>1. Shutdown the backup SRRP instance.</li> <li>2. Change the message SAP on the shutdown node.</li> <li>3. Change the message SAP on the active master node.</li> <li>4. Re-activate the shutdown SRRP instance.</li> </ol> <p>Shutting down the backup SRRP instance prevents the SRRP instances from becoming master due to temporarily using differing message path SAPs.</p> <p>If an MCS peering is operational between the redundant nodes and the SRRP instance has been associated with the peering, the designated message path SAP will be sent from each member.</p> <p>The <b>no</b> form of the command can only be executed when the SRRP instance is shutdown. Executing no message-path allows the existing SAP to be used for subscriber management functions. A new message-path SAP must be defined prior to activating the SRRP instance.</p> |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] policy vrrp-policy-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command associates one or more VRRP policies with the SRRP instance. A VRRP policy is a collection of connectivity and verification tests used to manipulate the in-use priorities of VRRP and SRRP instances. A VRRP policy can test the link state of ports, ping IP hosts, discover the existence of routes in the routing table or the ability to reach L2 hosts. When one or more of these tests fail, the VRRP policy has the option of decrementing or setting an explicit value for the in-use priority of an SRRP instance.</p> <p>More than one VRRP policy may be associated with an SRRP instance. When more than one VRRP policy is associated with an SRRP instance the delta decrement of the in-use priority is cumulative unless one or more test fail that have explicit priority values. When one or more explicit tests fail, the lowest priority value event takes effect for the SRRP instance. When the highest delta-in-use-limit is used to manage the lowest delta derived in-use priority for the SRRP instance.</p> <p>VRRP policy associations may be added and removed at anytime. A maximum of two VRRP policies can be associated with a single SRRP instance.</p> <p>The <b>no</b> form of the command removes the association with vrrp-policy-id from the SRRP instance.</p> |
| <b>Parameters</b>  | <p><i>vrrp-policy-id</i> — Specifies one or more VRRP policies with the SRRP instance.</p> <p><b>Values</b>      1 — 9999</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## priority

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>priority priority</b><br><b>no priority</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>sub-if>grp-if>srrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command overrides the default base priority for the SRRP instance. The SRRP instance priority is advertised by the SRRP instance to its neighbor router and is compared to the priority received from the neighbor router. The router with the best (highest) priority enters the master state while the other router enters the backup state. If the priority of each router is the same, the router with the lowest source IP address in the SRRP advertisement message assumes the master state.</p> <p>The base priority of an SRRP instance can be managed by VRRP policies. A VRRP policy defines a set of connectivity or verification tests which, when they fail, may lower an SRRP instances base priority (creating an in-use priority for the instance). Every time an SRRP instances in-use priority changes when in master state, it sends an SRRP advertisement message with the new priority. If the dynamic priority drops to zero or receives an SRRP Advertisement message with a better priority, the SRRP instance transitions to the <i>becoming backup</i> state.</p> <p>When the priority command is not specified, or the no priority command is executed, the system uses a default base priority of 100. The priority command may be executed at anytime.</p> <p>The <b>no</b> form of the command restores the default base priority to the SRRP instance. If a VRRP policy is associated with the SRRP instance, it will use the default base priority as the basis for any modifications to the SRRP instances in-use priority.</p> |



**Parameters**    *priority* — Specifies a base priority for the SRRP instance to override the default.

**Values**        1 — 254

**Default**        100

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## Interface VRRP Commands

### vrrp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vrrp</b> <i>virtual-router-id</i> [ <b>owner</b> ]<br><b>no vrrp</b> <i>virtual-router-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command creates or edits a Virtual Router ID (VRID) on the service IP interface. A VRID is internally represented in conjunction with the IP interface name. This allows the VRID to be used on multiple IP interfaces while representing different virtual router instances.</p> <p>Two VRRP nodes can be defined on an IP interface. One, both, or none may be defined as owner. The nodal context of vrrp virtual-router-id is used to define the configuration parameters for the VRID.</p> <p>The <b>no</b> form of this command removes the specified VRID from the IP interface. This terminates VRRP participation for the virtual router and deletes all references to the VRID. The VRID does not need to be shutdown in order to remove the virtual router instance.</p> |
| <b>Default</b>     | No default                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><i>virtual-router-id</i> — The virtual-router-id parameter specifies a new virtual router ID or one that can be modified on the IP interface.</p> <p><b>Values</b>      1 — 255</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

### authentication-key

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-key</b> [ <i>authentication-key</i>   <i>hash-key</i> ] [ <b>hash</b>   <b>hash2</b> ]<br><b>no authentication-key</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>The <b>authentication-key</b> command, within the vrrp <i>virtual-router-id</i> context, is used to assign a simple text password authentication key to generate master VRRP advertisement messages and validate received VRRP advertisement messages.</p> <p>The <b>authentication-key</b> command is one of the few commands not affected by the presence of the <b>owner</b> keyword. If simple text password authentication is not required, this command is not required. If the command is re-executed with a different password key defined, the new key will be used immediately. If a no <b>authentication-key</b> command is executed, the password authentication key is restored to the default value. The <b>authentication-key</b> command may be executed at any time, altering the simple text password used when <b>authentication-type</b> password authentication method is used by the virtual router instance. The <b>authentication-type password</b> command does not need to be executed prior to defining the <b>authentication-key</b> command.</p> <p>To change the current in-use password key on multiple virtual router instances:</p> <ul style="list-style-type: none"> <li>Identify the current master</li> </ul> |

- Shutdown the virtual router instance on all backups
- Execute the authentication-key command on the master to change the password key
- Execute the authentication-key command and no shutdown command on each backup key

The **no** form of this command restores the default null string to the value of key.

**Default** No default. The authentication data field contains the value 0 in all 16 octets.

**Parameters** *authentication-key* — The *key* parameter identifies the simple text password used when VRRP Authentication Type 1 is enabled on the virtual router instance. Type 1 uses a string eight octets long that is inserted into all transmitted VRRP advertisement messages and compared against all received VRRP advertisement messages. The authentication data fields are used to transmit the key.

The *key* parameter is expressed as a string consisting of up to eight alpha-numeric characters. Spaces must be contained in quotation marks ( " " ). The quotation marks are not considered part of the string.

The string is case sensitive and is left-justified in the VRRP advertisement message authentication data fields. The first field contains the first four characters with the first octet (starting with IETF RFC bit position 0) containing the first character. The second field holds the fifth through eighth characters. Any unspecified portion of the authentication data field is padded with the value 0 in the corresponding octet.

**Values** Any 7-bit printable ASCII character.

|             |                  |          |
|-------------|------------------|----------|
| Exceptions: | Double quote (") | ASCII 34 |
|             | Carriage Return  | ASCII 13 |
|             | Line Feed        | ASCII 10 |
|             | Tab              | ASCII 9  |
|             | Backspace        | ASCII 8  |

*hash-key* — The hash key. The key can be any combination of ASCII characters up to 22 characters in length (encrypted). If spaces are used in the string, enclose the entire string in quotation marks ( " " ).

This is useful when a user must configure the parameter, but, for security purposes, the actual unencrypted key value is not provided.

**hash** — Specifies the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** parameter specified.

**hash2** — Specifies the key is entered in a more complex encrypted form. If the **hash2** parameter is not used, the less encrypted **hash** form is assumed.

## authentication-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-type</b> { <b>password</b>   <b>message-digest</b> }<br><b>no authentication-type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>The <b>authentication-type</b> command, within the <b>vrrp</b> <i>virtual-router-id</i> context, is used to assign the authentication method to generate master VRRP advertisement messages and validate received VRRP advertisement messages.</p> <p><b>NOTE:</b> The authentication management for VRRP closely follows the authentication management format used for IS-IS.</p> <p>The <b>authentication-type</b> command is one of the commands not affected by the presence of the owner keyword. If authentication is not required, the authentication-type command must not be executed. If the command is re-executed with a different authentication type defined, the new type will be used. If the no authentication-type command is executed, authentication is removed and no authentication is performed. The authentication-type command may be executed at any time, altering the authentication method used by the virtual router instance.</p> <p>The <b>no</b> form of this command removes authentication from the virtual router instance. All VRRP Advertisement messages sent will have the Authentication Type field set to 0 and the Authentication Data fields will contain 0 in all octets. VRRP Advertisement messages received with Authentication Type fields containing a value other than 0 will be discarded.</p> <p><i>password</i> — The password keyword identifies VRRP Authentication Type 1. Type 1 requires the definition of a string of eight octets long using the authentication-key command. All transmitted VRRP Advertisement messages must have the Authentication Type field set to 1 and the Authentication Data fields must contain the authentication-key password.</p> <p>All received VRRP advertisement messages must contain a value of 1 in the Authentication Type field and the Authentication Data fields must match the defined authentication-key. All other received messages will be silently discarded.</p> <p><i>message-digest</i> — The message-digest keyword identifies VRRP Authentication Type 2. Type 2 defines a lower IP layer MD5 authentication mechanism using HMAC and IP authentication header standards. An MD5 key must be defined using the message-digest-key command. All transmitted VRRP advertisement messages must have the Authentication Type field set to 2 and the Authentication Data fields must contain 0 in all octets. The message-digest key is used in the hashing process when populating the IP Authentication Header fields. A sequential incrementing counter (set to zero when the message-digest-key is set) is incremented and then used in the IP Authentication Header to prevent replay attacks on authorized participating virtual router instances.</p> <p>All received VRRP advertisement messages must contain a value of 2 in the Authentication Type field and the Authentication Data fields are ignored. The message must have been authorized by the lower layer IP Authentication Header process with the sequential counter field and the source IP address presented to the virtual router instance. To track the validity of the received counter, the virtual router instance maintains a master counter table containing up to 32 source IP addresses and the last received counter value. Populate the table as follows:</p> <ol style="list-style-type: none"> <li>1. Check to see if source IP address exists in table. <ul style="list-style-type: none"> <li>– If non-existent, create an entry if available.</li> </ul> </li> </ol> |

- If no entry is available, delete the oldest and create an entry. The new entry should have a counter value of zero.
- 2. Compare the message counter value to the entry value (0 if new entry or equal to the previous message counter from the source IP address).
  - If the message counter is not greater than the entry counter value, silently discard the packet.
  - If the message counter is greater than the entry counter value, accept the message for further checking and replace the entry counter value with the message counter value and time stamp the entry.

## backup

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] backup</b> <i>ip-address</i>                                   |
| <b>Context</b>     | config>service>vpn>if>vrrp<br>config>service>vpn>if>ipv6>vrrp          |
| <b>Description</b> | This command configures virtual router IP addresses for the interface. |

## bfd-enable

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bfd-enable</b> [ <b>base</b>   <i>service-id</i> ] <b>interface</b> <i>interface-name</i> <b>dst-ip</b> <i>ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vpn>if>vrrp<br>config>service>vpn>sub-if>grp-if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This commands assigns a bi-directional forwarding (BFD) session providing heart-beat mechanism for the given VRRP/SRRP instance. There can be only one BFD session assigned to any given VRRP/SRRP instance, but there can be multiple SRRP/VRRP sessions using the same BFD session.</p> <p>BFD control the state of the associated interface. By enabling BFD on a given protocol interface, the state of the protocol interface is tied to the state of the BFD session between the local node and the remote node. The parameters used for the BFD are set via the BFD command under the IP interface. The specified interface may not be configured with BFD; when it is, the virtual router will then initiate the BFD session.</p> <p>The <b>no</b> form of this command removes BFD from the configuration.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><i>service-id</i> — Specifies the service ID of the interface running BFD.</p> <p><b>Values</b></p> <ul style="list-style-type: none"> <li><i>service-id</i>: 1 — 2147483648</li> <li><i>svc-name</i>: Specifies an existing service name up to 64 characters in length.</li> <li>No service ID indicates a network interface.</li> </ul> <p><b>interface</b> <i>interface-name</i> — Specifies the name of the interface running BFD.</p> <p><b>dst-ip</b> <i>ip-address</i> — Specifies the destination address to be used for the BFD session.</p>                                                                                                                                                                                                                                                                   |

## init-delay

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>init-delay</b> <i>seconds</i><br><b>no init-delay</b>                                                       |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>ipv6>vrrp                                                |
| <b>Description</b> | This command configures a VRRP initialization delay timer.                                                     |
| <b>Default</b>     | no init-delay                                                                                                  |
| <b>Parameters</b>  | <i>seconds</i> — Specifies the initialization delay timer for VRRP, in seconds.<br><br><b>Values</b> 1 — 65535 |

## mac

|                    |                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac</b> <i>ieee-mac-address</i>                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>ipv6>vrrp                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command assigns a specific MAC address to an IP interface.<br><br>The <b>no</b> form of this command returns the MAC address of the IP interface to the default value.                                                                                                                                                                           |
| <b>Default</b>     | The physical MAC address associated with the Ethernet interface that the SAP is configured on.                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>ieee-mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i> , <i>bb</i> , <i>cc</i> , <i>dd</i> , <i>ee</i> and <i>ff</i> are hexadecimal numbers.<br>Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses. |

## master-int-inherit

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] master-int-inherit</b>                                                                     |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>ipv6>vrrp                                    |
| <b>Description</b> | This command allows the master instance to dictate the master down timer (non-owner context only). |
| <b>Default</b>     | no master-int-inherit                                                                              |

## message-interval

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>message-interval</b> {[seconds] [milliseconds milliseconds]}<br><b>no message-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>interface<br>config>service>vprn>if>ipv6>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command sets the advertisement timer and indirectly sets the master down timer on the virtual router instance. The message-interval setting must be the same for all virtual routers participating as a virtual router. Any VRRP advertisement message received with an Advertisement Interval field different than the virtual router instance configured message-interval value will be silently discarded.</p> <p>The message-interval command is available in both non-owner and owner <b>vrrp</b> <i>virtual-router-id</i> nodal contexts. If the message-interval command is not executed, the default message interval of 1 second will be used.</p> <p>The <b>no</b> form of this command restores the default message interval value of 1 second to the virtual router instance.</p> |
| <b>Parameters</b>  | <p><i>seconds</i> — The number of seconds that will transpire before the advertisement timer expires.</p> <p><b>Values</b> 1 — 255</p> <p><b>Default</b> 1</p> <p><b>milliseconds milliseconds</b> — Specifies the milliseconds time interval between sending advertisement messages. This parameter is not supported on the 7750 SR-1 chassis.</p> <p><b>Values</b> 100 — 900</p>                                                                                                                                                                                                                                                                                                                                                                                                                    |

## ping-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ping-reply</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>ipv6>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command enables the non-owner master to reply to ICMP Echo Requests directed at the virtual router instances IP addresses. The ping request can be received on any routed interface.</p> <p>Ping must not have been disabled at the management security level (either on the parental IP interface or based on the Ping source host address). When ping-reply is not enabled, ICMP Echo Requests to non-owner master virtual IP addresses are silently discarded.</p> <p>Non-owner backup virtual routers never respond to ICMP Echo Requests regardless of the setting of ping-reply configuration.</p> <p>The ping-reply command is only available in non-owner <b>vrrp</b> <i>virtual-router-id</i> nodal context. If the ping-reply command is not executed, ICMP Echo Requests to the virtual router instance IP addresses will be silently discarded.</p> <p>The <b>no</b> form of this command restores the default operation of discarding all ICMP Echo Request messages destined to the non-owner virtual router instance IP addresses.</p> |
| <b>Default</b>     | no ping-reply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## policy

|                    |                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>policy</b> <i>vrp-policy-id</i><br><b>no policy</b>                                                            |
| <b>Context</b>     | config>service>vprn>if>vrp<br>config>service>vprn>if>ipv6>vrp                                                     |
| <b>Description</b> | This command associates a VRRP priority control policy with the virtual router instance (non-owner context only). |
| <b>Parameters</b>  | <i>vrp-policy-id</i> — Specifies a VRRP priority control policy.<br><b>Values</b> 1 — 9999                        |

## preempt

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>preempt</b><br><b>no preempt</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>interface<br>config>service>vprn>if>ipv6>vrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command provides the ability of overriding an existing non-owner master to the virtual router instance. Enabling preempt mode is recommended for proper operation of the base-priority and vrrp-policy-id definitions on the virtual router instance. If the virtual router cannot preempt an existing non-owner master, the affect of the dynamic changing of the in-use priority is greatly diminished.</p> <p>The preempt command is only available in the non-owner <b>vrrp</b> <i>virtual-router-id</i> nodal context. The owner may not be preempted due to the fact that the priority of non-owners can never be higher than the owner. The owner will always preempt all other virtual routers when it is available.</p> <p>Non-owner virtual router instances will only preempt when preempt is set and the current master has an in-use message priority value less than the virtual router instances in-use priority.</p> <p>A master non-owner virtual router will only allow itself to be preempted when the incoming VRRP Advertisement message Priority field value is one of the following:</p> <ul style="list-style-type: none"> <li>• Greater than the virtual router in-use priority value</li> <li>• Equal to the in-use priority value and the source IP address (primary IP address) is greater than the virtual router instance primary IP address</li> </ul> <p>The <b>no</b> form of this command prevents a non-owner virtual router instance from preempting another, less desirable virtual router. Use the preempt command to restore the default mode.</p> |
| <b>Default</b>     | preempt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |



## priority

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |         |                |     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|----------------|-----|
| <b>Syntax</b>      | <b>priority</b> <i>priority</i><br><b>no priority</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |         |                |     |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>ipv6>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |         |                |     |
| <b>Description</b> | <p>The priority command provides the ability to configure a specific priority value to the virtual router instance. In conjunction with an optional policy command, the base-priority is used to derive the in-use priority of the virtual router instance.</p> <p>The priority command is only available in the non-owner <b>vrrp</b> <i>virtual-router-id</i> nodal context. The priority of owner virtual router instances is permanently set to 255 and cannot be changed. For non-owner virtual router instances, if the priority command is not executed, the base-priority will be set to 100.</p> <p>The <b>no</b> form of this command restores the default value of 100 to base-priority.</p> |               |         |                |     |
| <b>Parameters</b>  | <p><i>base-priority</i> — The base-priority parameter configures the base priority used by the virtual router instance. If a VRRP priority control policy is not also defined, the base-priority will be the in-use priority for the virtual router instance.</p> <table> <tr> <td><b>Values</b></td><td>1 — 254</td></tr> <tr> <td><b>Default</b></td><td>100</td></tr> </table>                                                                                                                                                                                                                                                                                                                       | <b>Values</b> | 1 — 254 | <b>Default</b> | 100 |
| <b>Values</b>      | 1 — 254                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |         |                |     |
| <b>Default</b>     | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |         |                |     |

## ssh-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ssh-reply</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>if>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command enables the non-owner master to reply to SSH Requests directed at the virtual router instance's IP addresses. The SSH request can be received on any routed interface. SSH must not have been disabled at the management security level (either on the parental IP interface or based on the SSH source host address). Proper login and CLI command authentication is still enforced.</p> <p>When ssh-reply is not enabled, SSH packets to non-owner master virtual IP addresses are silently discarded. Non-owner backup virtual routers never respond to SSH regardless of the ssh-reply configuration.</p> <p>The ssh-reply command is only available in non-owner <b>vrrp</b> <i>virtual-router-id</i> nodal context. If the ssh-reply command is not executed, SSH packets to the virtual router instance IP addresses will be silently discarded.</p> <p>The <b>no</b> form of this command restores the default operation of discarding all SSH packets destined to the non-owner virtual router instance IP addresses.</p> |
| <b>Default</b>     | no ssh-reply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## standby-forwarding

|                    |                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] standby-forwarding</b>                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>ipv6>vrrp                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command allows the forwarding of packets by a standby router.</p> <p>The <b>no</b> form of the command specifies that a standby router should not forward traffic sent to virtual router's MAC address. However, the standby router should forward traffic sent to the standby router's real MAC address.</p> |
| <b>Default</b>     | no standby-forwarding                                                                                                                                                                                                                                                                                                 |

## telnet-reply

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] telnet-reply</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>ipv6>vrrp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command enables the non-owner master to reply to TCP port 23 Telnet Requests directed at the virtual router instance's IP addresses. The Telnet request can be received on any routed interface. Telnet must not have been disabled at the management security level (either on the parental IP interface or based on the Telnet source host address). Proper login and CLI command authentication is still enforced.</p> <p>When telnet-reply is not enabled, TCP port 23 Telnet packets to non-owner master virtual IP addresses are silently discarded.</p> <p>Non-owner backup virtual routers never respond to Telnet Requests regardless of the telnet-reply configuration.</p> <p>The telnet-reply command is only available in non-owner <b>VRRP</b> nodal context. If the telnet-reply command is not executed, Telnet packets to the virtual router instance IP addresses will be silently discarded.</p> <p>The <b>no</b> form of this command restores the default operation of discarding all Telnet packets destined to the non-owner virtual router instance IP addresses.</p> |
| <b>Default</b>     | no telnet-reply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## traceroute-reply

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] traceroute-reply</b>                                                                              |
| <b>Context</b>     | config>service>vprn>if>vrrp<br>config>service>vprn>if>ipv6>vrrp                                           |
| <b>Description</b> | This command is valid only if the VRRP virtual router instance associated with this entry is a non-owner. |

When this command is enabled, a non-owner master can reply to traceroute requests directed to the virtual router instance IP addresses.

A non-owner backup virtual router never responds to such traceroute requests regardless of the **trace-route-reply** status.

**Default**    no traceroute-reply

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## PIM Commands

### pim

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] pim</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures a Protocol Independent Multicast (PIM) instance in the VPRN service. When an PIM instance is created, the protocol is enabled. PIM is used for multicast routing within the network. Devices in the network can receive the multicast feed requested and non-participating routers can be pruned. The 7750 SR OS supports PIM sparse mode (PIM-SM).</p> <p>The <b>no</b> form of the command deletes the PIM protocol instance removing all associated configuration parameters.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### apply-to

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>apply-to {all   none}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command creates a PIM interface with default parameters.</p> <p>If a manually created interface or modified interface is deleted, the interface will be recreated when the <b>apply-to</b> command is executed. If PIM is not required on a specific interface, then execute a <b>shutdown</b> command.</p> <p>The <b>apply-to</b> command is saved first in the PIM configuration structure, all subsequent commands either create new structures or modify the defaults as created by the <b>apply-to</b> command.</p> |
| <b>Default</b>     | none (keyword)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><b>all</b> — Specifies that all VPRN and non-VPRN interfaces are automatically applied in PIM.</p> <p><b>none</b> — No interfaces are automatically applied in PIM. PIM interfaces must be manually configured.</p>                                                                                                                                                                                                                                                                                                           |

## import

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>import</b> { <b>join-policy</b>   <b>register-policy</b> } [ <i>policy-name</i> [ <i>.. policy-name</i> ] <i>policy-name</i> ]<br><b>no import</b> { <b>join-policy</b>   <b>register-policy</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command specifies the import route policy to be used for determining which routes are accepted from peers. Route policies are configured in the <b>config&gt;router&gt;policy-options</b> context. When an import policy is not specified, BGP routes are accepted by default.</p> <p>The <b>no</b> form of the command removes the policy association from the IGMP instance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Default</b>     | no import join-policy<br>no import register-policy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><b>join-policy</b> — Use this command to filter PIM join messages which prevents unwanted multicast streams from traversing the network.</p> <p><b>register-policy</b> — This keyword filters register messages. PIM register filters prevent register messages from being processed by the RP. This filter can only be defined on an RP. When a match is found, the RP immediately sends back a register-stop message.</p> <p><i>policy-name</i> — The route policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes. Route policies are configured in the <b>config&gt;router&gt;policy-options</b> context.</p> |

## interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>interface</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command enables PIM on an interface and enables the context to configure interface-specific parameters. By default interfaces are activated in PIM based on the <b>apply-to</b> command, and do not have to be configured on an individual basis unless the default values must be changed.</p> <p>The <b>no</b> form of the command deletes the PIM interface configuration for this interface. If the <b>apply-to</b> command parameter is configured, then the <b>no interface</b> form must be saved in the configuration to avoid automatic (re)creation after the next <b>apply-to</b> is executed as part of a reboot.</p> <p>The <b>shutdown</b> command can be used to disable an interface without removing the configuration for the interface.</p> |
| <b>Default</b>     | Interfaces are activated in PIM based on the apply-to command.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specify the interface name. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## bfd-enable

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bfd-enable</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>pim>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command enables the use of bi-directional forwarding (BFD) to control the state of the associated protocol interface. By enabling BFD on a given protocol interface, the state of the protocol interface is tied to the state of the BFD session between the local node and the remote node. The parameters used for the BFD are set via the BFD command under the IP interface.</p> <p>The <b>no</b> form of this command removes BFD from the associated IGP protocol adjacency.</p> |
| <b>Default</b>     | no bfd-enable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## bsm-check-rtr-alert

|                    |                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bsm-check-rtr-alert</b>                                                                                       |
| <b>Context</b>     | config>service>vprn>pim>interface                                                                                     |
| <b>Description</b> | <p>This command enables the checking of router alert option in the bootstrap messages received on this interface.</p> |
| <b>Default</b>     | no bsm-check-rtr-alert                                                                                                |

## hello-interval

|                    |                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hello-interval</b> <i>hello-interval</i><br><b>no hello-interval</b>                                                                                                             |
| <b>Context</b>     | config>service>vprn>pim>interface                                                                                                                                                   |
| <b>Description</b> | <p>This command configures the frequency at which PIM Hello messages are transmitted on this interface.</p> <p>The <b>no</b> form of this command reverts to the default value.</p> |
| <b>Default</b>     | 30                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>hello-interval</i> — Specifies the hello interval in seconds. A 0 (zero) value disables the sending of hello messages.<br><b>Values</b> 0 — 255 seconds                          |

## hello-multiplier

|                    |                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hello-multiplier</b> <i>deci-units</i><br><b>no hello-multiplier</b>                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>pim>interface                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command configures the multiplier to determine the holdtime for a PIM neighbor.<br>The <b>hello-multiplier</b> in conjunction with the <b>hello-interval</b> determines the holdtime for a PIM neighbor.                                                                                  |
| <b>Parameters</b>  | <i>deci-units</i> — Specify the value, specified in multiples of 0.1, for the formula used to calculate the hello-holdtime based on the hello-multiplier:<br>$(\text{hello-interval} * \text{hello-multiplier}) / 10$<br>This allows the PIMv2 default timeout of 3.5 seconds to be supported. |
| <b>Values</b>      | 20 — 100                                                                                                                                                                                                                                                                                       |
| <b>Default</b>     | 35                                                                                                                                                                                                                                                                                             |

## improved-assert

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] improved-assert</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>pim>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command enables improved assert processing on this interface. The PIM assert process establishes a forwarder for a LAN and requires interaction between the control and forwarding planes.<br><br>The assert process is started when data is received on an outgoing interface. This could impact performance if data is continuously received on an outgoing interface.<br><br>When enabled, the PIM assert process is done entirely on the control-plane with no interaction between the control and forwarding plane. |
| <b>Default</b>     | enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## max-groups

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>max-groups</b> <i>value</i><br><b>no max-groups</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>pim>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command configures the maximum number of groups for which PIM can have downstream state based on received PIM Joins on this interface. This does not include IGMP local receivers on the interface. When this configuration is changed dynamically to a value lower than the currently accepted number of groups, the groups that are already accepted are not deleted. Only new groups will not be allowed. When this object has a value of 0, there is no limit to the number of groups. |

**Parameters**     *value* — Specifies the maximum number of groups for this interface.

**Values**         1 — 16000

### multicast-senders

**Syntax**         **multicast-senders** {**auto** | **always** | **never**}  
**no multicast-senders**

**Context**         config>service>vprn>pim>interface

**Description**     This command configures the way subnet matching is done for incoming data packets on this interface. An IP multicast sender is an user entity to be authenticated in a receiving host.

**Parameters**     **auto** — Subnet matching is automatically performed for incoming data packets on this interface.  
**always** — Subnet matching is always performed for incoming data packets on this interface.  
**never** — Subnet matching is never performed for incoming data packets on this interface.

### priority

**Syntax**         **priority** *dr-priority*  
**no priority**

**Context**         config>service>vprn>pim>interface

**Description**     This command sets the priority value to become the rendezvous point (RP) that is included in bootstrap messages sent by the router. The RP is sometimes called the bootstrap router. The **priority** command indicates whether the router is eligible to be a bootstrap router. The **no** form of the command disqualifies the router to participate in the bootstrap election.

**Default**         1 (The router is the least likely to become the designated router.)

**Parameters**     *dr-priority* — Specifies the priority to become the designated router. The higher the value, the higher the priority.

**Values**         1 — 4294967295

### sticky-dr

**Syntax**         **sticky-dr** [**priority** *dr-priority*]  
**no sticky-dr**

**Context**         config>service>vprn>pim>interface

**Description**     This command enables sticky-dr operation on this interface. When enabled, the priority in PIM hellos sent on this interface when elected as the designated router (DR) will be modified to the value configured in *dr-priority*. This is done to avoid the delays in forwarding caused by DR recovery, when switching back to the old DR on a LAN when it comes back up.



By enabling **sticky-dr** on this interface, it will continue to act as the DR for the LAN even after the old DR comes back up.

The **no** form of the command disables sticky-dr operation on this interface.

|                   |                                                                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | disabled                                                                                                                                                                            |
| <b>Parameters</b> | <b>priority</b> <i>dr-priority</i> — Sets the DR priority to be sent in PIM Hello messages following the election of that interface as the DR, when sticky-dr operation is enabled. |
| <b>Values</b>     | 1 — 4294967295                                                                                                                                                                      |

## three-way-hello

|                    |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>three-way-hello</b> [ <b>compatibility-mode</b> ]<br><b>no three-way-hello</b> |
| <b>Context</b>     | config>service>vprn>pim>interface                                                 |
| <b>Description</b> | This command configures the compatibility mode for enabling the three way hello.  |
| <b>Parameters</b>  | <b>compatibility-mode</b> — Specifies to enable the three way hello.              |

## tracking-support

|                    |                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>tracking-support</b>                                                                                                                           |
| <b>Context</b>     | config>service>vprn>pim>interface                                                                                                                               |
| <b>Description</b> | This command sets the the T bit in the LAN Prune Delay option of the Hello Message. This indicates the router's capability to disable Join message suppression. |
| <b>Default</b>     | no tracking-support                                                                                                                                             |

## mc-ecmp-balance

|                    |                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [ <b>no</b> ] <b>mc-ecmp-balance</b>                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>pim                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command enables multicast balancing of traffic over ECMP links. When enabled, each multicast stream that needs to be forwarded over an ECMP link will be re-evaluated for the total multicast bandwidth utilization. Re-evaluation occurs on the ECMP interface in question.<br><br>The <b>no</b> form of the command disables the multicast balancing. |

## mc-ecmp-balance-hold

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mc-ecmp-balance-hold</b> <i>minutes</i><br><b>no mc-ecmp-balance-hold</b>                                           |
| <b>Context</b>     | config>service>vprn>pim                                                                                                |
| <b>Description</b> | This command configures the hold time for multicast balancing over ECMP links.                                         |
| <b>Parameters</b>  | <i>minutes</i> — Specifies the hold time, in minutes, that applies after an interface has been added to the ECMP link. |

## non-dr-attract-traffic

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] non-dr-attract-traffic</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command specifies whether the router should ignore the designated router state and attract traffic even when it is not the designater router.</p> <p>An operator can configure an interface (router or IES or VPRN interfaces) to IGMP and PIM. The interface IGMP state will be synchronized to the backup node if it is associated with the redundant peer port. The interface can be configured to use PIM which will cause multicast streams to be sent to the elected DR only. The DR will also be the router sending traffic to the DSLAM. Since it may be required to attract traffic to both routers a flag non-dr-attract-traffic can be used in the PIM context to have the router ignore the DR state and attract traffic when not DR. Note that while using this flag the router may not send the stream down to the DSLAM while not DR.</p> <p>When enabled, the designated router state is ignored. When disabled, <b>no non-dr-attract-traffic</b>, the designated router value is honored.</p> |
| <b>Default</b>     | no non-dr-attract-traffic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## rp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rp</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command enables access to the context to configure the rendezvous point (RP) ) of a PIM protocol instance.</p> <p>An Alcatel-Lucent PIM router acting as an RP must respond to a PIM register message specifying an SSM multicast group address by sending to the first hop router stop register message(s). It does not build an (S, G) shortest path tree toward the first hop router. An SSM multicast group address can be either from the SSM default range of 232/8 or from a multicast group address range that was explicitly configured for SSM.</p> |
| <b>Default</b>     | rp enabled when PIM is enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## anycast

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] anycast</b> <i>rp-ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>pim>rp                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures a PIM anycast protocol instance for the RP being configured. Anycast enables fast convergence when a PIM RP router fails by allowing receivers and sources to rendezvous at the closest RP.</p> <p>The <b>no</b> form of the command removes the anycast instance from the configuration.</p>                                                                                                                                            |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>rp-ip-address</i> — Configure the loopback IP address shared by all routes that form the RP set for this anycast instance. Only a single address can be configured. If another anycast command is entered with an address then the old address will be replaced with the new address. If no ip-address is entered then the command is simply used to enter the anycast CLI level.</p> <p><b>Values</b> Any valid loopback address configured on the node.</p> |

## rp-set-peer

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] rp-set-peer</b> <i>ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>pim>rp>anycast                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command configures a peer in the anycast rp-set. The address identifies the address used by the other node as the RP candidacy address for the same multicast group address range as configured on this node.</p> <p>This is a manual procedure. Caution should be taken to produce a consistent configuration of an RP-set for a given multicast group address range. The priority should be identical on each node and be a higher value than any other configured RP candidate that is not a member of this rp-set.</p> <p>Although there is no set maximum of addresses that can be configured in an rp-set, up to 15 multicast addresses is recommended.</p> <p>The <b>no</b> form of the command removes an entry from the list.</p> |
| <b>Default</b>     | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><i>ip-address</i> — Specifies the address used by the other node as the RP candidacy address for the same multicast group address range as configured on this node.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## bootstrap-export

|                    |                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>bootstrap-export</b> <i>policy-name</i> [ <i>policy-name</i> ... up to five]<br><b>no bootstrap-export</b>                                                                                                                 |
| <b>Context</b>     | config>service>vprn>pim>rp                                                                                                                                                                                                    |
| <b>Description</b> | This command exports policies to control the flow of bootstrap messages from the RP. Up to five policies can be defined.<br><br>The <b>no</b> form of this command removes the specified policy names from the configuration. |
| <b>Default</b>     | none                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <i>policy-name</i> — Specify the policy name. The policy statement must already be configured in the config>router>policy-options context.                                                                                    |

## bootstrap-import

|                    |                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>bootstrap-import</b> <i>policy-name</i> [ <i>policy-name</i> ... up to five]<br><b>no bootstrap-import</b> <i>policy-name</i> [ <i>policy-name</i> ... up to five]                                                         |
| <b>Context</b>     | config>service>vprn>pim>rp                                                                                                                                                                                                    |
| <b>Description</b> | This command imports policies to control the flow of bootstrap messages into the RP. Up to five policies can be defined.<br><br>The <b>no</b> form of this command removes the specified policy names from the configuration. |
| <b>Default</b>     | none                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <i>policy-name</i> — Specify the policy name. The policy statement must already be configured in the config>router>policy-options context.                                                                                    |

## bsr-candidate

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>bsr-candidate</b>                                                                                    |
| <b>Context</b>     | config>service>vprn>pim>rp                                                                              |
| <b>Description</b> | This command enables the context to configure a local rendezvous point (RP) of a PIM protocol instance. |
| <b>Default</b>     | Enabled when PIM is enabled.                                                                            |

## address

|                    |                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] address</b> <i>ip-address</i>                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>pim>rp>bsr-candidate<br>config>service>vprn>pim>rp>rp-candidate                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command configures a static bootstrap or rendezvous point (RP) as long as the source is not directly attached to this router.<br><br>Use the <b>no</b> form of this command to remove the static RP from the configuration.                                                                                                               |
| <b>Default</b>     | No IP address is specified.                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <i>ip-address</i> — The static IP address of the RP. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation.<br><br><b>Values</b> 1.0.0.0 – 223.255.255.255 |

## hash-mask-len

|                    |                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hash-mask-len</b> <i>hash-mask-length</i><br><b>no hash-mask-len</b>                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>pim>rp>bsr-candidate                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command is used to configure the length of a mask that is to be combined with the group address before the hash function is called. All groups with the same hash map to the same RP. For example, if this value is 24, only the first 24 bits of the group addresses matter. This mechanism is used to map one group or multiple groups to an RP. |
| <b>Parameters</b>  | <i>hash-mask-length</i> — The hash mask length.<br><br><b>Values</b> 0 — 32                                                                                                                                                                                                                                                                             |

## priority

|                    |                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>priority</b> <i>bootstrap-priority</i>                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>pim>rp>bsr-candidate                                                                                                                                                                                          |
| <b>Description</b> | This command defines the priority used to become the rendezvous point (RP) . The higher the priority value the more likely that this router becomes the RP. If there is a tie, the router with the highest IP address is elected. |
| <b>Parameters</b>  | <i>bootstrap-priority</i> — The priority to become the bootstrap router.<br><br><b>Values</b> 0 — 255<br><br><b>Default</b> 0 (the router is not eligible to be the bootstrap router)                                             |

## rp-candidate

|                    |                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rp-candidate</b>                                                                           |
| <b>Context</b>     | config>service>vprn>pim>rp                                                                    |
| <b>Description</b> | This command enables the context to configure the candidate rendezvous point (RP) parameters. |
| <b>Default</b>     | Enabled when PIM is enabled.                                                                  |

## group-range

|                    |                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group-range</b> { <i>grp-ip-address/mask</i>   <i>grp-ip-address</i> [ <i>netmask</i> ]}                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>pim>rp>rp-candidate<br>config>service>vprn>pim>ssm                                                                                                                                                                                                                          |
| <b>Description</b> | This command configures the group address or range of group addresses for which this router can be the rendezvous point (RP).<br><br>Use the <b>no</b> form of this command to remove the group address or range of group addresses for which this router can be the RP from the configuration. |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>group-ip-address</i> — Specify the addresses or address ranges that this router can be an RP.<br><i>mask</i> — Specify the address mask with the address to define a range of addresses.<br><i>netmask</i> — Specify the subnet mask in dotted decimal notation.                             |
| <b>Values</b>      | 0.0.0.0 — 255.255.255.255 (network bits all 1 and host bits all 0)                                                                                                                                                                                                                              |

## holdtime

|                    |                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>holdtime</b> <i>holdtime</i><br><b>no holdtime</b> <i>holdtime</i>                                                                                                     |
| <b>Context</b>     | config>service>vprn>pim>rp>rp-candidate                                                                                                                                   |
| <b>Description</b> | Use this command to define the length of time neighboring router consider this router to be up.<br>Use the <b>no</b> form of this command to revert to the default value. |
| <b>Default</b>     | 150                                                                                                                                                                       |
| <b>Parameters</b>  | <i>holdtime</i> — Specify the length of time, in seconds, that neighbor should consider the sending router to be operational.                                             |
| <b>Values</b>      | 0 — 255                                                                                                                                                                   |

## priority

|                    |                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>priority</b> <i>priority</i><br><b>no priority</b> <i>priority</i>                                                                                                                                                                         |
| <b>Context</b>     | config>router>pim>rp>local<br>config>service>vprn>pim>rp>rp-candidate                                                                                                                                                                         |
| <b>Description</b> | This command defines the priority used to become the rendezvous point (RP). The higher the priority value, the more likely that this router will become the RP.<br><br>Use the <b>no</b> form of this command to revert to the default value. |
| <b>Default</b>     | 1                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <i>priority</i> — Specify the priority to become the designated router. The higher the value the more likely the router will become the RP.<br><br><b>Values</b> 0 — 255                                                                      |

## static

|                    |                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static</b>                                                                                                         |
| <b>Context</b>     | config>service>vprn>pim>rp                                                                                            |
| <b>Description</b> | This command enables access to the context to configure a static rendezvous point (RP) of a PIM-SM protocol instance. |
| <b>Default</b>     | none                                                                                                                  |

## address

|                    |                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] address</b> <i>ip-address</i>                                                                                                                           |
| <b>Context</b>     | config>service>vprn>pim>rp>static                                                                                                                               |
| <b>Description</b> | This command configures the static rendezvous point (RP) address.<br><br>The <b>no</b> form of this command removes the static RP entry from the configuration. |
| <b>Default</b>     | none                                                                                                                                                            |

## group-prefix

|                |                                                                                                                         |
|----------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>[no] group-prefix</b> { <i>grp-ip-address/mask</i>   <i>grp-ip-address netmask</i> }                                 |
| <b>Context</b> | config>service>vprn>pim>rp>static                                                                                       |
| <b>Context</b> | The <b>group-prefix</b> for a static-rp defines a range of multicast-ip-addresses for which a certain RP is applicable. |

## VPRN Service Configuration Commands

The **no** form of the command removes the criterion.

|                   |                                                                                                                                                                                                                                                                                                            |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | none                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b> | <i>grp-ip-address</i> — Specify the multicast IP address.<br><i>mask</i> — Defines the mask of the multicast-ip-address.<br><b>Values</b> 4 — 32<br><i>netmask</i> — Enter the subnet mask in dotted decimal notation.<br><b>Values</b> 0.0.0.0 — 255.255.255.255 (network bits all 1 and host bits all 0) |

## override

|                    |                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] override</b>                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>pim>rp>static                                                                                                                                                                            |
| <b>Description</b> | This command changes the precedence of static RP over dynamically learned Rendezvous Point (RP).<br><br>When enabled, the static group-to-RP mappings take precedence over the dynamically learned mappings. |
| <b>Default</b>     | no override                                                                                                                                                                                                  |

## spt-switchover-threshold

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>spt-switchover-threshold</b> { <i>grp-ip-address/mask</i>   <i>grp-ip-address netmask</i> } <i>spt-threshold</i><br><b>no spt-switchover-threshold</b> { <i>grp-ip-address/mask</i>   <i>grp-ip-address netmask</i> }                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>pim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command configures a shortest path tree (SPT tree) switchover threshold for a group prefix.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>grp-ip-address</i> — Specify the multicast group address.<br><i>mask</i> — Defines the mask of the multicast-ip-address.<br><b>Values</b> 4 — 32<br><i>netmask</i> — Enter the subnet mask in dotted decimal notation.<br><b>Values</b> 0.0.0.0 — 255.255.255.255 (network bits all 1 and host bits all 0)<br><i>spt-threshold</i> — Specifies the configured threshold in kilo-bits per second(kbps) for the group to which this (S,G) belongs. For a group G configured with a threshold, switchover to SPT for an (S,G) is attempted only if the (S,G)'s rate exceeds this configured threshold. |



## ssm-groups

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ssm-groups</b>                                                                                         |
| <b>Context</b>     | config>service>vpn                                                                                             |
| <b>Description</b> | This command enables access to the context to enable a source-specific multicast (SSM) configuration instance. |
| <b>Default</b>     | none                                                                                                           |

---

## BGP Commands

### bgp

|                    |                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bgp</b>                                                                                                                                          |
| <b>Context</b>     | service>vprn                                                                                                                                             |
| <b>Description</b> | This command enables the BGP protocol with the VPRN service.<br>The <b>no</b> form of the command disables the BGP protocol from the given VPRN service. |
| <b>Default</b>     | no bgp                                                                                                                                                   |

### advertise-inactive

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] advertise-inactive</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command enables or disables the advertising of inactive BGP routes to other BGP peers.<br>By default, BGP only advertises BGP routes to other BGP peers if a given BGP route is chosen by the route table manager as the most preferred route within the system and is active in the forwarding plane. This command allows system administrators to advertise a BGP route even though it is not the most preferred route within the system for a given destination. |
| <b>Default</b>     | no advertise-inactive                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### aggregator-id-zero

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] aggregator-id-zero</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command is used to set the router ID in the BGP aggregator path attribute to zero when BGP aggregates routes. This prevents different routers within an AS from creating aggregate routes that contain different AS paths.<br><br>When BGP is aggregating routes, it adds the aggregator path attribute to the BGP update messages. By default, BGP adds the AS number and router ID to the aggregator path attribute.<br><br>When this command is enabled, BGP adds the router ID to the aggregator path attribute. This command is used at the group level to revert to the value defined under the global level, while this command is used at the neighbor level to revert to the value defined under the group level. |

The **no** form of the command used at the global level reverts to default where BGP adds the AS number and router ID to the aggregator path attribute.

The **no** form of the command used at the group level reverts to the value defined at the group level.

The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

**Default** no aggregator-id-zero — BGP adds the AS number and router ID to the aggregator path attribute.

## always-compare-med

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>always-compare-med {zero   infinity}</b><br><b>no always-compare-med</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>bgp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command specifies how the Multi-Exit Discriminator (MED) path attribute is used in the BGP route selection process. The MED attribute is always used in the route selection process regardless of the peer AS that advertised the route. This parameter determines what MED value is inserted in the RIB-IN. If this parameter is not configured, only the MEDs of routes that have the same peer ASs are compared.</p> <p>The <b>no</b> form of the command removes the parameter from the configuration.</p> |
| <b>Default</b>     | no always-compare-med — Only compare MEDs of routes that have the same peer AS.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><b>zero</b> — Specifies that for routes learned without a MED attribute that a zero (0) value is used in the MED comparison. The routes with the lowest metric are the most preferred.</p> <p><b>infinity</b> — Specifies for routes learned without a MED attribute that a value of infinity (4294967295) is used in the MED comparison. This in effect makes these routes the least desirable.</p>                                                                                                                |

## as-path-ignore

|                    |                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] as-path-ignore</b>                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>bgp                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command determines whether the AS path is used to determine the best BGP route.</p> <p>If this option is present, the AS paths of incoming routes are not used in the route selection process.</p> <p>The <b>no</b> form of the command removes the parameter from the configuration.</p> |
| <b>Default</b>     | no as-path-ignore                                                                                                                                                                                                                                                                                 |

## as-override

|                    |                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] as-override</b>                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                |
| <b>Description</b> | This command replaces all instances of the peer's AS number with the local AS number in a BGP route's AS_PATH.<br><br>This command breaks BGP's loop detection mechanism. It should be used carefully. |
| <b>Default</b>     | as-override is not enabled by default.                                                                                                                                                                 |

## authentication-key

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-key</b> <i>[authentication-key   hash-key]</i> [ <b>hash</b>   <b>hash2</b> ]<br><b>no authentication-key</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command configures the BGP authentication key.<br><br>Authentication is performed between neighboring routers before setting up the BGP session by verifying the password. Authentication is performed using the MD-5 message-based digest. The authentication key can be any combination of letters or numbers from 1 to 16.<br><br>The no form of the command removes the authentication password from the configuration and effectively disables authentication.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Default</b>     | Authentication is disabled and the authentication password is empty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>authentication-key</i> — The authentication key. The key can be any combination of ASCII characters up to 255 characters in length (unencrypted). If spaces are used in the string, enclose the entire string in quotation marks (" ").</p> <p><i>hash-key</i> — The hash key. The key can be any combination of ASCII characters up to 342 characters in length (encrypted). If spaces are used in the string, enclose the entire string in quotation marks (" ").</p> <p>This is useful when a user must configure the parameter, but, for security purposes, the actual unencrypted key value is not provided.</p> <p><b>hash</b> — Specifies the key is entered in an encrypted form. If the <b>hash</b> parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the <b>hash</b> parameter specified.</p> <p><b>hash2</b> — Specifies the key is entered in a more complex encrypted form. If the <b>hash2</b> parameter is not used, the less encrypted <b>hash</b> form is assumed.</p> |

## auth-keychain

|                    |                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>auth-keychain</b> <i>name</i>                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                 |
| <b>Description</b> | This command configures the BGP authentication key for all peers.<br><br>The keychain allows the rollover of authentication keys during the lifetime of a session. |
| <b>Default</b>     | <b>no auth-keychain</b>                                                                                                                                            |
| <b>Parameters</b>  | <i>name</i> — Specifies the name of an existing keychain, up to 32 characters, to use for the specified TCP session or sessions.                                   |

## bfd-enable

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bfd-enable</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>router>bgp<br>config>router>bgp>group<br>config>router>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command enables the use of bi-directional forwarding (BFD) to control the state of the associated protocol interface. By enabling BFD on a given protocol interface, the state of the protocol interface is tied to the state of the BFD session between the local node and the remote node. The parameters used for the BFD are set via the BFD command under the IP interface.<br><br>The <b>no</b> form of this command removes BFD from the associated BGP protocol peering. |
| <b>Default</b>     | <b>no bfd-enable</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## cluster

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cluster</b> <i>cluster-id</i><br><b>no cluster</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command configures the cluster ID for a route reflector server.<br><br>Route reflectors are used to reduce the number of IBGP sessions required within an AS. Normally, all BGP speakers within an AS must have a BGP peering with every other BGP speaker in an AS. A route reflector and its clients form a cluster. Peers that are not part of the cluster are considered to be non-clients.<br><br>When a route reflector receives a route, first it must select the best path from all the paths received. If the route was received from a non-client peer, then the route reflector sends the route to all clients in |

the cluster. If the route came from a client peer, the route reflector sends the route to all non-client peers and to all client peers except the originator.

For redundancy, a cluster can have multiple route reflectors.

Confederations can also be used to remove the full IBGP mesh requirement within an AS.

The **no** form of the command deletes the cluster ID and effectively disables the Route Reflection for the given group.

**Default** no cluster — No cluster ID is defined.

**Parameters** *cluster-id* — The route reflector cluster ID is expressed in dot decimal notation.

**Values** Any 32 bit number in dot decimal notation. (0.0.0.1 — 255.255.255.255)

## connect-retry

**Syntax** **connect-retry** *seconds*  
**no connect-retry**

**Context** config>service>vprr>bgp  
config>service>vprr>bgp>group  
config>service>vprr>bgp>group>neighbor

**Description** This command configures the BGP connect retry timer value in seconds.

When this timer expires, BGP tries to reconnect to the configured peer. This configuration parameter can be set at three levels: global level (applies to all peers), peer-group level (applies to all peers in group) or neighbor level (only applies to specified peer). The most specific value is used.

The **no** form of the command used at the global level reverts to the default value.

The **no** form of the command used at the group level reverts to the value defined at the global level.

The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

**Default** 120 seconds

**Parameters** *seconds* — The BGP Connect Retry timer value in seconds, expressed as a decimal integer.

**Values** 1 — 65535

## damping

**Syntax** [**no**] **damping**

**Context** config>service>vprr>bgp  
config>service>vprr>bgp>group  
config>service>vprr>bgp>group>neighbor

**Description** This command enables BGP route damping for learned routes which are defined within the route policy. Use damping to reduce the number of update messages sent between BGP peers and reduce the load on peers without affecting the route convergence time for stable routes. Damping parameters are set via route policy definition.

The **no** form of the command used at the global level disables route damping.

The **no** form of the command used at the group level reverts to the value defined at the global level.

The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

When damping is enabled and the route policy does not specify a damping profile, the default damping profile is used. This profile is always present and consists of the following parameters:

Half-life: 15 minutes

Max-suppress: 60 minutes

Suppress-threshold:3000

Reuse-threshold 750

**Default** no damping — Learned route damping is disabled.

## disable-4byte-asn

|                    |                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] disable-4byte-asn</b>                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command disables the use of 4-byte ASNs. It can be configured at all 3 level of the hierarchy so it can be specified down to the per peer basis.<br><br>If this command is enabled 4-byte ASN support should not be negotiated with the associated remote peer(s).<br><br>The <b>no</b> form of the command resets the behavior to the default which is to enable the use of 4-byte ASN. |

## disable-client-reflect

|                    |                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] disable-client-reflect</b>                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                              |
| <b>Description</b> | This command disables the reflection of routes by the route reflector to the group or neighbor. This only disables the reflection of routes from other client peers. Routes learned from non-client peers are still reflected to all clients.<br><br>The <b>no</b> form re-enables client reflection of routes. |
| <b>Default</b>     | no disable-client-reflect — Client routes are reflected to all client peers.                                                                                                                                                                                                                                    |

## disable-communities

|                    |                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>disable-communities</b> [standard] [extended]<br><b>no disable-communities</b>                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                  |
| <b>Description</b> | This command configures BGP to disable sending communities.                                                                                                                                                                         |
| <b>Parameters</b>  | <b>standard</b> — Specifies standard communities that existed before VPRNs or 2547.<br><b>extended</b> — Specifies BGP communities used were expanded after the concept of 2547 was introduced, to include handling the VRF target. |

## disable-fast-external-failover

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] disable-fast-external-failover</b>                                                         |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor |
| <b>Description</b> | This command configures BGP fast external failover.                                                |

## eibgp-loadbalance

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] eibgp-loadbalance</b>                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>bgp                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command enables eiBGP load sharing so routes with both MP-BGP and IPv4 next-hops can be used simultaneously.<br><br>In order for this command to be effective, the <b>ecmp</b> and <b>multipath</b> commands for the associated VPRN instance must also be configured to allow for multiple routes to the same destination.<br><br>The <b>no</b> form of the command used at the global level reverts to default values. |
| <b>Default</b>     | no eibgp-loadbalance — Multipath disabled.                                                                                                                                                                                                                                                                                                                                                                                    |



## enable-peer-tracking

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] enable-peer-tracking</b>                                                                   |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor |
| <b>Description</b> | This command enables BGP peer tracking.                                                            |
| <b>Default</b>     | no enable-peer-tracking                                                                            |

## graceful-restart

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] graceful-restart</b>                                                                       |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor |
| <b>Description</b> | This command enables or disables graceful-restart for all VPRN BGP peers.                          |

## stale-routes-time

|                    |                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] stale-routes-time</b> <i>time</i>                                                                                                             |
| <b>Context</b>     | config>service>vprn>bgp>graceful-restart<br>config>service>vprn>bgp>group>graceful-restart<br>config>service>vprn>bgp>group>neighbor>graceful-restart |
| <b>Description</b> | This command configures the time period to keep stale routes before the END-OF-RIB message is received from the restarting router.                    |
| <b>Parameters</b>  | <i>time</i> — [1..3600 seconds]                                                                                                                       |
| <b>Default</b>     | 360 seconds                                                                                                                                           |

## export

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>export</b> <i>policy</i> [ <i>policy...</i> ]<br><b>no export</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor<br>config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command specifies the export policies to be used to control routes advertised to BGP neighbors. When multiple policy names are specified, the policies are evaluated in the order they are specified. A maximum of five (5) policy names can be configured. The first policy that matches is applied.</p> <p>Note that if a non-existent route policy is applied to a VPRN instance, the CLI generates a warning message. This message is only generated at an interactive CLI session and the route policy association is made. No warning message is generated when a non-existent route policy is applied to a VPRN instance in a configuration file or when SNMP is used.</p> <p>The <b>no</b> form of this command removes all route policy names from the export list.</p> |
| <b>Default</b>     | no export — BGP advertises routes from other BGP routes but does not advertise any routes from other protocols unless directed by an export policy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>policy</i> — A route policy statement name.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## family

|                    |                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>family</b> [ <i>ipv4</i> ] [ <i>ipv6</i> ]<br><b>no family</b>                                                         |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                        |
| <b>Description</b> | <p>This command configures the IP family capability.</p> <p>The <b>no</b> form of the command reverts to the default.</p> |
| <b>Default</b>     | no family                                                                                                                 |
| <b>Parameters</b>  | <i>ipv4</i> — Provisions IPv4 support.<br><i>ipv6</i> — Provisions IPv6 support..                                         |

## group

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>group</b> <i>name</i> [ <b>dynamic-peer</b> ]<br><b>no group</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>bgp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command creates a context to configure a BGP peer group.<br><br>The <b>no</b> form of the command deletes the specified peer group and all configurations associated with the peer group. The group must be shutdown before it can be deleted.                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Default</b>     | None — No peer groups are defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>name</i> — The peer group name. Allowed values is a string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.<br><br><b>dynamic-peer</b> — This flag designates that the given BGP group will be used by BGP peers created dynamically based on subscriber-hosts pointing to corresponding BGP peering policy. There can be only one BGP group with this flag set in any given VPRN. No bBGP neighbours can be manually configured in a BGP group with this flag set.<br><br><b>Default</b> disabled |

## neighbor

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                      |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------|---------|--|----------------|---------------------------|--|--|---------------------------------|--|----|------------|--|----|-----------|--|------------|------------------------------------------------------|
| Syntax      | [no] neighbor ip-address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                      |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
| Context     | config>service>vprn>bgp>group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                      |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
| Description | <p>This command creates a BGP peer/neighbor instance within the context of the BGP group.</p> <p>This command can be issued repeatedly to create multiple peers and their associated configuration.</p> <p>The <b>no</b> form of the command is used to remove the specified neighbor and the entire configuration associated with the neighbor. The neighbor must be administratively <b>shutdown</b> before attempting to delete it. If the neighbor is not shutdown, the command will not result in any action except a warning message on the console indicating that neighbor is still administratively up.</p> |                                                      |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
| Default     | none — No neighbors are defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                      |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
| Parameters  | <p>ip-address — The IP address of the BGP peer router in dotted decimal notation.</p> <table><tr><td>Values</td><td>ipv4-address :</td><td>a.b.c.d</td></tr><tr><td></td><td>ipv6-address :</td><td>x:x:x:x:x:x:x[-interface]</td></tr><tr><td></td><td></td><td>x:x:x:x:x:x:d.d.d.d[-interface]</td></tr><tr><td></td><td>x:</td><td>[0..FFFF]H</td></tr><tr><td></td><td>d:</td><td>[0..255]D</td></tr><tr><td></td><td>interface:</td><td>32 chars maximum, mandatory for link local addresses</td></tr></table>                                                                                                  | Values                                               | ipv4-address : | a.b.c.d |  | ipv6-address : | x:x:x:x:x:x:x[-interface] |  |  | x:x:x:x:x:x:d.d.d.d[-interface] |  | x: | [0..FFFF]H |  | d: | [0..255]D |  | interface: | 32 chars maximum, mandatory for link local addresses |
| Values      | ipv4-address :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | a.b.c.d                                              |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
|             | ipv6-address :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | x:x:x:x:x:x:x[-interface]                            |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | x:x:x:x:x:x:d.d.d.d[-interface]                      |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
|             | x:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | [0..FFFF]H                                           |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
|             | d:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | [0..255]D                                            |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |
|             | interface:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 32 chars maximum, mandatory for link local addresses |                |         |  |                |                           |  |  |                                 |  |    |            |  |    |           |  |            |                                                      |

## family

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>family [ipv4] [ipv6]</b><br><b>no family</b>                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command specifies the address family or families to be supported over BGP peerings in the base router. This command is additive so issuing the <b>family</b> command adds the specified address family to the list.</p> <p>The <b>no</b> form of the command removes the specified address family from the associated BGP peerings. If an address family is not specified, then reset the supported address family back to the default.</p> |
| <b>Default</b>     | ipv4                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><b>ipv4</b> — Provisions support for IPv4 routing information.</p> <p><b>ipv6</b> — Exchange IPv6 routing information.</p>                                                                                                                                                                                                                                                                                                                       |

## hold-time

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>hold-time seconds [strict]</b><br><b>no hold-time</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures the BGP hold time, expressed in seconds.</p> <p>The BGP hold time specifies the maximum time BGP waits between successive messages (either keepalive or update) from its peer, before closing the connection. This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in group) or neighbor level (only applies to specified peer). The most specific value is used.</p> <p>Even though the router OS implementation allows setting the <b>keepalive</b> time separately, the configured <b>keepalive</b> timer is overridden by the <b>hold-time</b> value under the following circumstances:</p> <ol style="list-style-type: none"> <li>1. If the specified hold-time is less than the configured <b>keepalive</b> time, then the operational <b>keepalive</b> time is set to a third of the <b>hold-time</b>; the configured <b>keepalive</b> time is not changed.</li> <li>2. If the <b>hold-time</b> is set to zero, then the operational value of the <b>keepalive</b> time is set to zero; the configured <b>keepalive</b> time is not changed. This means that the connection with the peer is up permanently and no <b>keepalive</b> packets are sent to the peer.</li> </ol> <p>The <b>no</b> form of the command used at the global level reverts to the default value.<br/>The <b>no</b> form of the command used at the group level reverts to the value defined at the global level.<br/>The <b>no</b> form of the command used at the neighbor level reverts to the value defined at the group level.</p> |
| <b>Default</b>     | 90 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|                   |                                                                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>seconds</i> — The hold-time, in seconds, expressed as a decimal integer. A value of 0 indicates the connection to the peer is up permanently. |
| <b>Values</b>     | 0, 3 — 65535                                                                                                                                     |
| <b>strict</b>     | — When this parameter is specified, the advertised BGP hold-time from the far-end BGP peer must be greater than or equal to the specified value. |

## ibgp-multipath

|                    |                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ibgp-multipath</b>                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>bgp                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command defines the type of IBGP multipath to use when adding BGP routes to the route table if the route resolving the BGP nexthop offers multiple nexthops.<br><br>The <b>no</b> form of the command resets the IBGP multipath feature to the default value ( <i>load-balance</i> ). |
| <b>Default</b>     | ibgp-multipath load-balance                                                                                                                                                                                                                                                                |

## import

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>import</b> <i>policy</i> [ <i>policy</i> ...]<br><b>no import</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command specifies the import policies to be used to control routes advertised to BGP neighbors. Route policies are configured in the <b>config&gt;router&gt;policy-options</b> context. When multiple policy names are specified, the policies are evaluated in the order they are specified. A maximum of five (5) policy names can be specified. The first policy that matches is applied.<br><br>The <b>no</b> form of this command removes all route policy names from the import list. |
| <b>Default</b>     | no import — BGP accepts all routes from configured BGP neighbors. Import policies can be used to limit or modify the routes accepted and their corresponding parameters and metrics.                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <i>policy</i> — A route policy statement name.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## keepalive

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>keepalive</b> <i>seconds</i><br><b>no keepalive</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command configures the BGP keepalive timer. A keepalive message is sent every time this timer expires. The <i>seconds</i> parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in peer-group) or neighbor level (only applies to specified peer). The most specific value is used.</p> <p>The <b>keepalive</b> value is generally one-third of the <b>hold-time</b> interval. Even though the OS implementation allows the <b>keepalive</b> value and the <b>hold-time</b> interval to be independently set, under the following circumstances, the configured <b>keepalive</b> value is overridden by the <b>hold-time</b> value:</p> <p>If the specified <b>keepalive</b> value is greater than the configured <b>hold-time</b>, then the specified value is ignored, and the <b>keepalive</b> is set to one third of the current <b>hold-time</b> value.</p> <p>If the specified <b>hold-time</b> interval is less than the configured <b>keepalive</b> value, then the <b>keepalive</b> value is reset to one third of the specified <b>hold-time</b> interval.</p> <p>If the <b>hold-time</b> interval is set to zero, then the configured value of the <b>keepalive</b> value is ignored. This means that the connection with the peer is up permanently and no <b>keepalive</b> packets are sent to the peer.</p> <p>The <b>no</b> form of the command used at the global level reverts to the default value.<br/>The <b>no</b> form of the command used at the group level reverts to the value defined at the global level.<br/>The <b>no</b> form of the command used at the neighbor level reverts to the value defined at the group level.</p> |
| <b>Default</b>     | 30 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>seconds</i> — The keepalive timer in seconds, expressed as a decimal integer.<br><b>Values</b> 0 — 21845                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## local-address

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-address</b> <i>ip-address</i><br><b>no local-address</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>Configures the local IP address used by the group or neighbor when communicating with BGP peers. Outgoing connections use the <b>local-address</b> as the source of the TCP connection when initiating connections with a peer.</p> <p>When a local address is not specified, the 7750 SR OS uses the system IP address when communicating with IBGP peers and uses the interface address for directly connected EBGP peers. This command is used at the neighbor level to revert to the value defined under the group level.</p> |

The **no** form of the command removes the configured local-address for BGP.

The **no** form of the command used at the group level reverts to the value defined at the global level.

The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

**Default**     **no local-address** — The router ID is used when communicating with IBGP peers and the interface address is used for directly connected EBGP peers.

*ip-address* — The local address expressed in dotted decimal notation. Allowed values are a valid routable IP address on the router, either an interface or system IP address.

## local-as

**Syntax**     **local-as** *as-number* [**private**]  
**no local-as**

**Context**     config>service>vprn>bgp  
 config>service>vprn>bgp>group  
 config>service>vprn>bgp>group>neighbor

**Description**     This command configures a BGP virtual autonomous system (AS) number.

In addition to the AS number configured for BGP in the `config>router>autonomous-system` context, a virtual (local) AS number is configured. The virtual AS number is added to the as-path message before the router's AS number makes the virtual AS the second AS in the as-path.

This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in peer-group) or neighbor level (only applies to specified peer). Thus, by specifying this at each neighbor level, it is possible to have a separate as-number per EBGP session.

When a command is entered multiple times for the same AS, the last command entered is used in the configuration. The **private** attribute can be added or removed dynamically by reissuing the command.

Changing the local AS at the global level in an active BGP instance causes the BGP instance to restart with the new local AS number. Changing the local AS at the global level in an active BGP instance causes BGP to re-establish the peer relationships with all peers in the group with the new local AS number. Changing the local AS at the neighbor level in an active BGP instance causes BGP to re-establish the peer relationship with the new local AS number.

This is an optional command and can be used in the following circumstance:

Provider router P is moved from AS1 to AS2. The customer router that is connected to P, however, is configured to belong to AS1. To avoid reconfiguring the customer router, the **local-as** value on router P can be set to AS1. Thus, router P adds AS1 to the as-path message for routes it advertises to the customer router.

The **no** form of the command used at the global level will remove any virtual AS number configured.

The **no** form of the command used at the group level reverts to the value defined at the global level.

The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

**Default**     no local-as

**Parameters**     *as-number* — The virtual autonomous system number, expressed as a decimal integer.

**Values**         1 — 65535

**private** — Specifies the local-as is hidden in paths learned from the peering.

## local-preference

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-preference</b> <i>local-preference</i><br><b>no local-preference</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables setting the BGP local-preference attribute in incoming routes if not specified and configures the default value for the attribute. This value is used if the BGP route arrives from a BGP peer without the <b>local-preference</b> integer set.</p> <p>The specified value can be overridden by any value set via a route policy. This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in peer-group) or neighbor level (only applies to specified peer). The most specific value is used.</p> <p>The <b>no</b> form of the command at the global level specifies that incoming routes with local-preference set are not overridden and routes arriving without local-preference set are interpreted as if the route had local-preference value of 100.</p> <p>The <b>no</b> form of the command used at the group level reverts to the value defined at the global level.</p> <p>The <b>no</b> form of the command used at the neighbor level reverts to the value defined at the group level.</p> |
| <b>Default</b>     | <b>no local-preference</b> — Does not override the local-preference value set in arriving routes and analyze routes without local preference with value of 100.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><i>local-preference</i> — The local preference value to be used as the override value, expressed as a decimal integer.</p> <p><b>Values</b>      0 — 4294967295</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## loop-detect

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>loop-detect</b> { <b>drop-peer</b>   <b>discard-route</b>   <b>ignore-loop</b>   <b>off</b> }<br><b>no loop-detect</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures how the BGP peer session handles loop detection in the AS path.</p> <p>This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in peer-group) or neighbor level (only applies to specified peer). The most specific value is used.</p> <p>Note that dynamic configuration changes of <b>loop-detect</b> are not recognized.</p> <p>The <b>no</b> form of the command used at the global level reverts to default, which is <b>loop-detect ignore-loop</b>.</p> |



The **no** form of the command used at the group level reverts to the value defined at the global level.  
 The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

**Default** loop-detect ignore-loop

**Parameters** **drop-peer** — Sends a notification to the remote peer and drops the session.  
**discard-route** — Discards routes received with loops in the AS path.  
**ignore-loop** — Ignores routes with loops in the AS path but maintains peering.  
**off** — Disables loop detection.

## med-out

**Syntax** **med-out {number | igp-cost}**  
**no med-out**

**Context** config>service>vprn>bgp  
 config>service>vprn>bgp>group  
 config>service>vprn>bgp>group>neighbor

**Description** This command enables advertising the Multi-Exit Discriminator (MED) and assigns the value used for the path attribute for the MED advertised to BGP peers if the MED is not already set.  
 The specified value can be overridden by any value set via a route policy.  
 This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in peer-group) or neighbor level (only applies to specified peer). The most specific value is used.  
 The **no** form of the command used at the global level reverts to default where the MED is not advertised.  
 The **no** form of the command used at the group level reverts to the value defined at the global level.  
 The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

**Default** no med-out

**Parameters** *number* — The MED path attribute value, expressed as a decimal integer.  
**Values** 0 — 4294967295  
**igp-cost** — The MED is set to the IGP cost of the given IP prefix.

## min-as-origination

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>min-as-origination</b> <i>seconds</i><br><b>no min-as-origination</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command configures the minimum interval, in seconds, at which a path attribute, originated by the local router, can be advertised to a peer.</p> <p>This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in peer-group) or neighbor level (only applies to specified peer). The most specific value is used.</p> <p>The <b>no</b> form of the command used at the global level reverts to default.</p> <p>The <b>no</b> form of the command used at the group level reverts to the value defined at the global level.</p> <p>The <b>no</b> form of the command used at the neighbor level reverts to the value defined at the group level.</p> |
| <b>Default</b>     | 15 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>seconds</i> — The minimum path attribute advertising interval in seconds, expressed as a decimal integer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Values</b>      | 2 — 255                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## min-route-advertisement

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>min-route-advertisement</b> <i>seconds</i><br><b>no min-route-advertisement</b>                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command configures the minimum interval, in seconds, at which a prefix can be advertised to a peer.</p> <p>This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in peer-group) or neighbor level (only applies to specified peer). The most specific value is used.</p> <p>The <b>no</b> form of the command reverts to default values.</p> |
| <b>Default</b>     | 30 seconds                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>seconds</i> — The minimum route advertising interval, in seconds, expressed as a decimal integer.                                                                                                                                                                                                                                                                                                                           |
| <b>Values</b>      | 1 — 255                                                                                                                                                                                                                                                                                                                                                                                                                        |

## multihop

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multihop</b> <i>ttl-value</i><br><b>no multihop</b>                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command configures the time to live (TTL) value entered in the IP header of packets sent to an EBGP peer multiple hops away.</p> <p>This parameter is meaningful only when configuring EBGP peers. It is ignored if set for an IBGP peer.</p> <p>The <b>no</b> form of the command is used to convey to the BGP instance that the EBGP peers are directly connected.</p> <p>The <b>no</b> form of the command reverts to default values.</p> |
| <b>Default</b>     | <p><b>1</b> — EBGP peers are directly connected.</p> <p><b>64</b> — IBGP</p>                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>ttl-value</i> — The TTL value, expressed as a decimal integer.</p> <p><b>Values</b>      1 — 255</p>                                                                                                                                                                                                                                                                                                                                           |

## multipath

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multipath</b> <i>max-paths</i> [ <i>eibgp</i> ]<br><b>no multipath</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>bgp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command enables BGP multipath.</p> <p>When multipath is enabled BGP load shares traffic across multiple links. Multipath can be configured to load share traffic across a maximum of 16 routes. If the equal cost routes available are more than the configured value, then routes with the lowest next-hop IP address value are chosen.</p> <p>This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in group) or neighbor level (only applies to specified peer). The most specific value is used.</p> <p>Multipath is effectively disabled if the value is set to one. When multipath is disabled, and multiple equal cost routes are available, the route with the lowest next-hop IP address will be used.</p> <p>The <b>no</b> form of the command used at the global level reverts to default values.</p> |
| <b>Default</b>     | <b>no multipath</b> — Multipath disabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <p><i>integer</i> — The number of equal cost routes to use for multipath routing. If more equal cost routes exist than the configured value, routes with the lowest next-hop value are chosen. Setting this value to 1 disables multipath.</p> <p><b>Values</b>      1 — 16</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**eibgp** — Enables EIBGP load balancing so that routes with both MP-BGP and IPv4 next-hops can be used simultaneously. Enabling this option will disable the nexthop type (MP-BGP or IPv4 and also the next-hop metric comparison).

### next-hop-self

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] next-hop-self</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command configures the group or neighbor to always set the NEXTHOP path attribute to its own physical interface when advertising to a peer.</p> <p>This is primarily used to avoid third-party route advertisements when connected to a multi-access network.</p> <p>The <b>no</b> form of the command used at the group level allows third-party route advertisements in a multi-access network.</p> <p>The <b>no</b> form of the command used at the neighbor level reverts to the value defined at the group level.</p> |
| <b>Default</b>     | <b>no next-hop-self</b> — Third-party route advertisements are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### passive

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] passive</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command enables passive mode for the BGP group or neighbor.</p> <p>When in passive mode, BGP will not attempt to actively connect to the configured BGP peers but responds only when it receives a connect open request from the peer.</p> <p>The <b>no</b> form of the command used at the group level disables passive mode where BGP actively attempts to connect to its peers.</p> <p>The <b>no</b> form of the command used at the neighbor level reverts to the value defined at the group level.</p> |
| <b>Default</b>     | <b>no passive</b> — BGP will actively try to connect to all the configured peers.                                                                                                                                                                                                                                                                                                                                                                                                                                   |

### peer-as

|                    |                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>peer-as as-number</b>                                                                                                                  |
| <b>Context</b>     | config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor                                                                   |
| <b>Description</b> | This command configures the autonomous system number for the remote peer. The peer AS number must be configured for each configured peer. |

For EBGp peers, the peer AS number configured must be different from the autonomous system number configured for this router under the global level since the peer will be in a different autonomous system than this router

For IBGP peers, the peer AS number must be the same as the autonomous system number of this router configured under the global level.

This is a required command for each configured peer. This may be configured under the group level for all neighbors in a particular group.

|                   |                                                                                  |
|-------------------|----------------------------------------------------------------------------------|
| <b>Default</b>    | No AS numbers are defined.                                                       |
| <b>Parameters</b> | <i>as-number</i> — The autonomous system number, expressed as a decimal integer. |
| <b>Values</b>     | 1 — 65535                                                                        |

## preference

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] preference</b> <i>preference</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command configures the route preference for routes learned from the configured peer(s).</p> <p>This configuration parameter can be set at three levels: global level (applies to all peers), group level (applies to all peers in peer-group) or neighbor level (only applies to specified peer). The most specific value is used.</p> <p>The lower the preference the higher the chance of the route being the active route. The OS assigns BGP routes highest default preference compared to routes that are direct, static or learned via MPLS or OSPF.</p> <p>The <b>no</b> form of the command used at the global level reverts to default value.</p> <p>The <b>no</b> form of the command used at the group level reverts to the value defined at the global level.</p> <p>The <b>no</b> form of the command used at the neighbor level reverts to the value defined at the group level.</p> |
| <b>Default</b>     | 170                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>preference</i> — The route preference, expressed as a decimal integer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Values</b>      | 1 — 255                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## prefix-limit

|                    |                                                                                 |
|--------------------|---------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>prefix-limit</b> <i>limit</i><br><b>no prefix-limit</b>                      |
| <b>Context</b>     | config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor         |
| <b>Description</b> | This command configures the maximum number of routes BGP can learn from a peer. |

## VPRN Service Configuration Commands

When the number of routes reaches 90% of this limit, an SNMP trap is sent. When the limit is exceeded, the BGP peering is dropped and disabled.

The **no** form of the command removes the **prefix-limit**.

|                   |                                                                                                      |
|-------------------|------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | no prefix-limit                                                                                      |
| <b>Parameters</b> | <i>limit</i> — The number of routes that can be learned from a peer, expressed as a decimal integer. |
| <b>Values</b>     | 1 — 4294967295                                                                                       |

### rapid-update

|                    |                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rapid-update</b> {[I2-vpn] [mvpn-ipv4]}<br><b>no rapid-update</b> {[I2-vpn] [mvpn-ipv4]}                                                                                                         |
| <b>Context</b>     | config>service>vprn>bgp                                                                                                                                                                             |
| <b>Description</b> | This command enables and disables BGP rapid update for specified address-families. When no parameter is given for the no rapid-update statement, rapid update is disabled for all address-families. |
| <b>Default</b>     | no rapid-update                                                                                                                                                                                     |

### rapid-withdrawal

|                    |                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>rapid-withdrawal</b>                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>bgp                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command disables the delay (Minimum Route Advertisement) on sending BGP withdrawals. Normal route withdrawals may be delayed up to the minimum route advertisement to allow for efficient packing of BGP updates.</p> <p>The <b>no</b> form of the command removes this command from the configuration and returns withdrawal processing to the normal behavior.</p> |
| <b>Default</b>     | no rapid-withdrawal                                                                                                                                                                                                                                                                                                                                                          |

### remove-private

|                    |                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>remove-private</b>                                                                                  |
| <b>Context</b>     | config>service>vprn>bgp<br>config>service>vprn>bgp>group<br>config>service>vprn>bgp>group>neighbor          |
| <b>Description</b> | This command allows private AS numbers to be removed from the AS path before advertising them to BGP peers. |

When the **remove-private** parameter is set at the global level, it applies to all peers regardless of group or neighbor configuration. When the parameter is set at the group level, it applies to all peers in the group regardless of the neighbor configuration.

The OS software recognizes the set of AS numbers that are defined by IANA as private. These are AS numbers in the range 64512 through 65535, inclusive.

The **no** form of the command used at the global level reverts to default value. The **no** form of the command used at the group level reverts to the value defined at the global level. The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

**Default** **no remove-private** — Private AS numbers will be included in the AS path attribute.

## type

**Syntax** **[no] type {internal | external}**

**Context** config>service>vpn>bgp>group  
config>service>vpn>bgp>group>neighbor

**Description** This command designates the BGP peer as type internal or external.

The type of **internal** indicates the peer is an IBGP peer while the type of external indicates that the peer is an EBGP peer.

By default, the OS derives the type of neighbor based on the local AS specified. If the local AS specified is the same as the AS of the router, the peer is considered **internal**. If the local AS is different, then the peer is considered **external**.

The **no** form of the command used at the group level reverts to the default value.  
The **no** form of the command used at the neighbor level reverts to the value defined at the group level.

**Default** **no type** — Type of neighbor is derived on the local AS specified.

**Parameters** **internal** — Configures the peer as internal.  
**external** — Configures the peer as external.

## ttl-security

**Syntax** **ttl-security min-ttl-value**  
**no ttl-security**

**Context** config>service>vpn>bgp>group  
config>service>vpn>bgp>group>neighbor

**Description** Configure TTL security parameters for incoming packets.

**Parameters** *min-ttl-value* — Specify the minimum TTL value for an incoming BGP packet.

**Values** 1 — 255

**Default** 1

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## OSPF Commands

### ospf

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ospf</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command enables access to the context to enable an OSPF protocol instance.</p> <p>When an OSPF instance is created, the protocol is enabled. To start or suspend execution of the OSPF protocol without affecting the configuration, use the <b>no shutdown</b> command.</p> <p>The <b>no</b> form of the command deletes the OSPF protocol instance removing all associated configuration parameters.</p> |
| <b>Default</b>     | <b>no ospf</b> — The OSPF protocol is not enabled.                                                                                                                                                                                                                                                                                                                                                                 |

### ospf3

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ospf3</b>                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command enables access to the context to enable an OSPF3 protocol instance.</p> <p>When an OSPF3 instance is created, the protocol is enabled. To start or suspend execution of the OSPF protocol without affecting the configuration, use the <b>no shutdown</b> command.</p> <p>The <b>no</b> form of the command deletes the OSPF3 protocol instance removing all associated configuration parameters.</p> |
| <b>Default</b>     | <b>no ospf3</b> — The OSPF3 protocol is not enabled.                                                                                                                                                                                                                                                                                                                                                                  |

### area

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] area <i>area-id</i></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>ospf<br>config>service>vprn>ospf3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command creates the context to configure an OSPF area. An area is a collection of network segments within an AS that have been administratively grouped together. The area ID can be specified in dotted decimal notation or as a 32-bit decimal integer.</p> <p>The <b>no</b> form of the command deletes the specified area from the configuration. Deleting the area also removes the OSPF configuration of all the interfaces, virtual-links, sham-links, and address-ranges etc., that are currently assigned to this area.</p> |
| <b>Default</b>     | <b>no area</b> — No OSPF areas are defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



|                   |                                                                                                        |
|-------------------|--------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>area-id</i> — The OSPF area ID expressed in dotted decimal notation or as a 32-bit decimal integer. |
| <b>Values</b>     | 0.0.0.0 — 255.255.255.255 (dotted decimal)<br>0 — 4294967295 (decimal integer)                         |

## area-range

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>area-range</b> <i>ip-prefix/prefix-length</i> [ <b>advertise</b>   <b>not-advertise</b> ]<br><b>no area-range</b> <i>ip-prefix/mask</i><br><b>area-range</b> <i>ipv6-prefix/prefix-length</i> [ <b>advertise</b>   <b>not-advertise</b> ]<br><b>no area-range</b> <i>ip-prefix/mask</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>       | config>service>vprn>ospf>area<br>ospf>service>vprn>nssa<br>config>service>vprn>ospf3>area                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>   | <p>This command creates ranges of addresses on an Area Border Router (ABR) for the purpose of route summarization or suppression. When a range is created, the range is configured to be advertised or not advertised into other areas. Multiple range commands may be used to summarize or hide different ranges. In the case of overlapping ranges, the most specific range command applies.</p> <p>ABRs send summary link advertisements to describe routes to other areas. To minimize the number of advertisements that are flooded, you can summarize a range of IP addresses and send reachability information about these addresses in an LSA.</p> <p>The <b>no</b> form of the command deletes the range (non) advertisement.</p>                                                                                                                                                                                                                                    |
| <b>Default</b>       | <b>no area-range</b> — No range of addresses are defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Special Cases</b> | <p><b>NSSA Context</b> — In the NSSA context, the option specifies that the range applies to external routes (via type-7 LSAs) learned within the NSSA when the routes are advertised to other areas as type-5 LSAs.</p> <p><b>Area Context</b> — If this command is not entered under the NSSA context, the range applies to summary LSAs even if the area is an NSSA.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>    | <p><i>ipv6-prefix/prefix-length</i> — The IP prefix in dotted decimal notation for the range used by the ABR to advertise that summarizes the area into another area.</p> <p><b>Values</b>      <i>ipv6-prefix</i> - x:x:x:x:x:x:x:x (eight 16-bit pieces)<br/>                  x:x:x:x:x:d.d.d.d<br/>                  - x [0..FFFF]H - d [0..255]D<br/>                  <i>prefix-length</i> - [0..128]</p> <p><i>mask</i> — The subnet mask for the range expressed as a decimal integer mask length or in dotted decimal notation.</p> <p><b>Values</b>      0 — 32 (mask length), 0.0.0.0 — 255.255.255.255 (dotted decimal)</p> <p><b>advertise</b>   <b>not-advertise</b> — Specifies whether or not to advertise the summarized range of addresses into other areas. The <b>advertise</b> keyword indicates the range will be advertised, and the keyword <b>not-advertise</b> indicates the range will not be advertised.<br/>The default is <b>advertise</b>.</p> |

## blackhole-aggregate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] blackhole-aggregate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>ospf>area<br>config>service>vprn>ospf3>area                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command installs a low priority blackhole route for the entire aggregate. Existing routes that make up the aggregate will have a higher priority and only the components of the range for which no route exists are blackholed.</p> <p>It is possible that when performing area aggregation, addresses may be included in the range for which no actual route exists. This can cause routing loops. To avoid this problem configure the blackhole aggregate option.</p> <p>Use the no form of this command to remove this option.</p> |
| <b>Default</b>     | blackhole-aggregate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] interface</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>ospf>area<br>config>service>vprn>ospf3>area                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command creates a context to configure an OSPF interface.</p> <p>By default interfaces are not activated in any interior gateway protocol such as OSPF unless explicitly configured.</p> <p>The <b>no</b> form of the command deletes the OSPF interface configuration for this interface. The <b>shutdown</b> command in the config&gt;router&gt;ospf&gt;interface context can be used to disable an interface without removing the configuration for the interface.</p>                                                                                                                                                                                                                                                |
| <b>Default</b>     | <b>no interface</b> — No OSPF interfaces are defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><i>ip-int-name</i> — The IP interface name. Interface names must be unique within the group of defined IP interfaces for <b>config router interface</b> and <b>config service vprn interface</b> commands. An interface name cannot be in the form of an IP address. Interface names can be any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p>If the IP interface name does not exist or does not have an IP address configured an error message will be returned.</p> <p>If the IP interface exists in a different area it will be moved to this area.</p> |

## sham-link

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sham-link</b> <i>ip-int-name</i> <i>ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>ospf>area                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command is similar to a virtual link with the exception that metric must be included in order to distinguish the cost between the MPLS-VP RN link and the backdoor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><i>ip-int-name</i> — The local interface name used for the sham-link. This is a mandatory parameter and interface names must be unique within the group of defined IP interfaces for <b>config&gt;router&gt;interface</b>, <b>config&gt;service&gt;ies&gt;interface</b> and <b>config&gt;service&gt;vprn&gt;interface</b> commands. An interface name cannot be in the form of an IP address. Interface names can be any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters, the entire string must be enclosed within double quotes. If the IP interface name does not exist or does not have an IP address configured, an error message will be returned.</p> <p><i>ip-address</i> — The IP address of the SHAM-link neighbor in IP address dotted decimal notation. This parameter is the remote peer of the sham link's IP address used to set up the SHAM link. This is a mandatory parameter and must be a valid IP address.</p> |

## advertise-subnet

|                    |                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] advertise-subnet</b>                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>ospf>area>interface                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables advertising point-to-point interfaces as subnet routes (network number and mask). When disabled, point-to-point interfaces are advertised as host routes.</p> <p>Note that this command is not valid in the OSPF3 context.</p> <p>The <b>no</b> form of the command disables advertising point-to-point interfaces as subnet routes meaning they are advertised as host routes.</p> |
| <b>Default</b>     | <b>advertise-subnet</b> — Advertises point-to-point interfaces as subnet routes.                                                                                                                                                                                                                                                                                                                            |

## authentication-key

|                    |                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-key</b> [ <i>authentication-key</i>   <i>hash-key</i> ] [ <b>hash</b>   <b>hash2</b> ]<br><b>no authentication-key</b>                                                                                                                              |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf>area>virtual-link<br>config>service>vprn>ospf>area>sham-link                                                                                                                                      |
| <b>Description</b> | <p>This command configures the password used by the OSPF interface or virtual-link to send and receive OSPF protocol packets on the interface when simple password authentication is configured.</p> <p>Note that this command is not valid in the OSPF3 context.</p> |

All neighboring routers must use the same type of authentication and password for proper protocol communication. If the **authentication-type** is configured as password, then this key must be configured.

By default, no authentication key is configured.

The **no** form of the command removes the authentication key.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>no authentication-key</b> — No authentication key is defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b> | <p><i>authentication-key</i> — The authentication key. The key can be any combination of ASCII characters up to 8 characters in length (unencrypted). If spaces are used in the string, enclose the entire string in quotation marks (“ ”).</p> <p><i>hash-key</i> — The hash key. The key can be any combination of ASCII characters up to 22 characters in length (encrypted). If spaces are used in the string, enclose the entire string in quotation marks (“ ”).</p> <p>This is useful when a user must configure the parameter, but, for security purposes, the actual unencrypted key value is not provided.</p> <p><b>hash</b> — Specifies the key is entered in an encrypted form. If the <b>hash</b> parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the <b>hash</b> parameter specified.</p> <p><b>hash2</b> — Specifies the key is entered in a more complex encrypted form. If the <b>hash2</b> parameter is not used, the less encrypted <b>hash</b> form is assumed.</p> |

## authentication-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-type {password   message-digest}</b><br><b>no authentication-type</b>                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf>area>virtual-link                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command enables authentication and specifies the type of authentication to be used on the OSPF interface, virtual-link, and sham-link.</p> <p>Note that this command is not valid in the OSPF3 context.</p> <p>Both simple <b>password</b> and <b>message-digest</b> authentication are supported.</p> <p>By default, authentication is not enabled on an interface.</p> <p>The <b>no</b> form of the command disables authentication on the interface.</p> |
| <b>Default</b>     | <b>no authentication</b> — No authentication is enabled on an interface.                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><b>password</b> — This keyword enables simple password (plain text) authentication. If authentication is enabled and no authentication type is specified in the command, simple <b>password</b> authentication is enabled.</p> <p><b>message-digest</b> — This keyword enables message digest MD5 authentication in accordance with RFC1321. If this option is configured, then at least one message-digest-key must be configured</p>                           |

## dead-interval

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>dead-interval</b> <i>seconds</i><br><b>no dead-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>       | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf>area>virtual-link<br>config>service>vprn>ospf3>area>interface<br>config>service>vprn>ospf3>area>virtual-link<br>config>service>vprn>ospf>area>sham-link                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>   | This command configures the time, in seconds, that OSPF waits before declaring a neighbor router down. If no hello packets are received from a neighbor for the duration of the dead interval, the router is assumed to be down. The minimum interval must be two times the hello interval.<br><br>The <b>no</b> form of the command reverts to the default value.                                                                                                                                                                        |
| <b>Default</b>       | 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Special Cases</b> | <b>OSPF Interface</b> — If the <b>dead-interval</b> configured applies to an interface, then all nodes on the subnet must have the same dead interval.<br><br><b>Virtual Link</b> — If the <b>dead-interval</b> configured applies to a virtual link, then the interval on both termination points of the virtual link must have the same dead interval.<br><br><b>Sham-link</b> — If the <b>dead-interval</b> configured applies to a sham-link, then the interval on both endpoints of the sham-link must have the same dead interval . |
| <b>Parameters</b>    | <i>seconds</i> — The dead interval expressed as a decimal integer.<br><br><b>Values</b> 2 — 2147483647 seconds                                                                                                                                                                                                                                                                                                                                                                                                                            |

## graceful-restart

|                    |                                                                  |
|--------------------|------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] graceful-restart</b>                                     |
| <b>Context</b>     | config>service>vprn>ospf                                         |
| <b>Description</b> | This command enables or disables graceful-restart for VPRN OSPF. |

## helper-disable

|                    |                                               |
|--------------------|-----------------------------------------------|
| <b>Syntax</b>      | <b>helper-disable</b>                         |
| <b>Context</b>     | config>service>vprn>ospf>graceful-restart     |
| <b>Description</b> | This command disables the GR helper function. |

## hello-interval

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>        | <b>hello-interval</b> <i>seconds</i><br><b>no hello-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>       | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf3>area>interface<br>config>service>vprn>ospf>area>virtual-link<br>config>service>vprn>ospf3>area>virtual-link<br>config>service>vprn>ospf>area>sham-link                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>   | <p>This command configures the interval between OSPF hellos issued on the interface, virtual link, or sham-link.</p> <p>The hello interval, in combination with the dead-interval, is used to establish and maintain the adjacency. Use this parameter to edit the frequency that hello packets are sent.</p> <p>Reducing the interval, in combination with an appropriate reduction in the associated <b>dead-interval</b>, allows for faster detection of link and/or router failures at the cost of higher processing costs.</p> <p>The <b>no</b> form of this command reverts to the default value.</p> |
| <b>Default</b>       | <b>hello-interval 10</b> — A 10-second hello interval.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Special Cases</b> | <p><b>OSPF Interface</b> — If the <b>hello-interval</b> configured applies to an interface, then all nodes on the subnet must have the same hello interval.</p> <p><b>Virtual Link</b> — If the <b>hello-interval</b> configured applies to a virtual link, then the interval on both termination points of the virtual link must have the same hello interval.</p> <p><b>Sham Link</b> — If the hello-interval configured applies to a sham-link, then the interval on both endpoints of the sham-link must have the same hello interval</p>                                                               |
| <b>Parameters</b>    | <p><i>seconds</i> — The hello interval in seconds expressed as a decimal integer.</p> <p><b>Values</b> 1 — 65535</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## interface-type

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface-type</b> { <b>broadcast</b>   <b>point-to-point</b> }<br><b>no interface-type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf3>area>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command configures the interface type to be either broadcast or point-to-point.</p> <p>Use this command to set the interface type of an Ethernet link to point-to-point to avoid having to carry the broadcast adjacency maintenance overhead if the Ethernet link provided the link is used as a point-to-point.</p> <p>If the interface type is not known at the time the interface is added to OSPF and subsequently the IP interface is bound (or moved) to a different interface type, this command must be entered manually.</p> <p>The <b>no</b> form of the command reverts to the default value.</p> |
| <b>Default</b>     | <b>point-to-point</b> — If the physical interface is SONET.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**broadcast** — If the physical interface is Ethernet or unknown.

**Special Cases** **Virtual-Link** — A virtual link is always regarded as a point-to-point interface and not configurable.

**Parameters** **broadcast** — Configures the interface to maintain this link as a broadcast network. To significantly improve adjacency forming and network convergence, a network should be configured as point-to-point if only two routers are connected, even if the network is a broadcast media such as Ethernet.

**point-to-point** — Configures the interface to maintain this link as a point-to-point link.

## message-digest-key

**Syntax** **message-digest-key** *keyid* **md5** [*key* | *hash-key*] [**hash**]  
**no message-digest-key** *keyid*

**Context** config>service>vprn>ospf>area>interface  
 config>service>vprn>ospf>area>virtual-link  
 config>service>vprn>ospf>area>sham-link

**Description** This command configures a message digest key when MD5 authentication is enabled on the interface, virtual-link or sham-link. Multiple message digest keys can be configured.

Note that this command is not valid in the OSPF3 context.

The **no** form of the command removes the message digest key identified by the *key-id*.

**Default** No message digest keys are defined.

**Parameters** **keyid** — The *keyid* is expressed as a decimal integer.

**Values** 1 — 255

**md5** *key* — The MD5 key. The *key* can be any alphanumeric string up to 16 characters in length.

**md5** *hash-key* — The MD5 hash key. The *key* can be any combination of ASCII characters up to 32 characters in length (encrypted). If spaces are used in the string, enclose the entire string in quotation marks (“ ”).

This is useful when a user must configure the parameter, but, for security purposes, the actual unencrypted key value is not provided.

**hash** — Specifies the key is entered in an encrypted form. If the **hash** parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the **hash** parameter specified.

## metric

|                    |                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>metric</b> <i>metric</i><br><b>no metric</b>                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf3>area>interface<br>config>service>vprn>ospf>area>sham-link                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures an explicit route cost metric for the OSPF interface that overrides the metrics calculated based on the speed of the underlying link.</p> <p>The <b>no</b> form of the command deletes the manually configured interface metric, so the interface uses the computed metric based on the <b>reference-bandwidth</b> command setting and the speed of the underlying link.</p> |
| <b>Default</b>     | <b>no metric</b> — The metric is based on <b>reference-bandwidth</b> setting and the link speed.                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>metric</i> — The metric to be applied to the interface expressed as a decimal integer.                                                                                                                                                                                                                                                                                                               |
|                    | <b>Values</b> 1 — 65535                                                                                                                                                                                                                                                                                                                                                                                 |

## mtu

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>bytes</i><br><b>no mtu</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf3>area>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command configures the OSPF packet size used on this interface. If this parameter is not configured OSPF derives the MTU value from the MTU configured (default or explicitly) in the following contexts:</p> <pre>config&gt;port&gt;ethernet config&gt;port&gt;sonet-sdh&gt;path config&gt;port&gt;tdm&gt;t3-e3 config&gt;port&gt;tdm&gt;t1-e1&gt;channel-group</pre> <p>If this parameter is configured, the smaller value between the value configured here and the MTU configured (default or explicitly) in an above-mentioned context is used.</p> <p>To determine the actual packet size add 14 bytes for an Ethernet packet and 18 bytes for a tagged Ethernet packet to the size of the OSPF (IP) packet MTU configured in this command.</p> <p>Use the <b>no</b> form of this command to revert to default.</p> |
| <b>Default</b>     | <b>no mtu</b> — Uses the value derived from the MTU configured in the <b>config&gt;port</b> context.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>bytes</i> — The MTU to be used by OSPF for this logical interface in bytes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                    | <b>Values</b> 512 — 9198 (9212-14) (Depends on the physical media)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



## passive

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] passive</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf3>area>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command adds the passive property to the OSPF interface where passive interfaces are advertised as OSPF interfaces but do not run the OSPF protocol.</p> <p>By default, only interface addresses that are configured for OSPF will be advertised as OSPF interfaces. The <b>passive</b> parameter allows an interface to be advertised as an OSPF interface without running the OSPF protocol.</p> <p>While in passive mode, the interface will ignore ingress OSPF protocol packets and not transmit any OSPF protocol packets.</p> <p>The <b>no</b> form of the command removes the passive property from the OSPF interface.</p> |
| <b>Default</b>     | Service interfaces defined in <b>config&gt;router&gt;service-prefix</b> are passive.<br>All other interfaces are not passive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## priority

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>priority <i>number</i></b><br><b>no priority</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf3>area>interface                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command configures the priority of the OSPF interface that is used an election of the designated router on on the subnet.</p> <p>This parameter is only used if the interface is of type broadcast. The router with the highest priority interface becomes the designated router. A router with priority 0 is not eligible to be Designated Router or Backup Designated Router.</p> <p>The <b>no</b> form of the command reverts the interface priority to the default value.</p> |
| <b>Default</b>     | <b>priority 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>number</i> — The interface priority expressed as a decimal integer. A value of 0 indicates the router is not eligible to be the Designated Router of Backup Designated Router on the interface subnet.</p> <p><b>Values</b>      0 — 255</p>                                                                                                                                                                                                                                        |

## retransmit-interval

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>retransmit-interval</b> <i>seconds</i><br><b>no retransmit-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf>area>virtual-link<br>config>service>vprn>ospf3>area>interface<br>config>service>vprn>ospf3>area>virtual-link<br>config>service>vprn>ospf>area>sham-link                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command specifies the length of time, in seconds, that OSPF will wait before retransmitting an unacknowledged link state advertisement (LSA) to an OSPF neighbor.</p> <p>The value should be longer than the expected round trip delay between any two routers on the attached network. Once the retransmit-interval expires and no acknowledgement has been received, the LSA will be retransmitted.</p> <p>The <b>no</b> form of this command reverts to the default interval.</p> |
| <b>Default</b>     | <b>retransmit-interval 5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>seconds</i> — The retransmit interval in seconds expressed as a decimal integer.                                                                                                                                                                                                                                                                                                                                                                                                          |
|                    | <b>Values</b> 1 — 3600                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## transit-delay

|                    |                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>transit-delay</b> <i>seconds</i><br><b>no transit-delay</b>                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>ospf>area>interface<br>config>service>vprn>ospf3>area>interface<br>config>service>vprn>ospf>area>virtual-link<br>config>service>vprn>ospf3>area>virtual-link<br>config>service>vprn>ospf>area>sham-link                           |
| <b>Description</b> | <p>This command configures the estimated time, in seconds, that it takes to transmit a link state advertisement (LSA) on the interface or virtual link or sham-link.</p> <p>The <b>no</b> form of this command reverts to the default delay time.</p> |
| <b>Default</b>     | <b>transit-delay 1</b>                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>seconds</i> — The transit delay in seconds expressed as a decimal integer.                                                                                                                                                                         |
|                    | <b>Values</b> 0 — 3600                                                                                                                                                                                                                                |

## nssa

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] nssa</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>ospf>area<br>config>service>vprn>ospf3>area                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | <p>This command creates the context to configure an OSPF Not So Stubby Area (NSSA) and adds/removes the NSSA designation from the area.</p> <p>NSSAs are similar to stub areas in that no external routes are imported into the area from other OSPF areas. The major difference between a stub area and an NSSA is an NSSA has the capability to flood external routes that it learns throughout its area and via an ABR to the entire OSPF domain.</p> <p>Existing virtual links of a non-stub or NSSA area will be removed when the designation is changed to NSSA or stub.</p> <p>An area can be designated as stub or NSSA but never both at the same time.</p> <p>By default, an area is not configured as an NSSA area.</p> <p>The <b>no</b> form of the command removes the NSSA designation and configuration context from the area.</p> |
| <b>Default</b>     | <b>no nssa</b> — The OSPF area is not an NSSA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## originate-default-route

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>originate-default-route [type-7]</b><br><b>no originate-default-route</b>                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>ospf>area>nssa<br>config>service>vprn>ospf3>area>nssa                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command enables the generation of a default route and its LSA type (3 or 7) into a Not So Stubby Area (NSSA) by an NSSA Area Border Router (ABR)</p> <p>When configuring an NSSA with no summaries, the ABR will inject a type 3 LSA default route into the NSSA area. Some older implementations expect a type 7 LSA default route.</p> <p>The <b>no</b> form of the command disables origination of a default route.</p> |
| <b>Default</b>     | <b>no originate-default-route</b> — A default route is not originated.                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><b>type-7</b> — Specifies a type 7 LSA should be used for the default route.</p> <p>Configure this parameter to inject a type-7 LSA default route instead the type 3 LSA into the NSSA configured with no summaries.</p> <p>To revert to a type 3 LSA, enter <b>originate-default-route</b> without the <b>type-7</b> parameter.</p>                                                                                            |
| <b>Default</b>     | Type 3 LSA for the default route.                                                                                                                                                                                                                                                                                                                                                                                                  |

## redistribute-external

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] redistribute-external</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>ospf>area>nssa<br>config>service>vprn>ospf3>area>nssa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command enables the redistribution of external routes into the Not So Stubby Area (NSSA) or an NSSA area border router (ABR) that is exporting the routes into non-NSSA areas.</p> <p>NSSA or Not So Stubby Areas are similar to stub areas in that no external routes are imported into the area from other OSPF areas. The major difference between a stub area and an NSSA is that the NSSA has the capability to flood external routes that it learns (providing it is an ASBR) throughout its area and via an Area Border Router to the entire OSPF domain.</p> <p>The <b>no</b> form of the command disables the default behavior to automatically redistribute external routes into the NSSA area from the NSSA ABR.</p> |
| <b>Default</b>     | <b>redistribute-external</b> — External routes are redistributed into the NSSA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## summaries

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] summaries</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>ospf>area>nssa<br>config>service>vprn>ospf>area>stub<br>config>service>vprn>ospf3>area>nssa                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command enables sending summary (type 3) advertisements into a stub area or Not So Stubby Area (NSSA) on an Area Border Router (ABR). This parameter is particularly useful to reduce the size of the routing and Link State Database (LSDB) tables within the stub or nssa area. By default, summary route advertisements are sent into the stub area or NSSA.</p> <p>The <b>no</b> form of the command disables sending summary route advertisements and, for stub areas, only the default route is advertised by the ABR.</p> |
| <b>Default</b>     | <b>summaries</b> — Summary routes are advertised by the ABR into the stub area or NSSA.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## stub

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] stub</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>ospf>area<br>config>service>vprn>ospf3>area                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command enables access to the context to configure an OSPF stub area and adds/removes the stub designation from the area. External routing information is not flooded into stub areas. All routers in the stub area must be configured with the <b>stub</b> command. An OSPF area cannot be both an NSSA and a stub area. Existing virtual links of a non STUB or NSSA area will be removed when its designation is changed to NSSA or STUB.</p> <p>By default, an area is not a stub area.</p> |

The **no** form of the command removes the stub designation and configuration context from the area.

**Default** **no stub** — The area is not configured as a stub area.

## default-metric

**Syntax** **default-metric** *metric*  
**no default-metric**

**Context** config>service>vprn>ospf>area>stub  
config>service>vprn>ospf3>area>stub

**Description** This command configures the metric used by the area border router (ABR) for the default route into a stub area. The default metric should only be configured on an ABR of a stub area. An ABR generates a default route if the area is a **stub** area.

The **no** form of the command reverts to the default value.

**Default** default-metric 1

**Parameters** *metric* — The metric expressed as a decimal integer for the default route cost to be advertised into the stub area.

**Values** 1 — 16777215

## virtual-link

**Syntax** [**no**] **virtual-link** *router-id* **transit-area** *area-id*

**Context** config>service>vprn>ospf>area  
config>service>vprn>ospf3>area

**Description** This command configures a virtual link to connect area border routers to the backbone via a virtual link. The backbone area (area 0.0.0.0) must be contiguous and all other areas must be connected to the backbone area. If it is not practical to connect an area to the backbone (see area 0.0.0.2 in the picture below) then the area border routers (routers 1 and 2 in the picture below) must be connected via a virtual link. The two area border routers will form a point-to-point like adjacency across the transit area (area 0.0.0.1 in the picture below). A virtual link can only be configured while in the area 0.0.0.0 context.

The *router-id* specified in this command must be associated with the virtual neighbor. The transit area cannot be a stub area or a Not So Stubby Area (NSSA).

The **no** form of the command deletes the virtual link.

**Default** No virtual link is defined.

**Parameters** *router-id* — The router ID of the virtual neighbor in IP address dotted decimal notation.

**transit-area** *area-id* — The area-id specified identifies the transit area that links the backbone area with the area that has no physical connection with the backbone.

The OSPF backbone area, area 0.0.0.0, must be contiguous and all other areas must be connected to the backbone area. The backbone distributes routing information between areas. If it is not practical to connect an area to the backbone (see Area 0.0.0.5 in [Figure 139](#)) then the area border routers (such as routers Y and Z) must be connected via a virtual link. The two area border routers form a point-to-point-like adjacency across the transit area (see Area 0.0.0.4).

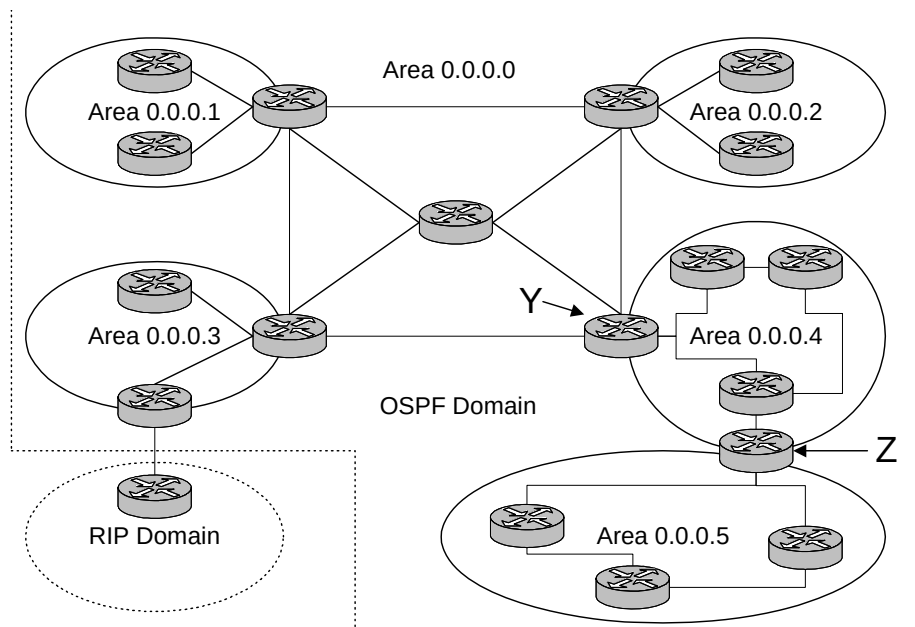


**Figure 139: OSPF Areas**

## compatible-rfc1583

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] compatible-rfc1583</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>ospf                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command enables OSPF summary and external route calculations in compliance with RFC1583 and earlier RFCs.</p> <p>RFC1583 and earlier RFCs use a different method to calculate summary and external route costs. To avoid routing loops, all routers in an OSPF domain should perform the same calculation method.</p> <p>Although it would be favorable to require all routers to run a more current compliancy level, this command allows the router to use obsolete methods of calculation.</p> <p>The <b>no</b> form of the command enables the post-RFC1583 method of summary and external route calculation.</p> |
| <b>Default</b>     | <b>compatible-rfc1583</b> — RFC1583 compliance is enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## export

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>export</b> <i>policy-name</i> [ <i>policy-name...</i> ]<br><b>no export</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>ospf<br>config>service>vprn>ospf3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command associates export route policies to determine which routes are exported from the route table to OSPF. Export policies are only in effect if OSPF is configured as an ASBR.</p> <p>If no export policy is specified, non-OSPF routes are not exported from the routing table manager to OSPF.</p> <p>If multiple policy names are specified, the policies are evaluated in the order they are specified. The first policy that matches is applied. If multiple export commands are issued, the last command entered will override the previous command. A maximum of five policy names can be specified.</p> <p>The <b>no</b> form of the command removes all policies from the configuration.</p> |
| <b>Default</b>     | <b>no export</b> — No export route policies specified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><i>policy-name</i> — The export route policy name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p>The specified name(s) must already be defined.</p>                                                                                                                                                                                                                                                                                                                                                                   |

## external-db-overflow

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>external-db-overflow</b> <i>limit interval</i><br><b>no external-db-overflow</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>ospf<br>config>service>vprn>ospf3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command enables limits on the number of non-default AS-external-LSA entries that can be stored in the LSDB and specifies a wait timer before processing these after the limit is exceeded.</p> <p>The <i>limit</i> value specifies the maximum number of non-default AS-external-LSA entries that can be stored in the link-state database (LSDB). Placing a limit on the non-default AS-external-LSAs in the LSDB protects the router from receiving an excessive number of external routes that consume excessive memory or CPU resources. If the number of routes reach or exceed the <i>limit</i>, the table is in an overflow state. When in an overflow state, the router will not originate any new AS-external-LSAs. In fact, it withdraws all the self-originated non-default external LSAs.</p> <p>The <i>interval</i> specifies the amount of time to wait after an overflow state before regenerating and processing non-default AS-external-LSAs. The waiting period acts like a dampening period preventing the router from continuously running Shortest Path First (SPF) calculations caused by the excessive number of non-default AS-external LSAs.</p> <p>The <b>external-db-overflow</b> must be set identically on all routers attached to any regular OSPF area. OSPF stub areas and not-so-stubby areas (NSSAs) are excluded.</p> <p>The <b>no</b> form of the command disables limiting the number of non-default AS-external-LSA entries.</p> |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>no external-db-overflow</b> — No limit on non-default AS-external-LSA entries.                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b> | <p><i>limit</i> — The maximum number of non-default AS-external-LSA entries that can be stored in the LSDB before going into an overflow state expressed as a decimal integer.</p> <p><b>Values</b>      -1 — 2147483647</p> <p><i>interval</i> — The number of seconds after entering an overflow state before attempting to process non-default AS-external-LSAs expressed as a decimal integer.</p> <p><b>Values</b>      0 — 2147483647</p> |

## external-preference

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>external-preference</b> <i>preference</i><br><b>no external-preference</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>ospf<br>config>service>vprn>ospf3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command configures the preference for OSPF external routes.</p> <p>A route can be learned by the router from different protocols in which case the costs are not comparable; when this occurs the preference is used to decide which route will be used.</p> <p>Different protocols should not be configured with the same preference, if this occurs the tiebreaker is per the default preference table as defined in the following table. If multiple routes are learned with an identical preference using the same protocol, the lowest cost route is used.</p> <p>If multiple routes are learned with an identical preference using the same protocol and the costs (metrics) are equal, then the decision of what route to use is determined by the configuration of the <b>ecmp</b> in the config&gt;router context.</p> <p>The <b>no</b> form of the command reverts to the default value.</p> |
| <b>Default</b>     | <b>external-preference 150</b> — OSPF external routes have a default preference of 150.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>preference</i> — The preference for external routes expressed as a decimal integer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Route Type             | Preference | Configurable     |
|------------------------|------------|------------------|
| Direct attached        | 0          | No               |
| Static routes          | 5          | Yes              |
| OSPF internal          | 10         | Yes <sup>a</sup> |
| IS-IS level 1 internal | 15         | Yes              |
| IS-IS level 2 internal | 18         | Yes              |
| RIP                    | 100        | Yes              |
| OSPF external          | 150        | Yes              |
| IS-IS level 1 external | 160        | Yes              |



| Route Type             | Preference | Configurable (Continued) |
|------------------------|------------|--------------------------|
| IS-IS level 2 external | 165        | Yes                      |
| BGP                    | 170        | Yes                      |

a. Preference for OSPF internal routes is configured with the **preference** command.

**Values** 1 — 255

## ignore-dn-bit

|                    |                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ignore-dn-bit</b>                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>ospf                                                                                                                                                                                                                             |
| <b>Description</b> | This command specifies whether to ignore the DN bit for OSPF LSA packets for this instance of OSPF on the router. When enabled, the DN bit for OSPF LSA packets will be ignored. When disabled, the DN bit will not be ignored for OSPF LSA packets. |

## overload

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>overload [timeout seconds]</b><br><b>no overload</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>ospf<br>config>service>vprn>ospf3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command changes the overload state of the local router so that it appears to be overloaded. When overload is enabled, the router can participate in OSPF routing, but is not used for transit traffic. Traffic destined to directly attached interfaces continue to reach the router.</p> <p>To put the IGP in an overload state enter a timeout value. The IGP will enter the overload state until the timeout timer expires or a <b>no overload</b> command is executed.</p> <p>If the <b>overload</b> command is encountered during the execution of an <b>overload-on-boot</b> command then this command takes precedence. This could occur as a result of a saved configuration file where both parameters are saved. When the file is saved by the system the <b>overload-on-boot</b> command is saved after the <b>overload</b> command.</p> <p>Use the <b>no</b> form of this command to return to the default. When the <b>no overload</b> command is executed, the overload state is terminated regardless the reason the protocol entered overload state.</p> |
| <b>Default</b>     | no overload                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><b>timeout seconds</b> — Specifies the number of seconds to reset overloading.</p> <p><b>Values</b> 60 — 1800</p> <p><b>Default</b> 60</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## overload-include-stub

|                    |                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] overload-include-stub</b>                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>ospf<br>config>service>vprn>ospf3                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command is used to to determine if the OSPF stub networks should be advertised with a maximum metric value when the system goes into overload state for any reason. When enabled, the system uses the maximum metric value. When this command is enabled and the router is in overload, all stub interfaces, including loopback and system interfaces, will be advertised at the maximum metric. |
| <b>Default</b>     | no overload-include-stub                                                                                                                                                                                                                                                                                                                                                                              |

## overload-on-boot

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |          |                |    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|----------------|----|
| <b>Syntax</b>      | <b>overload-on-boot [timeout seconds]</b><br><b>no overload</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |          |                |    |
| <b>Context</b>     | config>service>vprn>ospf<br>config>service>vprn>ospf3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |          |                |    |
| <b>Description</b> | <p>When the router is in an overload state, the router is used only if there is no other router to reach the destination. This command configures the IGP upon bootup in the overload state until one of the following events occur:</p> <ul style="list-style-type: none"> <li>• The timeout timer expires.</li> <li>• A manual override of the current overload state is entered with the <b>no overload</b> command.</li> </ul> <p>The <b>no overload</b> command does not affect the <b>overload-on-boot</b> function.</p> <p>The <b>no</b> form of the command removes the overload-on-boot functionality from the configuration.</p> |               |          |                |    |
| <b>Default</b>     | no overload-on-boot                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |          |                |    |
| <b>Parameters</b>  | <p><b>timeout seconds</b> — Specifies the number of seconds to reset overloading.</p> <table> <tr> <td><b>Values</b></td><td>60 —1800</td></tr> <tr> <td><b>Default</b></td><td>60</td></tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Values</b> | 60 —1800 | <b>Default</b> | 60 |
| <b>Values</b>      | 60 —1800                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |          |                |    |
| <b>Default</b>     | 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |          |                |    |

## preference

|                |                                                                  |
|----------------|------------------------------------------------------------------|
| <b>Syntax</b>  | <b>preference preference</b><br><b>no preference</b>             |
| <b>Context</b> | config>service>vprn>ospf<br>config>service>vprn>ospf3            |
|                | This command configures the preference for OSPF internal routes. |

A route can be learned by the router from different protocols in which case the costs are not comparable, when this occurs the preference is used to decide to which route will be used.

Different protocols should not be configured with the same preference, if this occurs the tiebreaker is per the default preference table as defined in the following table. If multiple routes are learned with an identical preference using the same protocol, the lowest cost route is used.

If multiple routes are learned with an identical preference using the same protocol and the costs (metrics) are equal, then the decision of what route to use is determined by the configuration of the **ecmp** in the `config>router` context.

The **no** form of the command reverts to the default value.

|                   |                                                                                                                                                              |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>preference 10</b> — OSPF internal routes have a preference of 10.                                                                                         |
| <b>Parameters</b> | <i>preference</i> — The preference for internal routes expressed as a decimal integer. Defaults for different route types are listed in the following table. |

| Route Type             | Preference | Configurable     |
|------------------------|------------|------------------|
| Direct attached        | 0          | No               |
| Static routes          | 5          | Yes              |
| OSPF internal          | 10         | Yes <sup>a</sup> |
| IS-IS level 1 internal | 15         | Yes              |
| IS-IS level 2 internal | 18         | Yes              |
| RIP                    | 100        | Yes              |
| OSPF external          | 150        | Yes              |
| IS-IS level 1 external | 160        | Yes              |
| IS-IS level 2 external | 165        | Yes              |
| BGP                    | 170        | Yes              |

a. Preference for OSPF internal routes is configured with the **preference** command.

**Values** 1 — 255

## reference-bandwidth

|                    |                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>reference-bandwidth</b> <i>reference-bandwidth</i><br><b>no reference-bandwidth</b>                                                                                                |
| <b>Context</b>     | <code>config&gt;service&gt;vprn&gt;ospf</code><br><code>config&gt;service&gt;vprn&gt;ospf3</code>                                                                                     |
| <b>Description</b> | This command configures the reference bandwidth in kilobits per second (Kbps) that provides the reference for the default costing of interfaces based on their underlying link speed. |

The default interface cost is calculated as follows:

$$\text{cost} = \text{reference-bandwidth} \div \text{bandwidth}$$

The default *reference-bandwidth* is 100,000,000 Kbps or 100 Gbps, so the default auto-cost metrics for various link speeds are as follows:

- 10 Mbs link default cost of 10000
- 100 Mbs link default cost of 1000
- 1 Gbps link default cost of 100
- 10 Gbps link default cost of 10

The **reference-bandwidth** command assigns a default cost to the interface based on the interface speed. To override this default cost on a particular interface, use the **metric** *metric* command in the `config>router>ospf>area>interface ip-int-name` context.

The **no** form of the command reverts the reference-bandwidth to the default value.

|                   |                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>reference-bandwidth 100000000</b> — Reference bandwidth of 100 Gbps.                                     |
| <b>Parameters</b> | <i>reference-bandwidth</i> — The reference bandwidth in kilobits per second expressed as a decimal integer. |
| <b>Values</b>     | 1 — 10000000000                                                                                             |

## super-backbone

|                    |                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] super-backbone</b>                                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | <code>config&gt;service&gt;vprn&gt;ospf</code>                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command specifies whether CE-PE functionality is required or not. The OSPF super backbone indicates the type of the LSA generated as a result of routes redistributed into OSPF. When enabled, the redistributed routes are injected as summary, external or NSSA LSAs. When disabled, the redistributed routes are injected as either external or NSSA LSAs only. |
| <b>Default</b>     | no super-backbone                                                                                                                                                                                                                                                                                                                                                       |

## suppress-dn-bit

|                    |                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] suppress-dn-bit</b>                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | <code>config&gt;service&gt;vprn&gt;ospf</code><br><code>config&gt;service&gt;vprn&gt;ospf3</code>                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command specifies whether to suppress the setting of the DN bit for OSPF LSA packets generated by this instance of OSPF on the router. When enabled, the DN bit for OSPF LSA packets generated by this instance of the OSPF router will not be set. When disabled, this instance of the OSPF router will follow the normal procedure to determine whether to set the DN bit. |
| <b>Default</b>     | no suppress-dn-bit                                                                                                                                                                                                                                                                                                                                                                |

## timers

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>timers</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>ospf<br>config>service>vprn>ospf3                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command enables the context that allows for the configuration of OSPF timers. Timers control the delay between receipt of a link state advertisement (LSA) requiring a Dijkstra (Shortest Path First (SPF)) calculation and the minimum time between successive SPF calculations.</p> <p>Changing the timers affect CPU utilization and network reconvergence times. Lower values reduce convergence time but increase CPU utilization. Higher values reduce CPU utilization but increase reconvergence time.</p> |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## spf-wait

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>spf-wait</b> <i>max-spf-wait</i> [ <i>spf-initial-wait</i> [ <i>spf-second-wait</i> ]]<br><b>no spf-wait</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>ospf>timers<br>config>service>vprn>ospf3>timers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command defines the maximum interval between two consecutive SPF calculations in milliseconds. Timers that determine when to initiate the first, second, and subsequent SPF calculations after a topology change occurs can be controlled with this command. Subsequent SPF runs (if required) will occur at exponentially increasing intervals of the <i>spf-second-wait</i> interval. For example, if the <i>spf-second-wait</i> interval is 1000, then the next SPF will run after 2000 milliseconds, and then next SPF will run after 4000 milliseconds, etc., until it reaches the <b>spf-wait</b> value. The SPF interval will stay at the <b>spf-wait</b> value until there are no more SPF runs scheduled in that interval. After a full interval without any SPF runs, the SPF interval will drop back to <i>spf-initial-wait</i>.</p> <p>The timer must be entered in increments of 100 milliseconds. Values entered that do not match this requirement will be rejected.</p> <p>Use the <b>no</b> form of this command to return to the default.</p> |
| <b>Default</b>     | no spf-wait                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>max-spf-wait</i> — Specifies the maximum interval in milliseconds between two consecutive SPF calculations.</p> <p><b>Values</b> 1 — 120000</p> <p><b>Default</b> 1000</p> <p><i>spf-initial-wait</i> — Specifies the initial SPF calculation delay in milliseconds after a topology change.</p> <p><b>Values</b> 10 — 100000</p> <p><b>Default</b> 1000</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## VPRN Service Configuration Commands

*spf-second-wait* — Specifies the hold time in milliseconds between the first and second SPF calculation.

**Values** 10 — 100000

**Default** 1000

### vpn-domain

**Syntax** **vpn-domain** [*type* {0005 | 0105 | 0205 | 8005}] **id** *id*  
**no vpn-domain**

**Context** config>service>vpn>ospf

**Description** This command specifies type of the extended community attribute exchanged using BGP to carry the OSPF VPN domain ID. This applies to VPRN instances of OSPF only. An attempt to modify the value of this object will result in an inconsistent value error when is not a VPRN instance. The parameters are mandatory and can be entered in either order. This command is not applicable in the **config>service>vpn>ospf3** context.

**Default** no vpn-domain

**Parameters** *id* — Specifies the OSPF VPN domain in the “xxxx.xxxx.xxxx” format. This is exchanged using BGP in the extended community attribute associated with a prefix. This object applies to VPRN instances of OSPF only.

*type* — Specifies the type of the extended community attribute exchanged using BGP to carry the OSPF VPN domain ID.

**Values** 0005, 0105, 0205, 8005

### vpn-tag

**Syntax** **vpn-tag** *vpn-tag*  
**no vpn-tag**

**Context** config>service>vpn>ospf

**Description** This command specifies the route tag for an OSPF VPN on a PE router. This field is set in the tag field of the OSPF external LSAs generated by the PE. This is mainly used to prevent routing loops. This applies to VPRN instances of OSPF only. An attempt to modify the value of this object will result in an inconsistent value error when is not a VPRN instance.

**Default** vpn-tag 0

## lsa-arrival

|                    |                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lsa-arrival</b> <i>lsa-arrival-time</i><br><b>no lsa-arrival</b>                                                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>ospf>timers<br>config>service>vprn>ospf3>timers                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This parameter defines the minimum delay that must pass between receipt of the same Link State Advertisements (LSAs) arriving from neighbors. It is recommended that the neighbors configured ( <b>lsa-generate</b> ) <i>lsa-second-wait</i> interval is equal or greater than the <b>lsa-arrival</b> timer configured here.<br>Use the <b>no</b> form of this command to return to the default. |
| <b>Default</b>     | no lsa-arrival                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>lsa-arrival-time</i> — Specifies the timer in milliseconds. Values entered that do not match this requirement will be rejected.<br><br><b>Values</b> 0 — 600000                                                                                                                                                                                                                               |

## lsa-generate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lsa-generate</b> <i>max-lsa-wait</i> [ <i>lsa-initial-wait</i> [ <i>lsa-second-wait</i> ]]<br><b>no lsa-generate-interval</b>                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>ospf>timers<br>config>service>vprn>ospf3>timers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | This parameter customizes the throttling of OSPF LSA-generation. Timers that determine when to generate the first, second, and subsequent LSAs can be controlled with this command. Subsequent LSAs are generated at increasing intervals of the <i>lsa-second-wait</i> timer until a maximum value is reached. Configuring the <b>lsa-arrival</b> interval to equal or less than the <i>lsa-second-wait</i> interval configured in the <b>lsa-generate</b> command is recommended.<br>Use the <b>no</b> form of this command to return to the default. |
| <b>Default</b>     | no lsa-generate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>max-lsa-wait</i> — Specifies the maximum interval, in milliseconds, between two consecutive occurrences of an LSA being generated.<br><br>The timer must be entered as either 1 or in millisecond increments. Values entered that do not match this requirement will be rejected.<br><br><b>Values</b> 1 — 600000                                                                                                                                                                                                                                    |

---

## RIP Commands

### rip

|                    |                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] rip</b>                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn                                                                                                                                                    |
| <b>Description</b> | This command enables the RIP protocol on the given VPRN IP interface.<br>The <b>no</b> form of the command disables the RIP protocol from the given VPRN IP interface. |
| <b>Default</b>     | no rip                                                                                                                                                                 |

### authentication-key

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-key</b> <i>[authentication-key   hash-key]</i> [ <b>hash</b>   <b>hash2</b> ]<br><b>no authentication-key</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command sets the authentication password to be passed between RIP neighbors.<br>The authentication type and authentication key must match exactly for the RIP message to be considered authentic and processed.<br>The <b>no</b> form of the command removes the authentication password from the configuration and disables authentication.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Default</b>     | <b>no authentication-key</b> — Authentication is disabled and the authentication password is empty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <i>authentication-key</i> — The authentication key. The key can be any combination of ASCII characters up to 16 characters in length (unencrypted). If spaces are used in the string, enclose the entire string in quotation marks (“ ”).<br><i>hash-key</i> — The hash key. The key can be any combination of ASCII characters up to 33 characters in length (encrypted). If spaces are used in the string, enclose the entire string in quotation marks (“ ”).<br>This is useful when a user must configure the parameter, but, for security purposes, the actual unencrypted key value is not provided.<br><b>hash</b> — Specifies the key is entered in an encrypted form. If the <b>hash</b> parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the <b>hash</b> parameter specified.<br><b>hash2</b> — Specifies the key is entered in a more complex encrypted form. If the <b>hash2</b> parameter is not used, the less encrypted <b>hash</b> form is assumed. |



## authentication-type

|                    |                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication-type</b> { <b>none</b>   <b>password</b>   <b>message-digest</b> }<br><b>no authentication-type</b>                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                                                                |
| <b>Description</b> | This command defines the type of authentication to be used between RIP neighbors. The type and password must match exactly for the RIP message to be considered authentic and processed.<br><br>The <b>no</b> form of the command removes the authentication type from the configuration and effectively disables authentication. |
| <b>Default</b>     | no authentication-type                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>none</i> — No authentication is used.<br><br><i>simple</i> — A simple clear-text password is sent.<br><br><i>md5</i> — MD5 authentication is used.                                                                                                                                                                             |

## check-zero

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>check-zero</b> { <b>enable</b>   <b>disable</b> }<br><b>no check-zero</b>                                                                                                                                                                                                       |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                 |
| <b>Description</b> | This command enables checking for zero values in fields specified to be zero by the RIPv1 and RIPv2 specifications.<br><br>The <b>no</b> form of the command disables this check and allows the receipt of RIP messages even if the mandatory zero fields are non-zero.            |
| <b>Default</b>     | no check-zero                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <b>enable</b> — Enables checking of the mandatory zero fields in the RIPv1 and RIPv2 specifications and rejecting non-compliant RIP messages.<br><br><b>disable</b> — Disables the checking and allows the receipt of RIP messages even if the mandatory zero fields are non-zero. |

## split-horizon

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>split-horizon {enable   disable}</b><br><b>no split-horizon</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command enables the use of split-horizon. RIP uses split-horizon with poison-reverse to protect from such problems as “counting to infinity”. Split-horizon with poison reverse means that routes learned from a neighbor through a given interface are advertised in updates out of the same interface but with a metric of 16 (infinity).</p> <p>The <b>split-horizon disable</b> command enables split horizon without poison reverse. This allows the routes to be re-advertised on interfaces other than the interface that learned the route, with the advertised metric equaling an increment of the metric-in value.</p> <p>This configuration parameter can be set at three levels: global level (applies to all groups and neighbor interfaces), group level (applies to all neighbor interfaces in the group) or neighbor level (only applies to the specified neighbor interface). The most specific value is used. In particular if no value is set (<b>no split-horizon</b>), the setting from the less specific level is inherited by the lower level.</p> <p>The <b>no</b> form of the command disables split horizon command which allows the lower level to inherit the setting from an upper level.</p> |
| <b>Default</b>     | enabled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## export

|                    |                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>export <i>policy</i> [<i>policy</i>...]</b><br><b>no export</b>                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command specifies the export policies to be used to control routes advertised to RIP neighbors. By default, RIP advertises routes from other RIP routes but does not advertise any routes from other protocols unless directed by an export policy.</p> <p>The <b>no</b> form of the command removes all route policy names from the export list.</p> |
| <b>Default</b>     | no export                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <i>policy</i> — A route policy statement name.                                                                                                                                                                                                                                                                                                                |

## export-limit

|                    |                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>export-limit</b> <i>number</i> [ <b>log</b> <i>percentage</i> ]<br><b>no export-limit</b>                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>service>vprn>rip                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command configures the maximum number of routes (prefixes) that can be exported into RIP from the route table.<br><br>The <b>no</b> form of the command removes the parameters from the configuration.                                                                                                                             |
| <b>Default</b>     | no export-limit, the export limit for routes or prefixes is disabled..                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>number</i> — Specifies the maximum number of routes (prefixes) that can be exported into RIP from the route table.<br><br><b>Values</b> 1 — 4294967295<br><br><i>log percentage</i> — Specifies the percentage of the export-limit, at which a warning log message and SNMP notification would be sent.<br><br><b>Values</b> 1 — 100 |

## import

|                    |                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>import</b> <i>policy</i> [ <i>policy</i> ...]<br><b>no import</b>                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command specifies the import policies to be used to control routes advertised from RIP neighbors. By default, RIP accepts all routes from configured RIP neighbors. Import policies can be used to limit or modify the routes accepted and their corresponding parameters and metrics.<br><br>The <b>no</b> form of the command removes all route policy names from the import list. |
| <b>Default</b>     | no import                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <i>policy</i> — A route policy statement name.                                                                                                                                                                                                                                                                                                                                            |

## message-size

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>message-size</b> <i>max-num-of-routes</i><br><b>no message-size</b>                             |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor |
| <b>Description</b> | This command sets the maximum number of routes per RIP update message.                             |

## VPNRN Service Configuration Commands

The **no** form of the command resets the maximum number of routes back to the default of 25.

|                   |                        |
|-------------------|------------------------|
| <b>Default</b>    | no message-size        |
| <b>Parameters</b> | <i>size</i> — Integer. |
| <b>Default</b>    | 25                     |
| <b>Values</b>     | 25 — 255               |

### metric-in

|                    |                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>metric-in</b> <i>metric</i><br><b>no metric-in</b>                                                                                                                          |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                             |
| <b>Description</b> | This command sets the metric added to routes that were received from a RIP neighbor.<br>The <b>no</b> form of the command reverts the <i>metric</i> value back to the default. |
| <b>Default</b>     | no metric-in                                                                                                                                                                   |
| <b>Parameters</b>  | <i>metric</i> — The value added to the metric of routes received from a RIP neighbor, expressed as a decimal integer.                                                          |
| <b>Values</b>      | 1 — 16                                                                                                                                                                         |

### metric-out

|                    |                                                                                                                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>metric-out</b> <i>metric</i><br><b>no metric-out</b>                                                                                                                                                                                |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                     |
| <b>Description</b> | This command sets the metric added to routes that were exported into RIP and advertised to RIP neighbors.<br>The <b>no</b> form of the command removes the command from the config and resets the metric-in value back to the default. |
| <b>Default</b>     | no metric-out                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <i>metric</i> — The value added to the metric for routes exported into RIP and advertised to RIP neighbors, expressed as a decimal integer.                                                                                            |
| <b>Values</b>      | 1 — 16                                                                                                                                                                                                                                 |

## preference

|                    |                                                                                                                                                                                                      |               |         |                |     |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|----------------|-----|
| <b>Syntax</b>      | <b>preference</b> <i>preference</i><br><b>no preference</b>                                                                                                                                          |               |         |                |     |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                   |               |         |                |     |
| <b>Description</b> | This command sets the route preference assigned to RIP routes. This value can be overridden by route policies.<br><br>The <b>no</b> form of the command resets the <i>preference</i> to the default. |               |         |                |     |
| <b>Default</b>     | no preference                                                                                                                                                                                        |               |         |                |     |
| <b>Parameters</b>  | <i>preference</i> — An integer.<br><br><table> <tr> <td><b>Values</b></td><td>1 — 255</td></tr> <tr> <td><b>Default</b></td><td>100</td></tr> </table>                                               | <b>Values</b> | 1 — 255 | <b>Default</b> | 100 |
| <b>Values</b>      | 1 — 255                                                                                                                                                                                              |               |         |                |     |
| <b>Default</b>     | 100                                                                                                                                                                                                  |               |         |                |     |

## propagate-metric

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] propagate-metric</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>rip                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command allows the RIP metric to be used to set the MP-BGP MED attribute when RIP is used as the CE-PE routing protocols for VPRNs. This is similar to the way the OSPF metric can be used to set the MP-BGP metric when OSPF is used as the CE-PE protocol.<br><br>MP-BGP will use the RIP metric to set the MED attribute, this attribute gets flooded through out the MP-BGP peers and will then be used to set the RIP metric at the other end and re-advertise the RIP metric to the far-end RIP neighbors. |

## receive

|                    |                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>receive {both   none   version-1   version-2}</b><br><b>no receive</b>                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command configures the type(s) of RIP updates that will be accepted and processed.<br><br>If <b>both</b> or <b>version-2</b> is specified, the RIP instance listens for and accepts packets sent to the broadcast and multicast (224.0.0.9) addresses.<br><br>If <b>version-1</b> is specified, the router only listens for and accepts packets sent to the broadcast address. |

This control can be issued at the global, group or interface level. The default behavior accepts and processes both RIPv1 and RIPv2 messages.

The **no** form of the command resets the type of messages accepted to both.

|                   |                                                                                                                                                                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>no receive</b> — Accepts both formats.                                                                                                                                                                                                                                                    |
| <b>Parameters</b> | <b>both</b> — Receive RIP updates in either Version 1 or Version 2 format.<br><b>none</b> — Do not accept and RIP updates.<br><b>version-1</b> — Router should only accept RIP updates in Version 1 format.<br><b>version-2</b> — Router should only accept RIP updates in Version 2 format. |

## send

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>send {broadcast   multicast   none   version-1   both}</b><br><b>no send</b>                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | <p>This command specifies the type of RIP messages sent to RIP neighbors. This control can be issued at the global, group or interface level. The default behavior sends RIPv2 messages with the multicast (224.0.0.9) destination address.</p> <p>If <b>version-1</b> is specified, the router only listens for and accepts packets sent to the broadcast address.</p> <p>The <b>no</b> form of this command resets the type of messages sent back to the default value.</p> |
| <b>Default</b>     | <b>no send</b> — Sends RIPv2 to the broadcast address.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <b>broadcast</b> — Send RIPv2 formatted messages to the broadcast address.<br><b>multicast</b> — Send RIPv2 formatted messages to the multicast address.<br><b>none</b> — Do not send any RIP messages (i.e. silent listener).<br><b>version-1</b> — Send RIPv1 formatted messages to the broadcast address.<br><b>both</b> — Send both RIP v1 & RIP v2 updates to the broadcast address.                                                                                     |

## timers

|                    |                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>timers update timeout flush</b><br><b>no timers</b>                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>rip<br>config>service>vprn>rip>group<br>config>service>vprn>rip>group>neighbor                                                                                         |
| <b>Description</b> | <p>This command sets the values for the update, timeout, and flush timers.</p> <ul style="list-style-type: none"> <li>Update timer — Determines how often RIP updates are sent.</li> </ul> |

- Timeout timer — If a router is not updated by the time the timer expires, the route is declared invalid, but maintained in the RIP database.
- Flush timer — Determines how long a route is maintained in the RIP database, after it has been declared invalid. Once this timer expires it is flushed from the RIP database completely.

The **no** form of the command resets all timers to their default values of 30, 180, and 120 seconds respectively.

|                   |                                                          |
|-------------------|----------------------------------------------------------|
| <b>Default</b>    | no timers                                                |
| <b>Parameters</b> | <i>update</i> — The RIP update timer value in seconds.   |
| <b>Values</b>     | 1 — 600                                                  |
| <b>Default</b>    | 30                                                       |
|                   | <i>timeout</i> — The RIP timeout timer value in seconds. |
| <b>Values</b>     | 1 — 1200                                                 |
| <b>Default</b>    | 180                                                      |
|                   | <i>flush</i> — The RIP flush timer value in seconds.     |
| <b>Values</b>     | 1 — 1200                                                 |
| <b>Default</b>    | 120                                                      |

## group

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] group</b> <i>group-name</i>                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>service>vprn>rip                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>This command creates a context for configuring a RIP group of neighbors. RIP groups are a way of logically associating RIP neighbor interfaces to facilitate a common configuration for RIP interfaces.</p> <p>The <b>no</b> form of the command deletes the RIP neighbor interface group. Deleting the group will also remove the RIP configuration of all the neighbor interfaces currently assigned to this group.</p> |
| <b>Default</b>     | <b>no group</b> — No group of RIP neighbor interfaces defined                                                                                                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <i>group-name</i> — The RIP group name. Allowed values are any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.                                                                                                                                                      |

## neighbor

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] neighbor</b> <i>ip-int-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>rip>group                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | <p>This command creates a context for configuring a RIP neighbor interface. By default, interfaces are not activated in any interior gateway protocol such as RIP unless explicitly configured.</p> <p>The <b>no</b> form of the command deletes the RIP interface configuration for this interface. The <b>shutdown</b> command in the <b>config&gt;router&gt;rip&gt;group group-name&gt;neighbor ip-int-name</b> context can be used to disable an interface without removing the configuration for the interface.</p>                                                                                                                    |
| <b>Default</b>     | <b>no neighbor</b> — No RIP interfaces defined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><i>ip-int-name</i> — The IP interface name. Interface names must be unique within the group of defined IP interfaces for <b>config router interface</b> and <b>config service vprn interface</b> commands. An interface name cannot be in the form of an IP address. Interface names can be any string up to 32 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.</p> <p>If the IP interface name does not exist or does not have an IP address configured an error message will be returned.</p> |



## IPSec Configuration Commands

### ipsec

|                    |                                                               |
|--------------------|---------------------------------------------------------------|
| <b>Syntax</b>      | <b>ipsec</b>                                                  |
| <b>Context</b>     | config>service>vpn>ipsec                                      |
| <b>Description</b> | This command enables the context to configure IPSec policies. |
| <b>Default</b>     | none                                                          |

### security-policy

|                    |                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <b>security-policy</b> <i>security-policy-id</i> [ <b>create</b> ]<br><b>no security-policy</b> <i>security-policy-id</i>                                                                                                                                                                       |
| <b>Context</b>     | config>service>vpn>ipsec                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command configures a security policy to use for an IPSec tunnel.                                                                                                                                                                                                                           |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>security-policy-id</i> — specifies a value to be assigned to a security policy.<br><b>Values</b> 1 — 8192<br><b>create</b> — Keyword used to create the security policy instance. The <b>create</b> keyword requirement can be enabled/disabled in the <b>environment&gt;create</b> context. |

### entry

|                    |                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>entry</b> <i>entry-id</i> [ <b>create</b> ]<br><b>no entry</b> <i>entry-id</i>                                                                                                                                                                                             |
| <b>Context</b>     | config>service>vpn>ipsec>sec-plcy                                                                                                                                                                                                                                             |
| <b>Description</b> | This command configures an IPSec security policy entry.                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <i>entry-id</i> — Specifies the IPSec security policy entry.<br><b>Values</b> 1 — 16<br><b>create</b> — Keyword used to create the security policy entry instance. The <b>create</b> keyword requirement can be enabled/disabled in the <b>environment&gt;create</b> context. |

## local-ip

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |                               |  |                          |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------|--|--------------------------|
| <b>Syntax</b>      | <b>local-ip</b> { <i>ip-prefix/prefix-length</i>   <i>ip-prefix netmask</i>   <b>any</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                               |  |                          |
| <b>Context</b>     | config>service>vpn>ipsec>sec-plcy>entry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |                               |  |                          |
| <b>Description</b> | <p>This command configures the local (from the VPN ) IP prefix/mask for the policy parameter entry.</p> <p>Only one entry is necessary to describe a potential flow. The <b>local-ip</b> and <b>remote-ip</b> commands can be defined only once. The system will evaluate the local IP as the source IP when traffic is examined in the direction of VPN to the tunnel and as the destination IP when traffic flows from the tunnel to the VPN. The remote IP will be evaluated as the source IP when traffic flows from the tunnel to the VPN when traffic flows from the VPN to the tunnel.</p> |               |                               |  |                          |
| <b>Parameters</b>  | <p><i>ip-prefix</i> — The destination address of the aggregate route in dotted decimal notation.</p> <table><tr><td><b>Values</b></td><td>a.b.c.d (host bits must be 0)</td></tr><tr><td></td><td>prefix-length     1 — 32</td></tr></table> <p><i>netmask</i> — The subnet mask in dotted decimal notation.</p> <p><b>any</b> — keyword to specify that it can be any address.</p>                                                                                                                                                                                                               | <b>Values</b> | a.b.c.d (host bits must be 0) |  | prefix-length     1 — 32 |
| <b>Values</b>      | a.b.c.d (host bits must be 0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                               |  |                          |
|                    | prefix-length     1 — 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |                               |  |                          |

## remote-ip

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                               |  |                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------------|--|--------------------------|
| <b>Syntax</b>      | <b>remote-ip</b> <i>ip-prefix/prefix-length</i>   <i>ip-prefix netmask</i>   <b>any</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |                               |  |                          |
| <b>Context</b>     | config>service>vpn>ipsec>sec-plcy>entry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |                               |  |                          |
| <b>Description</b> | <p>This command configures the remote (from the tunnel) IP prefix/mask for the policy parameter entry.</p> <p>Only one entry is necessary to describe a potential flow. The <b>local-ip</b> and <b>remote-ip</b> commands can be defined only once. The system will evaluate the local IP as the source IP when traffic is examined in the direction of VPN to the tunnel and as the destination IP when traffic flows from the tunnel to the VPN. The remote IP will be evaluated as the source IP when traffic flows from the tunnel to the VPN when traffic flows from the VPN to the tunnel.</p> |               |                               |  |                          |
| <b>Parameters</b>  | <p><i>ip-prefix</i> — The destination address of the aggregate route in dotted decimal notation.</p> <table><tr><td><b>Values</b></td><td>a.b.c.d (host bits must be 0)</td></tr><tr><td></td><td>prefix-length     1 — 32</td></tr></table> <p><i>netmask</i> — The subnet mask in dotted decimal notation.</p> <p><b>any</b> — keyword to specify that it can be any address.</p>                                                                                                                                                                                                                  | <b>Values</b> | a.b.c.d (host bits must be 0) |  | prefix-length     1 — 32 |
| <b>Values</b>      | a.b.c.d (host bits must be 0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |                               |  |                          |
|                    | prefix-length     1 — 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |                               |  |                          |

## ipsec-interface

|                    |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ipsec-interface</b> <i>ip-int-name</i> [create]<br><b>no ipsec-interface</b> <i>ip-int-name</i> |
| <b>Context</b>     | config>service>vpn                                                                                 |
| <b>Description</b> | This command configures an IPSec interface.                                                        |

- Parameters** *ip-int-name* — Specifies the name of the IP interface. Interface names can be from 1 to 32 alphanumeric characters. If the string contains special characters (#, \$, spaces, etc.), the entire string must be enclosed within double quotes.
- Values** 1 — 32 characters maximum
- create** — Keyword used to create the IPSec interface instance. The **create** keyword requirement can be enabled/disabled in the **environment>create** context.

## address

- Syntax** **[no] address** {*ip-address/mask* | *ip-address netmasks*}
- Context** config>service>vprn>ipsec-if
- Description** This command assigns an IP address/IP subnet to the interface
- Parameters** *ip-address* — Specifies the base IP address of the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).
- mask* — The subnet mask in dotted decimal notation. Allowed values are dotted decimal addresses in the range 128.0.0.0 – 255.255.255.252. Note that a mask of 255.255.255.255 is reserved for system IP addresses.
- netmask* — Specifies a string of 0s and 1s that mask or screen out the network part of an IP address so that only the host computer part of the address remains.

## ip-mtu

- Syntax** **ip-mtu** *octets*  
**no ip-mtu**
- Context** config>service>vprn>ipsec-if
- Description** This command configures the IP maximum transmit unit (packet) for this interface. The **no** form of the command returns the default value.
- Default** no ip-mtu
- Parameters** *octets* — Specifies the MTU size for this interface.
- Values** 512 — 9000

## tunnel

|                    |                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tunnel</b> <i>ipsec-tunnel-name</i> [ <b>create</b> ]<br><b>no tunnel</b> <i>ipsec-tunnel-name</i>                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command specifies an IPsec tunnel name. An IPsec client sets up the encrypted tunnel across public network. The 7750-SR IPsec MDA acts as a concentrator gathering, and terminating these IPsec tunnels into an IES or VPRN service. This mechanism allows as service provider to offer a global VPRN service even if node of the VPRN are on an uncontrolled or insecure portion of the network. |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>ipsec-tunnel-name</i> — Specifies an IPsec tunnel name up to 32 characters in length.<br><b>create</b> — Keyword used to create the IPsec tunnel instance. The <b>create</b> keyword requirement can be enabled/disabled in the <b>environment&gt;create</b> context.                                                                                                                               |

## bfd-designate

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>bfd-designate</b>                                                      |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel                                 |
| <b>Description</b> | This command specifies whether this IPsec tunnel is the BFD designated tunnel. |
| <b>Default</b>     | none                                                                           |

## bfd-enable

|                    |                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>bfd-enable service</b> <i>service-id</i> <b>interface</b> <i>interface-name</i> <b>dst-ip</b> <i>ip-address</i>                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command assign a BFD session provide heart-beat mechanism for given IPsec tunnel. There can be only one BFD session assigned to any given IPsec tunnel, but there can be multiple IPsec tunnels using same BFD session. BFD control the state of the associated tunnel, if BFD session goes down, system will also bring down the associated non-designated IPsec tunnel. |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <b>service</b> <i>service-id</i> — Specifies where the service-id that the BFD session resides.<br><b>interface</b> <i>interface-name</i> — Specifies the name of the interface used by the BFD session.<br><b>dst-ip</b> <i>ip-address</i> — Specifies the destination address to be used for the BFD session.                                                                |

## dynamic-keying

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dynamic-keying</b>                                |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel            |
| <b>Description</b> | This command enables dynamic keying for the IPsec tunnel. |
| <b>Default</b>     | none                                                      |

## auto-establish

|                    |                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] auto-establish</b>                                                                                                                                                                     |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel                                                                                                                                                 |
| <b>Description</b> | This command specifies whether to attempt to establish a phase 1 exchange automatically.<br>The <b>no</b> form of the command disables the automatic attempts to establish a phase 1 exchange. |
| <b>Default</b>     | no auto-establish                                                                                                                                                                              |

## transform

|                    |                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>transform</b> <i>transform-id</i> [ <i>transform-id...</i> (up to 4 max)]<br><b>no transform</b>                                                                                                                                   |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel>dynamic-keying                                                                                                                                                                         |
| <b>Description</b> | This command associates the IPSec transform sets allowed for this tunnel. A maximum of four transforms can be specified. The transforms are listed in decreasing order of preference (the first one specified is the most preferred). |
| <b>Default</b>     | none                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>transform-id</i> — Specifies the value used for transforms for dynamic keying.<br><b>Values</b> 1 — 2048                                                                                                                           |

## local-gateway-address

|                    |                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>local-gateway-address</b> <i>ip-address</i> <b>peer</b> <i>ip-address</i> <b>delivery-service</b> <i>service-id</i><br><b>no local-gateway-address</b>                        |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel                                                                                                                                   |
| <b>Description</b> | This command specifies the local gateway address used for the tunnel and the address of the remote security gateway at the other end of the tunnelremote peer IP address to use. |
| <b>Default</b>     | The base routing context is used if the delivery-router option is not specified.                                                                                                 |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><i>ip-address</i> — IP address of the local end of the tunnel.</p> <p><b>delivery-service</b> <i>service-id</i> — The ID of the IES or VPRN (front-door) delivery service of this tunnel. Use this service-id to find the VPRN used for delivery.</p> <p><b>Values</b>      <i>service-id</i>: 1 — 2147483648</p> <p>                 <i>svc-name</i>: Specifies an existing service name up to 64 characters in length.</p> |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### manual-keying

|                    |                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] manual-keying</b>                                                                                                                                                                              |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel                                                                                                                                                         |
| <b>Description</b> | This command configures Security Association (SA) for manual keying. When enabled, the command specifies whether this SA entry is created manually by the user or dynamically by the IPsec sub-system. |
| <b>Default</b>     | none                                                                                                                                                                                                   |

### security-association

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>security-association</b> <i>security-entry-id</i> <b>authentication-key</b> <i>authentication-key</i> <b>encryption-key</b> <i>encryption-key</i> <b>spi</b> <i>spi</i> <b>transform</b> <i>transform-id</i> <b>direction</b> {inbound   outbound}<br><b>no security-association</b> <i>security-entry-id</i> <b>direction</b> {inbound   outbound}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel>manual-keying                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command configures the information required for manual keying SA creation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Default</b>     | none                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><i>security-entry-id</i> — Specifies the ID of an SA entry.</p> <p><b>Values</b>      1 — 16</p> <p><b>encryption-key</b> <i>encryption-key</i> — specifies the key used for the encryption algorithm.</p> <p><b>Values</b>      none or 0x0..0xFFFFFFFF...(max 64 hex nibbles)</p> <p><b>authentication-key</b> <i>authentication-key</i> —</p> <p><b>Values</b>      none or 0x0..0xFFFFFFFF...(max 40 hex nibbles)</p> <p><b>spi</b> <i>spi</i> — Specifies the SPI (Security Parameter Index) used to look up the instruction to verify and decrypt the incoming IPSec packets when the direction is inbound. When the direction is outbound, the SPI that will be used in the encoding of the outgoing packets. The remote node can use this SPI to lookup the instruction to verify and decrypt the packet.</p> <p><b>Values</b>      256 — 16383</p> <p><b>transform</b> <i>transform-id</i> — specifies the transform entry that will be used by this SA entry. This object should be specified for all the entries created which are manual SAs. If the value is dynamic, then this value is irrelevant and will be zero.</p> |

**Values** 1 — 2048

**direction** {**inbound** | **outbound**} — Specifies the direction of an IPsec tunnel.

## replay-window

|                    |                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>replay-window</b> { <b>32</b>   <b>64</b>   <b>128</b>   <b>256</b>   <b>512</b> }<br><b>no replay-window</b>                                                                                                              |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel                                                                                                                                                                                |
| <b>Description</b> | This command specifies the size of the anti-replay window. The anti-replay window protocol secures IP against an entity that can inject messages in a message stream from a source to a destination computer on the Internet. |
| <b>Default</b>     | none                                                                                                                                                                                                                          |
| <b>Parameters</b>  | { <b>32</b>   <b>64</b>   <b>128</b>   <b>256</b>   <b>512</b> } — Specifies the size of the SA anti-replay window.                                                                                                           |

## security-policy

|                    |                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>security-policy</b> <i>security-policy-id</i><br><b>no security-policy</b>                                                 |
| <b>Context</b>     | config>service>vprn>ipsec-interface>sap>tunnel                                                                                |
| <b>Description</b> | This command configures an IPSec security policy. The policy may then be associated with tunnels defined in the same context. |
| <b>Default</b>     | none                                                                                                                          |
| <b>Parameters</b>  | <i>security-policy-id</i> — Specifies the IPSec security policy entry that the tunnel will use.<br><b>Values</b> 1 — 8192     |





# Versatile Service Module

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## In This Chapter

This chapter provides information about configuring Versatile Service Module (VSM) parameters.

Topics in this chapter include:

- [VSM Overview on page 1430](#)
  - [Multiple System Solution on page 1430](#)
  - [Hybrid Service Solution on page 1430](#)
  - [Single System Multiple Interface Solution on page 1431](#)
  - [Full Feature Internal Service Cross Connect Solution on page 1431](#)
- [Functional Components on page 1432](#)
  - [Service Cross Connect Adapter \(CCA\) on page 1432](#)
  - [Internal Service CCAG on page 1433](#)
  - [Internal Service Cross Connect Identifier \(CCID\) on page 1433](#)
  - [CCAG Bandwidth and Resiliency on page 1434](#)
  - [CCAG SAP QoS on page 1435](#)

## VSM Overview

In many instances, it is desirable to process a stream of packets from one or more subscribers through multiple features that, for one reason or another, are mutually exclusive in the 7750 SR forwarding planes. For example, multiple subscriber sites could be bridged together through a VPLS instance while requiring in-service high speed Internet access (IES). Functionality of this type can be handled several ways:

- [Multiple System Solution on page 1430](#)
- [Hybrid Service Solution on page 1430](#)
- [Single System Multiple Interface Solution on page 1431](#)
- [Full Feature Internal Service Cross Connect Solution on page 1431](#)

For the purpose exploring each of these solutions, the VPLS and IES service interconnection scenario is examined.

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### Multiple System Solution

The multiple system (meaning multiple boxes) solution splits the functionality between two distinct nodes. The first node performs the VPLS bridging functions while maintaining per site QoS and accounting functions. The second node connects to the first node as a destination in the VPLS service. This connection could be configured as a SAP to SAP or a pseudo-wire spoke connection.

---

### Hybrid Service Solution

The hybrid solution merges the two services into a single, common service. This can be accomplished for our example service interconnect by either supporting a virtual IP interface in the context of a VPLS service or providing an IP-only solution that provides for multiple SAPs on a single IES IP interface.

The hybrid solution does not provide for separate accounting and QoS for packets forwarded (or routed) between the subscriber sites and the packets routed to next-hops outside the subscriber domain.

## Single System Multiple Interface Solution

The single system solution retains the same SLA enforcement and accounting capabilities as the multiple system solution but with the advantage of only requiring a single chassis. This is accomplished by defining the VPLS and IES services on different physical interfaces of the same type. Both interfaces are defined as access types and use the same encapsulation type (i.e., Dot1q). The services are configured with the same encapsulation values and the physical interfaces are interconnected using an external jumper cable. To avoid single point of failure issues, Link Aggregation Groups (LAG) can be used to provide an N-to-1 redundancy mechanism (as well as adding more interconnect bandwidth).

---

## Full Feature Internal Service Cross Connect Solution

The internal service cross connect solution provides similar functionality as the single system multiple interface solution while attempting to minimize the cost, density and provisioning issues inherent to the external port jumper method. The internal service cross connection feature uses new service provisioning objects and a new type of hardware adapter to manage internal service cross connections. The remainder of this document describes the internal service cross connection feature.

## Functional Components

The internal service cross connection feature uses a new adapter designed to fit within an IOM (Input Output Module) MDA (Media Dependant Adapter) slot. One or more adapters are placed into a cross connect aggregation group (CCAG). To cross connect two services, each service is bound to the same cross connect aggregation group using the same cross connection identifier. This section introduces each object and gives a brief explanation of its function.

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### Service Cross Connect Adapter (CCA)

The VSM Cross Connect Adapter (CCA) is a type of MDA for 7750 SR platforms designed to provide an egress to ingress forwarding plane interconnection. When a CCA is installed in an MDA slot, a set of virtual ports is available to the system providing the ability to extend packet processing through an extra set of egress and ingress forwarding paths that CCA interfaces.

Unlike external port connections which utilize two TX-RX paths, a CCA interconnects the egress forwarding path on the IOM directly to the ingress forwarding path. This eliminates the need for the physical port MAC, PHY, cable and other MDA-specific components producing a less costly and more reliable adapter. The complete 10G+ forwarding path is available allowing single conversations up to 10G.

Bandwidth is utilized more efficiently than with externally cabled ports. Typically, the offered load presented to each side of the cross-connect port-pair is asymmetric in nature. When physical ports are used to cross connect services, each service is egress bandwidth-limited to the link speed of the TX-RX path.

If one TX-RX path is under-utilized, egress services on the other path cannot make use of the available bandwidth. Since the CCA is forwarding all services over the same path, all the available bandwidth can be used.

The forwarding plane that the CCA interconnects maintains the complete egress and ingress features of the services it is interconnecting. This includes the ability to remap QoS, enforce policing and shaping, and provide ingress and egress accounting for each service.

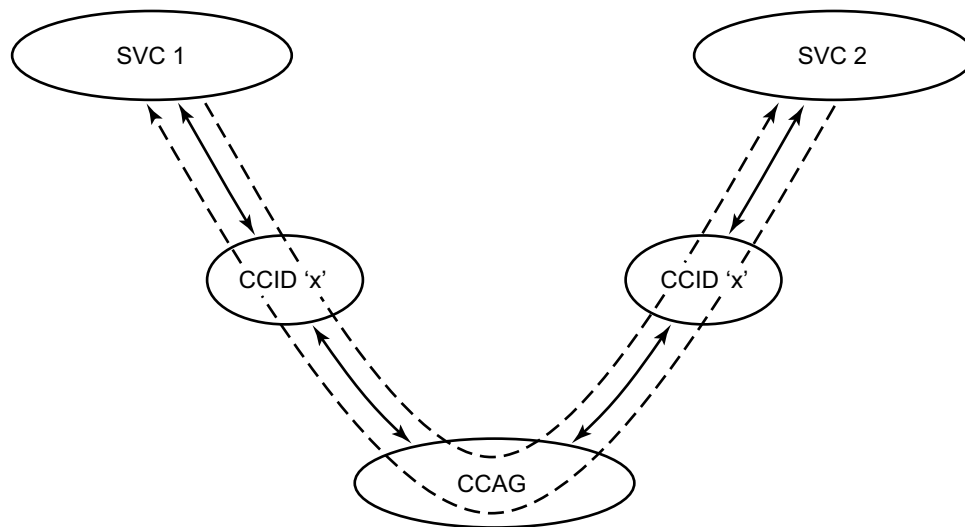
## Internal Service CCAG

VSM CCAs are placed in a CCAG. A CCAG provides a mechanism to aggregate multiple CCAs into a single forwarding group. The CCAG uses conversation hashing to dynamically distribute cross-connect traffic to the active CCAs in the aggregation group. In the event that an active CCA fails or is removed from the group, the conversation hashing function redistributes the traffic over the remaining active CCAs within the group.

The conversation hashing mechanism performed for a CCAG is identical to the hashing functions performed for Ethernet LAGs (Link Aggregation Groups).

## Internal Service Cross Connect Identifier (CCID)

Services and IP interfaces are bound to a CCAG through a CCID (Cross Connect Identifier). When two services or a service and an IP interface are assigned the same CCID the CCAG attempts to provide a cross connection path between the objects. The CCID enables multiple pairs of cross connected services to share the same CCAG.



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**Figure 140: Internal Service Interconnection Using CCID**

From a service perspective, a CCID is an object that not only binds two services together, but also provides the attachment point for the ingress and egress QoS, filtering, and accounting parameters. When considered in conjunction with the CCAG, it allows the actual cross connection path (through the CCAs) to be indirectly associated with the services using the CCAG and maintains a simplified provisioning model over port level cross connected services.

## CCAG Bandwidth and Resiliency

A CCAG is an intermediate object between cross-connected objects (SAPs and network IP interfaces) and the CCAs. A CCAG is similar to a Link Aggregation Group (LAG) of Ethernet ports and uses the same underlying mechanisms to distribute conversations over multiple CCAs and converge when a CCA becomes active or inactive in the group.

When a CCAG is created, the system allocates six Ethernet LAGs for the virtual ports on the CCAs placed into the group. Each virtual port is placed into a respective LAG. For instance, each time a CCA is placed into the CCAG, virtual port 1 on that CCA is placed into the first LAG allocated to that CCAG. Virtual port 2 is placed into the second LAG on the CCAG. Virtual ports 3 through 6 are placed into their respective LAGs as well.

Using the set of LAGs provides a mechanism for conversation hashing or service mapping over all member CCAs in the CCAG. In the unlikely event that a CCA fails or is removed from the CCAG, the system will automatically modify the conversation hashing or service mapping on the CCAG to represent the available active CCAs.

---

## CCAG LAG Attributes

Unlike a user-provisioned LAG, the internal LAGs do not use a primary member to control the typical port level configuration parameters. Instead, the parameters usually found at the port level are implemented directly on the CCAG internal LAG representative objects (**sap-sap**, **sap-net** and **net-sap**) for each path. These commands perform functions such as MTU definition and locally administering the MAC address.

The default unique MAC addresses used each internal LAG within the CCAG are automatically assigned from the chassis MAC pool. These MAC addresses are assigned from the pool based on an offset relative to the CCAG-ID. The same set of default MAC addresses are assigned each time a specific CCAG-ID is created.

Although a CCAG uses internal LAG mechanisms, the LACP protocol is not supported or required. LAG resources used for CCAG purposes are not exposed to the user.

---

## CCAG Traffic Distribution

A CCAG uses both direct object mapping and conversation hashing to distribute traffic over multiple CCAs. To understand how each object type's ingress traffic is distributed over the active CCAs in a CCAG, refer to the LAG and ECMP Hashing section of the 7750 SR OS Interface Configuration Guide.

## CCAG SAP QoS

When a SAP is created on a CCAG, the service queues defined by the ingress and egress QoS policy are created on each CCA member in the CCAG. Packets are forwarded to the egress queues based on the hashing or service mapping enforced by the LAG functions internal to the system. Packets are received on a CCA ingress queue based on which CCA handled the egress processing. Each ingress and egress hardware queue buffering and rate parameters are managed by the system based on one of two models governed by the state of the LAG QoS adaptation setting. The adaptation state also governs the application of hierarchical virtual schedulers associated with the SAP queues.

---

### Link Level CCAG SAP QoS Adaptation

Link level QoS adaptation is set when the CCA access QoS adaptation flag is set to **link**. Link-level distribution informs the system that a service queue's buffering and rate parameters should be applied directly to each hardware queue representing the service queue. For example, when a service queue is configured with a rate equal to 10Mbps, each corresponding CCA hardware queue will be configured with a rate of 10Mbps. Given many flows conversation hashing to different CCAs, the maximum forwarded rate will be the 10Mbps multiplied by the number of active CCAs.

When a link-level adaptation service queue is a child to a parent virtual scheduler, the parent scheduler and the rest of the scheduler hierarchy is implemented per CCA. An instance of the scheduler policy is maintained per CCA.

When a CCAG SAP is a member of a Multi-Service Site (MSS), all SAPs in the MSS must be CCAG SAPs created on the same CCAG-ID.

---

### Distributed CCAG SAP QoS Adaptation

Distributed QoS adaptation is set when the CCA access QoS adaptation flag is set to **distribute**. The distributed QoS parameter setting informs the system that a service queue's buffering and rate parameters should be distributed between the active CCAs in the CCAG. For example, when a service queue is configured with a rate equal to 10Mbps and two CCAs are active in the CCAG, each corresponding CCA hardware queue will be configured with a rate of 5Mbps (1/2 of the provisioned service queue parameters). Given many flows conversation hashing to different CCAs, the maximum forwarded rate will be limited to 10Mbps.

When a distributed adaptation service queue is a child to a parent virtual scheduler, the parent scheduler and the rest of the scheduler hierarchy is implemented on each IOM with an active member CCA from the CCAG. The scheduler parameters are divided amongst the IOMs with active CCAs based on the total number of active CCAs. If there are three active CCAs in the

CCAG, each CCA represents 1/3 of rate and CIR defined for each scheduler in the policy. If two of the active CCAs are on one IOM and one active CCA is on a second IOM, the first IOM would receive 2/3 of the rate and CIR for each scheduler and the second IOM would receive 1/3. The overall distribution is based on the following equation:

$$\text{IOM Scheduler Rate} = \text{Policy Scheduler Rate} * (\text{Number Active CCAs on IOM} / \text{Total Active CCAs})$$
$$\text{IOM Scheduler CIR} = \text{Policy Scheduler CIR} * (\text{Number Active CCAs on IOM} / \text{Total Active CCAs})$$

When a CCAG SAP is a member of a multi-service site, all SAPs in the multi-service site must be CCAG SAPs created on the same CCAG-ID.



# Configuration Process Overview

Figure 141 displays the process to provision VSM parameters.

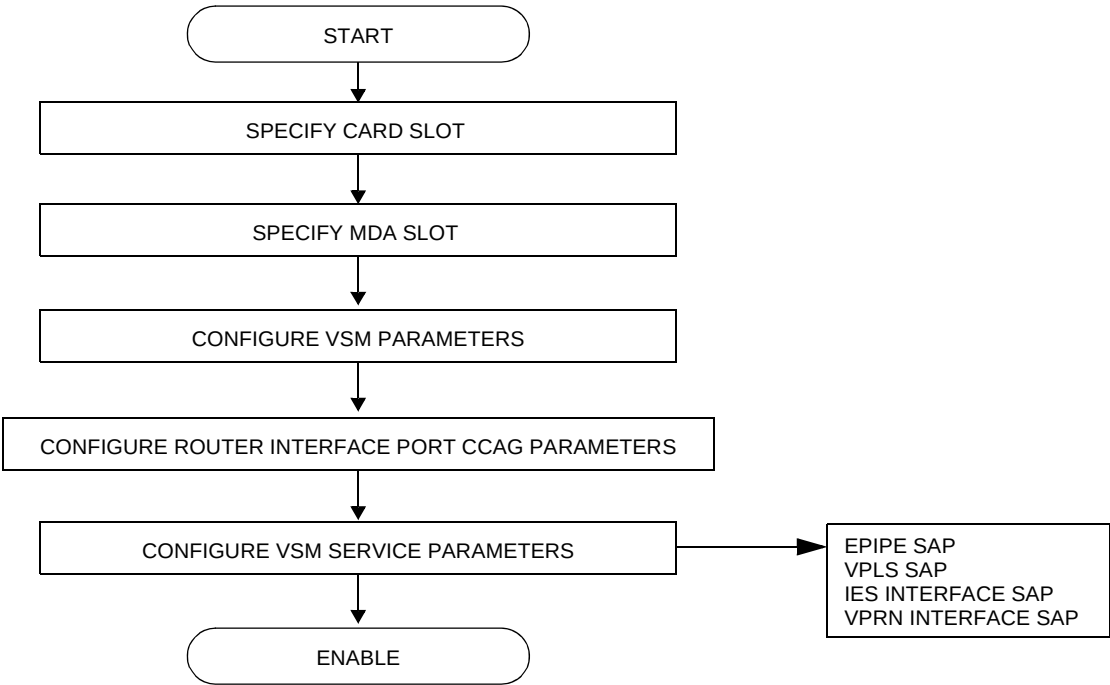


Figure 141: VSM/CCAG Configuration and Implementation Flow

## Configuration Notes

The following information describes provisioning caveats:

- Services can only be provisioned on Ethernet SAPs.
- The cross connections supported are:
  - IP to all Layer 2 SAPs
  - SAP to SAP of all types with the exception of:
    - A cross connection within the same service.
    - An IES service to another IES service.

## Configuring VSM and CCAG with CLI

This section provides information to configure cards, MDAs, and ports.

Topics in this section include:

- [Configuring VSM and CCAG with CLI on page 1439](#)
- [Basic Configuration on page 1440](#)
- [Common Configuration Tasks on page 1443](#)
- [Service Management Tasks on page 1453](#)

## Basic Configuration

The following fields require specific input (there are no defaults) to configure VSM:

- CCAG ID
- For a local service, two SAPs must be configured specifying the source and destination nodes and ports
- For a distributed service, one SAP and one SDP must be specified

The following example displays VSM defaults when a *ccag-id* is created.

```
A:ALA-48>config>vsm# info detail
#-----
echo "Versatile Services Module Configuration"
#-----
vsm
 ccag 1 create
 no description
 cca-rate max
 access
 adapt-qos distribute
 exit
 path a
 weight 50
 rate max aggregate
 sap-sap
 no mac
 no mtu
 egress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
 ingress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
 exit
 sap-net
 no mac
 no mtu
 egress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
 ingress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
exit
```

```

net-sap
 no mac
 no mtu
 no accounting-policy
 no collect-stats
 queue-policy "default"
 egress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
exit
path b
 weight 50
 rate max aggregate
 sap-sap
 no mac
 no mtu
 egress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
 ingress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
 exit
exit
sap-net
 no mac
 no mtu
 egress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
 ingress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
exit
net-sap
 no mac
 no mtu
 no accounting-policy
 no collect-stats
 queue-policy "default"
 egress
 pool
 resv-cbs default
 slope-policy "default"
 exit
 exit
exit

```

## Basic Configuration

```
 exit
 exit
 no shutdown
 exit
exit

A:ALA-48>config>vsm#
```

## Common Configuration Tasks

This section provides a brief overview of the tasks that should be performed to configure VSM on an MDA, router, router interface, and services.

- Provision one or more CCA as MDAs in the system.
  - Create VSM CCAGs on the system.
  - Provision CCAG path bandwidth, path weighting, and overall bandwidth parameters.
  - Provision member CCAs into a CCAG.
  - Provision service SAPs using a CCAG, path, and CCID for cross connect purposes.
  - Bind routed network IP interfaces to a CCAG, path, and CCID for cross connect purposes.
- 

## Configure VSM CCAG Components

Use the CLI syntax displayed below to configure the following entities:

- [Provision VSM on an MDA on page 1443](#)
  - [Cross Connecting Network IP Interfaces on page 1448](#)
  - [Provision CCAG Parameters on page 1445](#)
  - [Configure Path Components on page 1446](#)
  - [Cross Connecting Services on page 1449](#)
- 

## Provision VSM on an MDA

Before a CCA module may be utilized in the system, the CCA must be provisioned into an MDA slot. The MDA provisioning command must be modified to support provisioning a CCA adaptor type. Up to 8 member CCAs can be configured per CCAG.

**CLI Syntax:** `config>card# mda mda-number mda-type {other-MDA-type|cca}`

The following example displays the command usage to provision CCA on an MDA:

**Example:**

```
config# card 10
config>card# mda 1
config>card>mda# mda-type vsm-cca
config>card>mda# exit
config>card#
```

The following example displays the configuration:

```
A:ALA-48>config>card# info

card-type iom-20g
mda 1
 mda-type vsm-cca
exit
mda 2
 mda-type m20-1gb-tx
exit

A:ALA-48>config>card#
```



## Provision CCAG Parameters

Once a CCA is provisioned into the system, it must be placed in a Cross Connect Aggregation Group (CCAG) to be used by cross connect objects. Besides CCA membership, the CCAG also supports bandwidth control parameters (see [Configure Path Components on page 1446](#)) used to manipulate forwarding distribution between objects in the alpha and beta path groups and the aggregate rate allowed on the CCA.

Use the following CLI syntax to provision CCAG components.

**CLI Syntax:**

```
config>vsm#
 ccag ccag-id [create]
 cca-rate kilobits-per-second
 description description-string
 member-cca card-slot/mda-number
 path {a|b}
 no shutdown
```

The following example displays the command usage to provision CCAG components:

**Example:**

```
config>vsm# ccag 1
config>vsm>ccag# description "VSM test"
config>vsm>ccag# cca-rate 1000000
config>vsm>ccag# member-cca 10/1
```

The following example displays the configuration:

```
A:ALA-48>config>vsm# info

 ccag 1 create
 description "VSM test"
 cca-rate 1000000
 member-cca 10/1
 exit
...

A:ALA-48>config>vsm#
```

## Configure Path Components

Each CCA is divided into two distinct paths for bandwidth management purposes. One path is identified as alpha (a) and the other beta (b). The significance of each path for bandwidth distribution is dependent on the relative path weights each path is given in relationship to the other. A maximum path rate may also be defined allowing the provisioning of a maximum cap on the aggregate bandwidth allowed to the SAP or IP interface queues associated with the path.

Each path is separated into three other contexts; SAP-2-SAP (sap-sap), SAP-2-Net (sap-net) and Net-2-SAP (net-sap). Each path context allows for the definition of the features that are usually associated with physical ports on other MDAs in the system. These include buffer pool management, ingress network queue definitions and accounting policy control.

Use the following CLI syntax to provision path components.

- Net SAP
- SAP net
- SAP SAP

Use the following CLI syntax to provision CCAG path components.

**CLI Syntax:**

```
config>vsm>ccag#
 path {a|b}
 net-sap
 accounting-policy policy-id
 collect-stats
 egress
 pool
 resv-cbs percent-or-default
 slope-policy slope-policy-name
 mac ieee-address
 mtu mtu-bytes
 queue-policy queue-policy-name
 rate kilo-bits-per-second [aggregate|cca]
 sap-net
 egress
 pool
 resv-cbs percent-or-default
 slope-policy slope-policy-name
 ingress
 pool
 resv-cbs percent-or-default
 slope-policy slope-policy-name
 mac ieee-address
 mtu mtu-bytes
 sap-sap
```

```

 egress
 pool
 resv-cbs percent-or-default
 slope-policy slope-policy-name
 ingress
 pool
 resv-cbs percent-or-default
 slope-policy slope-policy-name
 mac ieee-address
 mtu mtu-bytes
 weight path-weight

```

The following displays a CCAG path configuration example:

```

A:ALA-48>config>vsm# info

 ccag 1 create
 description "VSM test"
 member-cca 10/1
 path a
 weight 100
 exit
 path b
 weight 100
 rate 99999999
 exit
 no shutdown
 exit
...

A:ALA-48>config>vsm#

```

## Cross Connecting Network IP Interfaces

To support cross connection between services and network IP interfaces, the network interface port command has been augmented to allow the binding of the IP interface to a **ccag** *cc-id*. Similar to service CCAG SAPs, the network IP interface port binding command must reference the ccag-id, the CCA path (.a or .b) and the *cc-id* used by the service CCAG SAP on the other CCA path.

Use the following CLI syntax to configure CCAG a network IP interface.

**CLI Syntax:**

```
config# router [router-name]
 interface interface-name
 port ccag-ccag-id.{a|b} [.net-sap]:cc-id
 address {ip-address/mask | ip-address netmask} [broadcast
 all-ones|host-ones]
 mac ieee-address
```

The following displays CCAG network IP interface configuration examples:

```
A:ALA-48>config>router# info
#-----
echo "IP Configuration"
#-----
...
 interface "ccanet"
 address 2.1.1.1/24
 port ccag-1.a.net-sap:200
 mac 00:00:00:00:00:ff
 exit
 interface "ccanet2"
 address 4.1.1.1/24
 port ccag-1.b.net-sap:300
 static-arp 4.1.1.2 00:00:00:00:00:aa
 exit
...
#-----
A:ALA-48>config>router#
```

## Cross Connecting Services

Services are provisioned onto a CCAG using a special CCAG SAP definition. CCAG SAPs must reference a *ccag-id*, a CCA path (a or b), a pairing type (sap-sap or sap-net) and a unique *cc-id*. The *ccag-id* identifies the group of CCAs that will be used for forwarding packets associated with the SAP. The path identifies the bandwidth control grouping used to manage CCA egress bandwidth. The pairing type helps the system identify which buffering resources will be used to manage egress queuing of packets. Finally, the *cc-id* is used to explicitly cross connect the SAP to another SAP or network IP interface configured with the same *cc-id*.

- [Epipe on page 1449](#)
- [VPLS on page 1450](#)
- [IES on page 1451](#)
- [VPRN on page 1452](#)

### Epipe

**CLI Syntax:** `config>service#  
           epipe service-id [customer customer-id]  
           sap ccag-ccag-id.{a|b} [.sap-net|.sap-sap]:cc-id [create]`

The following displays an Epipe SAP configuration referencing a *ccag-id*:

```
A:ALA-48>config>service# info

...
 epipe 103 customer 6 vpn 103 create
 sap 3/1/1.1.1 create
 exit
 sap ccag-1.a:100 create
 exit
 no shutdown
 exit

A:ALA-48>config>service#
```

### VPLS

**CLI Syntax:** `config>service#`  
                  `vpls service-id [customer customer-id]`  
                  `sap ccag-ccag-id.{a|b} [.sap-net|.sap-sap]:cc-id [create]`

The following displays a VPLS SAP configuration referencing a *ccag-id*:

```
A:ALA-48>config>service# info

...
 vpls 740 customer 1 vpn 740 create
 stp
 shutdown
 exit
 sap 1/1/19:1 create
 exit
 sap 1/1/19:2 create
 ingress
 qos 3
 exit
 exit
 sap ccag-1.a:456 create
 ingress
 qos 3
 exit
 egress
 qos 1010
 exit
 exit
 no shutdown
 exit
...

A:ALA-48>config>service#
```

**IES**

**CLI Syntax:** config>service#  
           ies *service-id* [customer *customer-id*]  
           interface *ip-interface-name*  
           sap ccag-*ccag-id*.{a|b}[.sap-net|.sap-sap]:*cc-id* [create]  
           ate]

The following displays an IES SAP configuration referencing a *ccag-id*:

```
A:ALA-48>config>service# info

...
 ies 200 customer 1 create
 interface "ccaiesif" create
 address 8.1.1.1/24
 sap ccag-1.b:456 create
 ingress
 qos 3
 exit
 egress
 qos 1010
 exit
 exit
 exit
 no shutdown
exit
...

A:ALA-48>config>service#
```

### VPRN

**CLI Syntax:** `config>service#  
vprn service-id [customer customer-id]  
interface ip-interface-name  
sap ccag-ccag-id.{a|b} [.sap-net|.sap-sap]:cc-id [create]`

**Example:** `config>service# vprn 701 customer 2 create  
config>service>vprn$ interface "VSM Test" create  
config>service>vprn>if$ sap ccag-2.a:100 create  
config>service>vprn>if>sap$ no shutdown  
config>service>vprn>if>sap# exit  
config>service>vprn>if# exit  
config>service>vprn# no shutdown`

The following output displays the configuration:

```
A:ALA-48>config>service>vprn# info

 interface "VSM Test" create
 sap ccag-2.a:100 create
 exit
 exit
 no shutdown

A:ALA-48>config>service>vprn#
```



## Service Management Tasks

This section discusses the following service management tasks:

- [Modifying or Deleting a VSM MDA on page 1453](#)
  - [Modifying CCAG Parameters on a Network IP Interface on page 1454](#)
  - [Modifying CCAG Parameters on page 1455](#)
  - [Modifying Path Parameters on page 1456](#)
  - [Modifying Service Parameters on page 1458](#)
- 

### Modifying or Deleting a VSM MDA

To change or delete a VSM MDA already provisioned for a specific slot, first you must shut down and remove all service SAP and router interface associations ([page 1454](#)) to delete the VSM MDA from the configuration.

**CLI Syntax:**

```
config> card slot-number
 [no] mda mda-number
 [no] mda-type mda-type
 shutdown
```

**Example:**

```
config# card 10
config>card# mda 1
config>card>mda# mda-type vsm-cca
config>card>mda# shutdown
config>card>mda# exit
config>card# no mda 1
```

The following example displays the configuration:

```
A:ALA-48>config>card# info

 card-type iom-20g
 mda 2
 mda-type vsm-cca
 exit

A:ALA-48>config>card#
```

## Modifying CCAG Parameters on a Network IP Interface

**CLI Syntax:** `config# router [router-name]  
                   interface interface-name  
                   shutdown  
                   no port ccag-ccag-id.{a|b} [.net-sap]:cc-id`

The following example displays the command usage:

**Example:**       `config>router# interface ccanet  
                   config>router>if# address 3.1.1.1/24  
                   config>router>if# exit`

```
A:ALA-48>config>router# info

#-----
echo "IP Configuration"
#-----
...
 interface "ccanet"
 address 3.1.1.1/24
 port ccag-1.a.net-sap:200
 mac 00:00:00:00:00:ff
 exit
 interface "ccanet2"
 address 4.1.1.1/24
 port ccag-1.b.net-sap:300
 static-arp 4.1.1.2 00:00:00:00:00:aa
 exit
...
#-----
A:ALA-48>config>router#
```

## Modifying CCAG Parameters

**CLI Syntax:** config>vsm#

```

ccag ccag-id [create]
no ccag ccag-id [force]
access {link|distribute}
 adapt-qos
cca-rate kilobits-per-second
no cca-rate
description description-string
no description
[no] member-cca card-slot/mda-number
path {a|b}
no shutdown

```

The following example displays the command usage to provision CCAG components:

**Example:**config>vsm# ccag 1

```

config>vsm>ccag# access
config>vsm>ccag>access#
config>vsm>ccag>access# adapt-qos distribute
config>vsm>ccag>access# exit
config>vsm>ccag# member-cca 10/2
config>vsm>ccag# exit

```

The following example displays the configuration:

```

A:ALA-48>config>vsm# info

 ccag 1 create
 description "VSM test"
 member-cca 10/1
 member-cca 10/2
 path a
 weight 100
 exit
 path b
 weight 100
 rate 99999999
 exit
 no shutdown
 exit
...

A:ALA-48>config>vsm# ccag 1

```

## Modifying Path Parameters

The following example displays the command usage to provision CCAG path parameters:

```

Example:config>vsm# ccag 1
 config>vsm>ccag# path a
 config>vsm>ccag>path# no weight
 config>vsm>ccag>path# net-sap
 config>vsm>ccag>path>net-sap# queue-policy nq1
 config>vsm>ccag>path>net-sap# egress
 config>vsm>ccag>path>net-sap>egr# pool
 config>vsm>ccag>path>net-sap>egr>pool# slope-policy A
 config>vsm>ccag>path>net-sap>egr>pool# exit
 config>vsm>ccag>path>net-sap>egr# exit
 config>vsm>ccag>path>net-sap# exit
 config>vsm>ccag>path# exit
 config>vsm>ccag# path b
 config>vsm>ccag>path# no rate
 config>vsm>ccag>path# sap-sap
 config>vsm>ccag>path>sap-sap# egress
 config>vsm>ccag>path>sap-sap>egr# pool
 config>vsm>ccag>path>sap-sap>egr>pool#
 config>vsm>ccag>path>sap-sap>egr>pool# slope-policy B
 config>vsm>ccag>path>sap-sap>egr>pool# exit
 config>vsm>ccag>path>sap-sap>egr# exit
 config>vsm>ccag>path>sap-sap# exit
 config>vsm>ccag>path# exit
 config>vsm>ccag#

```

The following example displays the configuration:

```

A:ALA-48>config>vsm# info

ccag 1 create
 description "VSM test"
 member-cca 10/1
 member-cca 10/2
 path a
 net-sap
 queue-policy "nq1"
 egress
 pool
 slope-policy "A"
 exit
 exit
 exit
 exit
 path b
 weight 100
 sap-sap
 egress
 pool

```

```
 slope-policy "B"
 exit
 exit
 exit
 exit
 no shutdown
 exit
...

A:ALA-48>config>vsm#
```

## Modifying Service Parameters

- [Epipe on page 1458](#)
- [VPLS on page 1459](#)
- [IES on page 1460](#)
- [VPRN on page 1461](#)

### Epipe

**CLI Syntax:** `config>service#  
epipe service-id  
sap ccag-ccag-id.{a|b}[.sap-net|.sap-sap]:cc-id  
no sap sap-id  
shutdown`

The following service examples display the command usage to provision CCAG.

**Example:** `config>service# epipe 103  
config>service>epipe# sap ccag-1.a:100  
config>service>epipe>sap# shutdown  
config>service>epipe>sap# exit  
config>service>epipe# no sap ccag-1.a:100  
config>service>epipe# sap ccag-1.b:200 create  
config>service>epipe>sap$ no shutdown  
config>service>epipe>sap$ exit  
config>service>epipe#`

The following output displays the configuration:

```
A:ALA-48>config>service>epipe# info

 sap 3/1/1.1.1 create
 exit
 sap ccag-1.b:200 create
 exit
 no shutdown

A:ALA-48>config>service>epipe#
```

**VPLS**

**CLI Syntax:** config>service#  
 vpls service-id [customer customer-id]  
 sap ccag-ccag-id.{a|b} [.sap-net|.sap-sap]:cc-id  
 no sap sap-id  
 shutdown

**Example:** config>service>vpls# sap ccag-1.a:456  
 config>service>vpls>sap# shutdown  
 config>service>vpls>sap# exit  
 config>service>vpls# no sap ccag-1.a:456  
 config>service>vpls# sap ccag-1.b:100 create  
 config>service>vpls>sap\$ no shutdown  
 config>service>vpls>sap\$ exit  
 config>service>vpls# sap ccag-1.a:100  
 config>service>vpls>sap# ingress  
 config>service>vpls>sap>ingress# qos 3  
 config>service>vpls>sap>ingress# exit  
 config>service>vpls>sap# egress  
 config>service>vpls>sap>egress# qos 1010  
 config>service>vpls>sap>egress# exit  
 config>service>vpls>sap# exit

A:ALA-48>config>service>vpls# info

```

 stp
 shutdown
 exit
 sap 1/1/19:1 create
 exit
 sap 1/1/19:2 create
 ingress
 qos 3
 exit
 exit
 sap ccag-1.b:100 create
 exit
 no shutdown

```

A:ALA-48>config>service>vpls#

### IES

**CLI Syntax:**

```
config>service#
 ies service-id [customer customer-id]
 interface ip-interface-name
 sap ccag-ccag-id.{a|b} [.sap-net|.sap-sap]:cc-id
 no sap sap-id
 shutdown
```

**Example:**

```
config>service# ies 200
config>service>ies# interface "ccanet6"
config>service>ies>if# sap ccag-1.a:101 create
config>service>ies>if>sap# ingress
config>service>ies>if>sap>ingress# qos 3
config>service>ies>if>sap>ingress# exit
config>service>ies>if>sap# egress
config>service>ies>if>sap>egress# qos 1010
config>service>ies>if>sap>egress# exit
config>service>ies>if>sap# no shutdown
config>service>ies>if>sap# exit
config>service>ies>if#
```

The following output displays the configuration:

```
A:ALA-48>config>service>ies# info

 interface "ccaiesif" create
 address 8.1.1.1/24
 sap ccag-1.b:456 create
 ingress
 qos 3
 exit
 egress
 qos 1010
 exit
 exit
 exit
 interface "ccanet6" create
 address 7.1.1.1/24
 sap ccag-1.a:101 create
 ingress
 qos 3
 exit
 egress
 qos 1010
 exit
 exit
 exit
 no shutdown

A:ALA-48>config>service>ies#
```



**VPRN**

**CLI Syntax:** config>service#  
                 vprn *service-id* [customer *customer-id*]  
                     interface *ip-interface-name*  
                         sap *ccag-ccag-id*.{a|b}[*.sap-net*|*.sap-sap*]:*cc-id*  
                         no sap *sap-id*  
                         shutdown

On a VPRN service SAP:

**Example:** config>service#   vprn 701  
             config>service>vprn# interface "VSM-Test Config" create  
             config>service>vprn>if\$ sap ccag-2.b:50 create  
             config>service>vprn>if>sap\$ no shutdown  
             config>service>vprn>if>sap\$ exit  
             config>service>vprn>if# exit  
             config>service>vprn#

The following output displays the configuration:

```
A:ALA-48>config>service>vprn# info

 interface "VSM Test" create
 sap ccag-2.a:100 create
 exit
 exit
 interface "VSM-Test Config" create
 sap ccag-2.b:50 create
 exit
 exit
 no shutdown

A:ALA-48>config>service>vprn#
```



# VSM Command Reference

## Command Hierarchies

### VSM Configuration Commands

```

config
 — vsm
 — ccag ccag-id [create]
 — no ccag ccag-id [force]
 — access
 — adapt-qos {link | distribute}
 — no adapt-qos
 — cca-rate kilobits-per-second
 — no cca-rate
 — description description-string
 — no description
 — [no] member-cca card-slot/mda-number
 — path {a | b}
 — net-sap
 — accounting-policy accounting-policy
 — no accounting-policy
 — [no] collect-stats
 — egress
 — pool
 — resv-cbs percentage-of-pool
 — no resv-cbs
 — slope-policy slope-policy-name
 — no slope-policy
 — mac mac-address
 — no mac
 — mtu mtu-size
 — no mtu
 — queue-policy queue-policy-name
 — no queue-policy
 — rate kilobits-per-second [aggregate | cca]
 — no rate
 — sap-net
 — egress
 — pool
 — resv-cbs percentage-of-pool
 — no resv-cbs
 — slope-policy slope-policy-name
 — no slope-policy
 — ingress
 — pool

```

- **resv-cbs** *percentage-of-pool*
- **no resv-cbs**
- **slope-policy** *slope-policy-name*
- **no slope-policy**
- **mac** *mac-address*
- **no mac**
- **mtu** *mtu-size*
- **no mtu**
- **sap-sap**
  - **egress**
    - **pool**
      - **resv-cbs** *percentage-of-pool*
      - **no resv-cbs**
      - **slope-policy** *slope-policy-name*
      - **no slope-policy**
  - **ingress**
    - **pool**
      - **resv-cbs** *percentage-of-pool*
      - **no resv-cbs**
      - **slope-policy** *slope-policy-name*
      - **no slope-policy**
- **mac** *mac-address*
- **no mac**
- **mtu** *mtu-size*
- **no mtu**
- **weight** *path-weight*
- **no weight**
- **[no] shutdown**

## Related Commands

```

config card slot-number
 — mda {1 | 2} type {existing-mda-types | vsm}
 — [no] mda {1 | 2}
config router [router-name]
 — [no] interface ip-interface-name
 — port ccag-ccag-id.{a | b}[.net-sap]:cc-id
 — no port
config service
 — epipe service-id [customer customer-id]
 — sap ccag-ccag-id.{a | b}[.sap-net | .sap-sap]:cc-id [create]
 — no sap ccag-ccag-id.{a | b}[.sap-net | .sap-sap]:cc-id
config service
 — vppls service-id [customer customer-id]
 — sap ccag-ccag-id.{a | b}[.sap-net | .sap-sap]:cc-id [create]
 — no sap ccag-ccag-id.{a | b}[.sap-net | .sap-sap]:cc-id
ies service-id [customer customer-id]
 — interface ip-interface-name
 — sap ccag-ccag-id.{a | b}[.sap-net | .sap-sap]:cc-id [create]
 — no sap ccag-ccag-id.{a | b}[.sap-net | .sap-sap]:cc-id
vppls service-id [customer customer-id]
 — interface ip-interface-name
 — sap ccag-ccag-id.{a | b}[.sap-net | .sap-sap]:cc-id [create]
 — no sap ccag-ccag-id.{a | b}[.sap-net | .sap-sap]:cc-id

```



---

## VSM Configuration Commands

---

### Generic Commands

---

#### shutdown

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] shutdown</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>vsm>ccag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command controls the administrative state of the <i>ccag-id</i> the command is executed under. Upon creation, the default state of a CCAG is to be administratively up which corresponds to the no shutdown form of the command. If the CCAG must be forced to be operationally down, the <b>shutdown</b> command will place the CCAG into an administratively down state causing the operational state to also be down.</p> <p>When a CCAG is shutdown, all SAPs associated with the CCAG will be operationally down. An operationally down SAP cannot be used for forwarding packets. If the SAP is part of the VPLS service, all MAC entries associated with the SAP will be removed from the VPLS FDB and the SAP will be removed from the flooding domain of the VPLS. If the SAP is part of an IES service, the associated IP interface will be set to an operationally down state. Network IP interfaces bound to a shutdown CCAG will be operationally down as well.</p> <p>Executing the no shutdown command sets the CCAG to the default up administrative state. As long as at least one member CCA in the CCAG is active, all SAPs and network IP interfaces associated with the CCAG will be allowed to enter the operationally up state.</p> |
| <b>Default</b>     | <b>no shutdown</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

#### description

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>description</b> <i>description-string</i><br><b>no description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>vsm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command defines an informational string associated with the CCAG. The description string may be up to 80 characters long and contain only printable ASCII characters. Each time this command is successfully executed, any previous description string will be overwritten. If the command fails due to improper string definition, a previously successful description string will remain.</p> <p>The <b>no</b> form of the command removes any current description string from the CCAG.</p> |
| <b>Default</b>     | <b>None</b> (A description string must be explicitly defined)                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**Parameters**     *description-string* — Defines the string of printable ASCII characters, up to 80 characters that will be stored and displayed as a description for the *ccag-id* that the **description** command is executed under. The string must be entered in double quotation marks if the string contains spaces.



## VSM CLI Tree Node Commands

### vsm

|                    |                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] vsm</b>                                                                                                                                                                                                  |
| <b>Context</b>     | config                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command changes the current CLI context to the CCA nodal context. The CCA nodal context is where CCAGs are created and maintained.</p> <p>The CCA nodal context always exists and cannot be removed.</p> |

### ccag

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ccag ccag-id [create]</b><br><b>no ccag ccag-id [force]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>vsm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command creates a Cross Connect Aggregation Group (CCAG). A CCAG represents a group of CCAs as a common forwarding entity. Objects requiring a CCA cross connect function are mapped to a CCAG, not the individual CCAs within the CCAG. The CCAG treats each active member CCA as a possible destination when forwarding packets between the cross connected objects mapped to the CCAG. The system uses both conversation hashing functions and direct service mappings to determine the load sharing distribution between the active CCAs. All packets for a given conversation flow through the same CCA to preserve packet order. Packet ordering may be momentarily affected during convergence events when CCAs are dynamically added or removed from the active list.</p> <p>The CCAG context is used to manage the following functions per CCAG instance:</p> <ul style="list-style-type: none"> <li>• Informational description of the CCAG</li> <li>• Administrative state of the CCAG</li> <li>• Alpha path bandwidth and weight parameters</li> <li>• Beta path bandwidth and weight parameters</li> <li>• CCA total bandwidth limit</li> <li>• CCA membership in the CCAG</li> </ul> <p>The <b>no</b> form of the command removes an existing <i>ccag-id</i> from the system. Once the specified <i>ccag-id</i> is removed from the system, it may not be referenced by any cross connect objects. If the <b>force</b> keyword is not specified, the <b>no ccag ccag-id</b> command will fail if the specified <i>ccag-id</i> has one or more <i>cc-ids</i> associated with it. In the event that the specified <i>ccag-id</i> does not exist, the <b>no ccag ccag-id</b> command will return to the current CLI context without any change to the system.</p> |
| <b>Default</b>     | <b>None</b> (each CCAG context must be explicitly created to be used)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

- Parameters**    *ccag-id* — Identifies the CCAG instance that the system is creating or editing. Up to eight CCAGs may be created within the system. A *ccag-id* must be created on the system prior to creating cross connect object associations.
- After a *ccag-id* is created, a CCAG SAP may be created with an association with the *ccag-id*. A CCAG SAP is identified by a concatenation of an existing *ccag-id* and a *cc-id*. The *cc-id* must match the *cc-id* of the other object the CCAG SAP is paired with on the *ccag-id*. The created *ccag-id* may also be associated with a network IP interface. A network IP interface is bound to the *ccag-id* through the port command in the config router interface ip-interface context and references the *ccag-id* and a *cc-id*. Again, the *cc-id* must match the other object the IP interface is paired with on the *ccag-id*.
- Once created, the **ccag** *ccag-id* command may be executed to enter the *ccag-id* instance for the purpose of editing the CCAG parameters or operational state.
- Values**        1 through 8
- create** — The **create** keyword explicitly indicates that the specified *ccag-id* is being created. Handling the inclusion or exclusion state of the create keyword is dependent on the system environment variable create.
- When the system environment variable create is enabled, the system requires the explicit use of the create keyword when creating objects such as a CCAG. If the keyword is not included and the *ccag-id* has not already been created, an error will occur and the CLI will remain at the current CLI context. This is designed to prevent the inadvertent creation of a CCAG instance in the event where the wrong *ccag-id* is specified during an attempt to edit an existing CCAG instance. If the create keyword is specified, the *ccag-id* will be created given the *ccag-id* is within the proper range for CCAG identifiers.
- When the system environment variable create is disabled (using the no create command), the system will not require the create keyword when creating a CCAG instance. In the event that the ccag command is issued with a *ccag-id* that previously had not been created, that *ccag-id* will be considered available for cross connect associations and bindings.
- Once a *ccag-id* has been created, the create keyword is ignored when a ccag command is executed with that *ccag-id*. The **ccag** *ccag-id* create command will only result in a CLI context change to the specified CCAG instance for a pre-existing *ccag-id*.
- force** — The **force** keyword removes the specified *ccag-id* regardless of the presence of one or more *cc-id*. If a SAP exists on the *ccag-id*, the force keyword will cause the SAP to be removed from the configuration. If a network IP interface is bound to the *ccag-id*, the interface will be silently unbound from the *ccag-id*. The force keyword is intended as a time saving feature, preventing the need to first remove all service and network associations with the *ccag-id*. It is not required to first remove all CCAs from the CCAG prior to deleting the CCAG from the system. When the CCAG is removed, association with all member CCAs is automatically removed.

## access

|                    |                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>access</b>                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i>                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | <p>This command changes the current CLI context to the CCAG access nodal context. The access nodal context contains the qos adaptation command used to control the SAP QoS distribution across the active member CCAs within the CCAG.</p> <p>The CCAG access nodal context always exists and cannot be removed.</p> |

## adapt-qos

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>adapt-qos {link   distribute}</b><br><b>no adapt-qos</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >access                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command controls how the CCAG SAP queue and virtual scheduler buffering and rate parameters are adapted over multiple active CCAs. Two adaptation modes are supported; link and distributed.</p> <p>The <b>no</b> form of the command returns the CCAG access QoS adaptation rule to the default setting of distribute.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parameters</b>  | <p><b>link</b> — The <b>link</b> keyword is mutually exclusive with the <b>distributed</b> keyword. When <b>link</b> is specified, the CCAG will create the SAP queues and virtual schedulers on each CCA with the actual parameters defined in the QoS and scheduler policies. This mode is useful when conversation hashing places all or most traffic over a single CCA.</p> <p><b>Values</b> link or distribute</p> <p><b>Default</b> distribute</p> <p><b>distribute</b> — The <b>distribute</b> keyword is mutually exclusive with the <b>link</b> keyword. When <b>distribute</b> is specified, the CCAG SAP queues and schedulers on each CCA will receive a portion of the defined parameters in the QoS and scheduler policies. The portion is decided on an IOM basis with the ratio determined by the number of active CCA members on the IOM relative to the total number of active members within the CCAG. The following equation may be used to determine the actual ratio:</p> $\text{IOM-parameter-value} = (\text{IOM-active-CCA} / \text{total-active-CCA}) * \text{policy-parameter-value}$ <p><b>Values</b> link or distribute</p> <p><b>Default</b> distribute</p> |

## cca-rate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>cca-rate</b> <i>kilobits-per-second</i><br><b>no cca-rate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config cca>ccag <i>ccag-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command defines a maximum forwarding rate for each CCA member within the CCAG. Support of setting a maximum CCA forwarding rate is provided to prevent overrunning the ingress forwarding plane when sub-line rate ingress features are enabled. The primary ingress feature requiring this support is dual ingress access queuing. When dual ingress queuing is enabled on cross connect SAPs, the CCA forwarding rate should be limited to a rate that prevents packet loss due to ingress forwarding congestion. The specified limit is applied to the aggregate alpha and beta path bandwidth.<br>The <b>no</b> form of the command removes CCA bandwidth rate limiting. |
| <b>Parameters</b>  | <i>kilobits-per-second</i> — Defines the maximum CCA rate in kilobits per second. The actual Kilobits per second rate is rounded up to the nearest 50Mbps increment.<br><br><b>Values</b> 0 — 100000000, max<br><br><b>Default</b> <b>max</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## member-cca

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] member-cca</b> <i>card-slot/mda-number</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command adds and deletes provisioned CCAs from the CCAG. The only requirement to defining a CCA member is that the defined MDA position be provisioned as type cca. A CCA does not need to be populated in the defined MDA position prior to membership definition. A non-populated CCA member is considered inactive from a CCAG perspective. A populated CCA member will become active once it has been initialized by the system. A CCA member may be removed from the CCAG or depopulated from MDA slot at any time. At least one member CCA must be active on the CCAG for the CCAG to be placed in the operational state. Up to 8 member CCAs can be configured per CCAG.<br>The <b>no</b> form of the command removes a CCA member from the CCAG. If the CCA does not exist or is not currently a member of the CCAG, no error is returned. Once removed from the CCAG, all forwarding through the specified CCA stops. |
| <b>Parameters</b>  | <i>card-slot/mda-number</i> — Identifies the system MDA slot that is will be added as a member CCA for the CCAG. The specified MDA slot must have been pre-provisioned as type cca for the membership command to be successful.<br><br><i>card-slot</i> — Defines the IOM slot the provisioned CCA is or will be populated. It is separated from the following mda-position portion of the parameter by a forward slash (/).<br><br><b>Values</b> 1 through 10 (chassis type dependent)                                                                                                                                                                                                                                                                                                                                                                                                                                             |

*mda-position* — The mda-position portion of the parameter defines the MDA slot number on the IOM the CCA is or will be populated. It must be separated from the preceding card-slot portion of the parameter by a forward slash (/).

**Values**      1 or 2 (IOM type dependent)

## VSM Path Commands

### path

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>path {a   b}</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command changes the current CLI context to the path nodal context. The CCA path nodal context is where each CCA path bandwidth, buffer and accounting parameters are maintained. The path context command must be specified with either the a or b keyword specifying the CCA path context to be entered.</p> <p>Each CCA is divided into two distinct paths for bandwidth management purposes. One path is identified as alpha (a) and the other beta (b). The significance of each path for bandwidth distribution is dependent on the relative path weights each path is given in relationship to the other. A maximum path rate may also be defined allowing the provisioning of a maximum cap on the aggregate bandwidth allowed to the SAP or IP interface queues associated with the path. Each path is separated into three other contexts; SAP-2-SAP (sap-sap), SAP-2-Net (sap-net) and Net-2-SAP (net-sap). Each path context allows for the definition of the features that are usually associated with physical ports on other MDAs in the system. These include buffer pool management, ingress network queue definitions and accounting policy control.</p> <p>The CCA path nodal contexts always exist and cannot be removed.</p> |
| <b>Parameters</b>  | <p><b>a</b> — The <b>a</b> keyword is mutually exclusive to the <b>b</b> keyword and defines the CLI CCA path context to be the alpha path. Either the <b>a</b> or <b>b</b> path must be specified. If the <b>a</b> or <b>b</b> keyword is not present, the path command will fail without changing the current CLI context.</p> <p><b>b</b> — The <b>b</b> keyword is mutually exclusive to the <b>a</b> keyword and defines the CLI CCA path context to be the beta path. Either the <b>a</b> or <b>b</b> path must be specified. If the <b>a</b> or <b>b</b> keyword is not present, the path command will fail without changing the current CLI context.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### rate

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>rate <i>kilobits-per-second</i> [aggregate   cca]</b><br><b>no rate</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command defines a specific bandwidth rate limitation for the alpha or beta paths on each member CCA in the CCAG. Use of the rate command is optional. When the rate command is not executed or the no rate command is executed, bandwidth allocated to the path is not limited to a specific rate.</p> <p>Path limiting on a CCA prevents the aggregate bandwidth for the path from exceeding a certain rate. If the rate is exceeded, the CCA will backpressure all active egress queues sending on that path.</p> |

Access to the available bandwidth is dependent on the various parameters associated with each object egress queue.

The specified rate may be defined as an aggregate path rate for all CCAs in the CCAG or it may be defined as a per CCA path rate.

The **no** form of the command removes path rate limiting from all CCAs in the CCAG membership list for the path.

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default</b>    | <b>None</b> (rate limiting the alpha path must be explicitly defined)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b> | <i>kilobits-per-second</i> — Defines the path rate in kilobits per second. The <b>aggregate</b> and <b>cca</b> keywords specify how the defined rate is applied on a per CCA basis. The actual rate at each CCA is rounded up to the nearest 50Mbps.                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Values</b>     | 0 — 100000000, max                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Default</b>    | <b>max</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                   | <b>aggregate</b> — The <b>aggregate</b> keyword is optional and mutually exclusive to the <b>cca</b> keyword. When <b>aggregate</b> is specified, the defined rate is divided among the CCAs in the CCAG member list based on the number of active CCAs. If three CCAs are active, the rate is divided by three and the result is applied to each active CCA. If a fourth CCA becomes active on the CCAG, the defined rate is then divided by four with the result applied to each CCA member on the CCAG. The actual rate at each CCA is implemented in 50Mbps increments. The system will adapt the specified rate to the best rate available per CCA. |
|                   | <b>Default</b> When the kilobits-per-second parameter is specified, the default keyword is <b>aggregate</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                   | <b>cca</b> — The <b>cca</b> keyword is optional and mutually exclusive to the <b>aggregate</b> keyword. When <b>cca</b> is specified, the defined rate is applied to all CCAs in the CCAG member list. The actual rate at each CCA is implemented in 50Mbps increments. The system will adapt the specified rate to the best rate available per CCA.                                                                                                                                                                                                                                                                                                     |

## weight

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>weight</b> <i>path-weight</i><br><b>no weight</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config cca>ccag ccag-id>path {a   b}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command defines a scheduling weight to the aggregate output of the alpha and beta paths. The specified weight is used to calculate a scheduling percentage for each path. The percentage for each path is based on:</p> $\text{Alpha scheduling percentage} = \text{alpha-path-weight} / (\text{alpha-path-weight} + \text{beta-path-weight})$ $\text{Beta scheduling percentage} = \text{blue-path-weight} / (\text{alpha-path-weight} + \text{beta-path-weight})$ <p>Based on the above calculation, the sum of the alpha and beta scheduling percentage always equals 100 percent. When one path is not using all of its available scheduling bandwidth, the other path may use the remainder.</p> <p>The <b>no</b> form of the command returns the path-weight for the path to the default value of 50.</p> |

|                   |                                                                                                                                                                                                                                                                                                                              |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <i>path-weight</i> — The path-weight parameter is required and is used by the system to determine the scheduling percentage for both paths. Changing the path-weight for one path affects both paths scheduling percentage. The resulting scheduling percentage changes are applied to all CCAs in the CCAG membership list. |
| <b>Values</b>     | 1 to 100                                                                                                                                                                                                                                                                                                                     |
| <b>Default</b>    | 50                                                                                                                                                                                                                                                                                                                           |

sap-sap

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap-sap</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config cca>ccag ccag-id>path {a   b}                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command changes the current CLI context to the path SAP-SAP nodal context. This context contains the ingress and egress buffer pool configuration commands. The sap-sap&gt;path context is associated with all SAPs defined on the CCAG path (alpha or beta depending on the path context) that cross connect to a SAP on the other path.</p> <p>The CCA path SAP-SAP nodal context always exists and cannot be removed.</p> |

mac

|                    |                                                                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac</b> <i>mac-address</i>                                                                                                                                                                                         |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-net<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap                                                               |
| <b>Description</b> | <p>This command overrides the default MAC address for the path's context.</p> <p>The <b>no</b> form of the command returns the in-use MAC address for the path's context to the default MAC from the chassis MAC pool.</p> |
| <b>Parameters</b>  | <i>mac-address</i> — Defines the IEEE MAC address that is to be associated with the path's context.                                                                                                                        |
| <b>Values</b>      | Any valid IEEE MAC source MAC address<br>(6 byte address expressed in hexadecimal notation with each byte separated by a dash (-)).                                                                                        |
| <b>Default</b>     | The path's default sap-sap MAC address is derived from the chassis MAC address pool.                                                                                                                                       |



## mtu

|                    |                                                                                                                                                                                                                                                                                             |                |                                                                         |               |                  |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------|---------------|------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>mtu-size</i><br><b>no mtu</b>                                                                                                                                                                                                                                                 |                |                                                                         |               |                  |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-sap<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-net<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap                                                                                                                        |                |                                                                         |               |                  |
| <b>Description</b> | This command overrides the default port level MTU for the path's context.<br>The <b>no</b> form of the command returns the MTU for the path's sap-sap context to the default MTU.                                                                                                           |                |                                                                         |               |                  |
| <b>Parameters</b>  | <i>mtu-size</i> — Defines the Ethernet MTU that is to be associated with the path's context. <table> <tr> <td><b>Default</b></td><td><b>1518</b> - sap-sap<br/><b>1518</b> - sap-net<br/><b>9212</b> - net-sap</td></tr> <tr> <td><b>Values</b></td><td>512 — 9212 bytes</td></tr> </table> | <b>Default</b> | <b>1518</b> - sap-sap<br><b>1518</b> - sap-net<br><b>9212</b> - net-sap | <b>Values</b> | 512 — 9212 bytes |
| <b>Default</b>     | <b>1518</b> - sap-sap<br><b>1518</b> - sap-net<br><b>9212</b> - net-sap                                                                                                                                                                                                                     |                |                                                                         |               |                  |
| <b>Values</b>      | 512 — 9212 bytes                                                                                                                                                                                                                                                                            |                |                                                                         |               |                  |

## egress

|                    |                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress</b>                                                                                                                                                                                                        |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-sap<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-net<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap                                                 |
| <b>Description</b> | This command changes the current CLI context to the path's context. This context contains the egress buffer pool configuration commands.<br>The CCA path's egress nodal context always exists and cannot be removed. |

## pool

|                    |                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pool</b>                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-sap>egress<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-sap>ingress<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-net>egress<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-net>ingress<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap>egress |
| <b>Description</b> | This command changes the current CLI context to the path's nodal context. This context contains the egress buffer pool configuration commands. The CCA path's egress or ingress pool nodal context always exists and cannot be removed.                                                                                   |

## resv-cbs

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] resv-cbs percentage-of-pool</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | <pre>config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;sap-sap&gt;egress&gt;pool config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;sap-sap&gt;ingress&gt;pool config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;sap-net&gt;egress&gt;pool config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;sap-net&gt;ingress&gt;pool config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;net-sap&gt;egress&gt;pool</pre>                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command defines the percentage of the buffer pool that is considered reserved for the CBS buffer allocation for queues created in the path's pool context.</p> <p>The <b>no</b> form of the command returns the reserved portion of the buffer pool to the default percentage.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <p><i>percentage-of-pool</i> — The percentage-of-pool parameter defines the percentage of the buffer pool that is not considered shared. The shared portion of the pool is used by queues that have crossed their CBS buffer threshold and is subject to the WRED slope functions. The reserved portion of the pool is used by queues that have not crossed their CBS threshold. The aggregate CBS on the queues associated with the pool may oversubscribe the resv-cbs percentage. If the reserved portion is oversubscribed and the in-use reserved buffers exceed the defined percentage, buffers are removed from the shared portion of the pool.</p> <p><b>Values</b>      1 to 100 (percent)</p> <p><b>Default</b>      30</p> |

## slope-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>slope-policy slope-policy-name</b><br><b>no slope-policy</b>                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | <pre>config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;sap-sap&gt;egress&gt;pool config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;sap-sap&gt;ingress&gt;pool config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;sap-net&gt;egress&gt;pool config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;sap-net&gt;ingress&gt;pool config&gt;vsm&gt;ccag <i>ccag-id</i>&gt;path {a   b}&gt;net-sap&gt;egress&gt;pool</pre>           |
| <b>Description</b> | <p>This command defines the slope policy used to manage the shared portion of the buffer pools WRED slopes. The commands in the policy control the administrative state of the slopes, the start and knee points of each slope and the time-average-factor for the weighted average buffer utilization calculation.</p> <p>The <b>no</b> form of the command configures the default slope policy as the managing policy for the buffer pool.</p> |
| <b>Parameters</b>  | <p><i>slope-policy-name</i> — Defines the name of the WRED slope policy used to manage the WRED slopes in the shared portion of the buffer pool.</p> <p><b>Values</b>      Any existing slope policy name.</p>                                                                                                                                                                                                                                   |

## ingress

|                    |                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress</b>                                                                                                                                                                                                         |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-sap<br>config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-net                                                                                                           |
| <b>Description</b> | This command changes the current CLI context to the path's context. This context contains the ingress buffer pool configuration commands.<br>The CCA path's ingress nodal context always exists and cannot be removed. |

## sap-net

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap-net</b>                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command changes the current CLI context to the path sap-net nodal context. This context contains the ingress and egress buffer pool configuration commands. The sap-net>path context is associated with all SAPs defined on the CCAG path (alpha or beta depending on the path context) that cross connect to a network IP interface on the other path.<br>The CCA path sap-net nodal context always exists and cannot be removed. |

## slope-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>slope-policy</b> <i>slope-policy-name</i><br><b>no slope-policy</b>                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>sap-net>ingress>pool                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command defines the slope policy used to manage the shared portion of the buffer pools WRED slopes. The commands in the policy control the administrative state of the slopes, the start and knee points of each slope and the time-average-factor for the weighted average buffer utilization calculation.<br><br>The <b>no</b> form of the command configures the default slope policy as the managing policy for the buffer pool. |
| <b>Parameters</b>  | <i>slope-policy-name</i> — The slope-policy-name parameter defines the name of the WRED slope policy used to manage the WRED slopes in the shared portion of the buffer pool.                                                                                                                                                                                                                                                             |
| <b>Values</b>      | Any existing slope policy name.                                                                                                                                                                                                                                                                                                                                                                                                           |

## net-sap

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>net-sap</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command changes the current CLI context to the path net-sap nodal context. The net-sap nodal context contains the network accounting and queue policies and the egress buffer pool configuration commands. The net-sap path context is associated with all network IP interfaces bound to the CCAG path (alpha or beta depending on the path context) that cross connects to a SAP on the other path. The CCA path net-sap nodal context always exists and cannot be removed. |

## mtu

|                    |                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mtu</b> <i>mtu-size</i><br><b>no mtu</b>                                                                                                                                               |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>                                                                                                                                             |
| <b>Description</b> | This command overrides the default port level MTU for the path's net-sap context.<br>The <b>no</b> form of the command returns the MTU for the path's net-sap context to the default MTU. |
| <b>Parameters</b>  | <i>mtu-size</i> — The mtu-size, in bytes, defines the Ethernet MTU that is to be associated with the path's net-sap context.<br><b>Default</b> 1522                                       |

## accounting-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>accounting-policy</b> <i>accounting-policy</i><br><b>no accounting-policy</b>                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command defines the network accounting policy that will be used to define which statistics will be collected when the <b>collect-stats</b> command is enabled in the path's net-sap context.<br>The <b>no</b> form of the command reverts the path's net-sap context statistics billing collection to the statistics defined in the default network accounting policy. |
| <b>Parameters</b>  | <i>accounting-policy</i> — The accounting-policy parameter is required and identifies which set of statistics will be collected for billing output.<br><b>Values</b> Any existing network accounting policy in the system.<br><b>Default</b> The default network accounting policy                                                                                          |

## collect-stats

|                    |                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] collect-stats</b>                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command enables collecting stats on the path's net-sap context. When enabled the statistics defined in the accounting-policy accounting-policy command will be collected according to the specifications in the policy.</p> <p>The <b>no</b> form of the command disables network billing statistics collection on the net-sap context.</p> |
| <b>Default</b>     | Network statistics are not collected by default on the net-sap context.                                                                                                                                                                                                                                                                             |

## queue-policy

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>queue-policy</b> <i>queue-policy-name</i><br><b>no queue-policy</b>                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command defines the egress network queues used by IP interfaces bound to the path's net-sap context. The specified <i>queue-policy-name</i> defines the number of queues, the rate and buffering parameters for the queues and the forwarding class mappings to the queues.</p> <p>The <b>no</b> form of the command reverts the path's net-sap network IP interface queues to the systems default queue policy.</p> |
| <b>Parameters</b>  | <p><i>queue-policy-name</i> — Specifies which existing Queue Policy will define the queuing structure for network IP interfaces bound to the path's net-sap context.</p> <p><b>Values</b> Any existing queue policy on the system.</p> <p><b>Default</b> The default queue policy is used when another is not specified.</p>                                                                                                 |

## egress

|                    |                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress</b>                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap                                                                                                                                                                                                           |
| <b>Description</b> | <p>This command changes the current CLI context to the path&gt;net-sap&gt;egress nodal context. This context contains the egress buffer pool configuration commands.</p> <p>The CCA path net-sap egress nodal context always exists and cannot be removed.</p> |

### pool

|                    |                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pool</b>                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | config>vsm>ccag <i>ccag-id</i> >path {a   b}>net-sap>egress                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command changes the current CLI context to the path&gt;net-sap&gt;egress pool&gt;nodal context. This context contains the egress buffer pool configuration commands.</p> <p>The CCA path net-sap egress pool nodal context always exists and cannot be removed.</p> |

## Related Commands

Refer to the 7750 SR OS Interface Configuration Guide for more card, MDA, and port command information. Refer to the 7750 SR OS Services Guide for details about configuring specific service parameters.

### mda

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mda</b> <i>mda-slot</i><br><b>no mda</b> <i>mda-slot</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | config>card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>This command provisions an adaptor into an MDA position on an IOM slot. The provisioned MDA may or may not exist in the system at the time of provisioning. If the provisioned MDA does not currently exist in the specified MDA position number, it is considered to be a 'ghost' MDA. Ports and other resources on a ghost MDA may be configured once the MDA is provisioned. When a proper MDA matching the provisioned MDA type is inserted into the IOM MDA position, forwarding through the MDA based on configured services or network interface will be available once the MDA has been properly initialized.</p> <p>A Versatile Service Module (VSM) is provisioned into the system in the same manner as all other adaptors using MDA slots. Once a VSM is provisioned, independent of it actually existing in the system on the specified slot and MDA position, the VSM may be defined as a member of a CCAG (Cross Connect Adaptor Group). A VSM inserted into the system prior to provisioning is not available for CCAG membership and will be treated as an unprovisioned MDA.</p> <p>Once a VSM is provisioned and populated in the system, it cannot be used until it has been defined membership into a CCAG. When the CCAG membership has been defined for the VSM, the various internal resources of the VSM will be configured according to the CCAG bandwidth control parameters. This includes the alpha and beta path weights, the alpha and beta path maximum rates and the aggregate alpha and beta maximum rate.</p> <p>The <b>no</b> form of the command unprovisions an MDA from the system. For a VSM to be unprovisioned, the VSM must not be a member of a CCAG. If the VSM is a member of a CCAG, the <b>no cca slot-number/mda-number</b> command must be used in the CCAG member-list context. Once a CCA is unprovisioned from the system; it cannot be made a member of a CCAG until it has been reprovisioned.</p> |
| <b>Default</b>     | <b>None</b> (An MDA position number must be explicitly specified.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><i>mda-slot</i> — Defines the position on the card slot-number the CCA will be populated into. On the iom-20g IOM module, two MDA positions are available. Future IOMs will support a different number of MDA positions.</p> <p><b>Values</b>      1 or 2</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## port

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|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port ccag-ccag-id</b> .{a   b}[.net-sap]:cc-id<br><b>no port</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>router>interface <i>ip-interface-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command cross connects a network IP interface to a CCAG SAP using the referenced <i>ccag-id</i>. A CCAG network IP interface binding is identified by four items; the <i>ccag-id</i>, the CCAG path, the pairing type and the <i>cc-id</i>. A network IP interface CCAG port binding supports all the available features as port binding using a Dot1Q virtual interface.</p> <p>To support cross connection between services and network IP interfaces, the network interface port command allows the binding of the IP interface to a <i>ccag cc-id</i>. Similar to service CCAG SAPs, the network IP interface port binding command must reference the <i>ccag-id</i>, the CCA path (.a or .b) and the <i>cc-id</i> used by the service CCAG SAP on the other CCA path. The pairing type is optional as only <i>.net-sap</i> is supported.</p> <p>The <b>no</b> form of the command removes the CCAG binding from the network IP interface.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><b>ccag</b> — The ccag portion of the port binding is required and specifies that the network IP interface is binding to a <b>ccag cc-id</b>.</p> <p><i>ccag-id</i> — The <i>ccag-id</i> portion of the port binding is required and specifies which <i>ccag-id</i> the network IP interface must be bound to. The specified <i>ccag-id</i> must exist on the system or the port binding will fail. The leading dash must be included as a separator between ccag and the <i>ccag-id</i>.</p> <p><b>Values</b>        -1 (dash 1) to -8 (dash 8)</p> <p><b>Default</b>        None</p> <p><b>.a   .b</b> — The .a and .b portion of the port binding is required and is used to define the CCA bandwidth path the network IP interface will be associated with. The path association must be specified and .a and .b are mutually exclusive. The .a designation identifies the network IP interface as being on the Alpha path and the .b designation identifies the network IP interface as being on the Beta path. The paired SAP using the same <i>cc-id</i> as the bound network IP interface must be associated with the opposite path. The leading period must be included as a separator between the <i>ccag-id</i> and the path designator.</p> <p><b>Values</b>        .a or .b</p> <p><b>Default</b>        None</p> <p><i>.net-sap</i> — The <i>.net-sap</i> portion of the network IP interface CCAG binding is optional and is used to explicitly define the pairing type as Net-2-SAP. A cross connection between two network IP interfaces is not currently allowed. The <i>.net-sap</i> pairing type is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.</p> <p><b>Default</b>        <b>.net-sap</b></p> <p><i>:cc-id</i> — The <i>:cc-id</i> portion of the port binding is required and specifies the unique <i>cc-id</i> in use by the CCAG network IP interface port binding and the cross connect SAP on the other path.</p> <p><b>Values</b>        1 to 4094</p> |



## Services Commands

- [Epipe SAP on page 1485](#)
- [VPLS SAP on page 1487](#)
- [IES SAP on page 1489](#)
- [VPRN SAP on page 1490](#)

### Service CCAG SAP Provisioning

Services are provisioned onto a CCAG using a special CCAG SAP definition. CCAG SAPs must reference a *ccag-id*, a CCA path (a or b), a pairing type (sap-sap or sap-net) and a unique *cc-id*. The *ccag-id* identifies the group of CCAs that will be used for forwarding packets associated with the SAP. The path identifies the bandwidth control grouping used to manage CCA egress bandwidth. The pairing type helps the system identify which buffering resources will be used to manage egress queuing of packets. Finally, the *cc-id* is used to explicitly cross connect the SAP to another SAP or network IP interface configured with the same *cc-id*.

#### sap

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|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap ccag-ccag-id.{a   b} [.sap-net   .sap-sap]:cc-id [create]</b><br><b>no sap ccag-ccag-id.{a   b} [.sap-net   .sap-sap]:cc-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | config>service>epipe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>This command creates a cross connect SAP on the <i>ccag-id</i> referenced in the Epipe service. A CCAG SAP is identified by four items; the <i>ccag-id</i>, the CCAG path, the pairing type and the <i>cc-id</i>. An Epipe CCAG SAP supports all the available QoS, filtering and accounting features as an Epipe Dot1Q SAP.</p> <p>The <b>no</b> form of the command removes a SAP from a service context. Once removed, all information and resources concerning the SAP is deleted from the system including the CCAG <i>cc-id</i> in use on the CCA path.</p>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><b>ccag</b> — The ccag portion of the SAP identifier is required and specifies that the epipe SAP is of the CCAG type.</p> <p><b>-ccag-id</b> — The <i>ccag-id</i> portion of the SAP identifier is required and specifies which <i>ccag-id</i> on which the SAP must be created. The specified <i>ccag-id</i> must exist on the system or the SAP creation will fail. The leading dash must be included as a separator between <b>ccag</b> and the <i>ccag-id</i>.</p> <p><b>Values</b>      -1 (dash 1) to -8 (dash 8)</p> <p><b>Default</b>      None</p> <p><b>.a   .b</b> — The .a and .b portion of the CCAG SAP identifier is required and is used to define the CCA bandwidth path with will be associated with the SAP. The path association must be specified and .a and .b are mutually exclusive. The .a designation identifies the SAP as being on the Alpha path and the .b designation identifies the SAP as being on the Beta path. The paired SAP or network</p> |

IP interface using the same *cc-id* as the SAP must be associated with the opposite path. The leading period must be included as a separator between the *ccag-id* and the path designator.

**Values** .a or .b

**Default** None

*.sap-net* — The *.sap-net* portion of the CCAG SAP identifier specifies that the SAP is of the SAP-2-Net pairing type and is required when the *cc-id* is paired with a network IP interface. The pairing type *.sap-net* is mutually exclusive with pairing type *.sap-sap*. If *.sap-net* is not specified, *.sap-sap* is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

**Values** .sap-net or .sap-sap

**Default** .sap-sap

*.sap-sap* — The *.sap-sap* portion of the CCAG SAP identifier is mutually exclusive to *.sap-net* and is used to define the pairing type as SAP-2-SAP. The *.sap-sap* pairing type is only used when the cross connect object sharing the same *cc-id* on the opposite path is a CCAG SAP. If the other cross connect object is a network IP interface, the pairing type must be defined as *.sap-net*. If *.sap-net* is not specified, *.sap-sap* is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

**Values** .sap-net or .sap-sap

**Default** .sap-sap

*:cc-id* — The *:cc-id* portion of the CCAG SAP identifier is required and specifies the unique *cc-id* in use by the CCAG SAP and the cross connect object on the other path.

**Values** 1 to 4094

**Default** None

**create** — Explicitly indicates that the specified CCAG SAP is being created by the **sap** command. Handling the inclusion or exclusion state of the create keyword is dependent on the system environment variable create.

When the system environment variable create is enabled, the system requires the explicit use of the **create** keyword when creating objects such as SAPs. If the keyword is not included and the specified CCAG SAP has not already been created, an error will occur and the CLI will not change context to the specified CCAG SAP instance. This is designed to prevent the inadvertent creation of a CCAG SAP in the event where the wrong CCAG SAP identifier is specified during an attempt to edit an existing CCAG SAP. If the **create** keyword is specified, the CCAG SAP will be created if it does not already exist or if it does exist, the CLI context will change to the specified CCAG SAP.

When the system environment variable create is disabled (using the **no create** command), the system will not require the **create** keyword when creating a CCAG SAP. In the event that the **sap** command is issued with a CCAG SAP identifier that previously had not been created, that CCAG SAP will be created.

Once a CCAG SAP has been created, the **create** keyword is ignored when a **sap** command is executed with that CCAG SAP identifier and the CLI context will change to the specified CCAG SAP.

## sap

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|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap ccag-ccag-id.{a   b}[.sap-net   .sap-sap]:cc-id [create]</b><br><b>no sap ccag-ccag-id.{a   b}[.sap-net   .sap-sap]:cc-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | config>service>vpls                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | <p>This command creates a cross connect SAP on the <i>ccag-id</i> referenced in the VPLS service. A CCAG SAP is identified by four items; the <i>ccag-id</i>, the CCAG path, the pairing type and the <i>cc-id</i>. A VPLS CCAG SAP supports all the available QoS, filtering and accounting features as a VPLS Dot1Q SAP.</p> <p>The <b>no</b> form of the command removes a SAP from a service context. Once removed, all information and resources concerning the SAP is deleted from the system including the CCAG <i>cc-id</i> in use on the CCA path.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><b>ccag</b> — The ccag portion of the SAP identifier is required and specifies that the vpls SAP is of the CCAG type.</p> <p><b>-ccag-id</b> — Specifies which <i>ccag-id</i> on which the SAP must be created. The specified <i>ccag-id</i> must exist on the system or the SAP creation will fail. The leading dash must be included as a separator between <b>ccag</b> and the <i>ccag-id</i>.</p> <p><b>Values</b>        -1 (dash 1) to -8 (dash 8)</p> <p><b>Default</b>        None</p> <p><b>.a   .b</b> — The <b>.a</b> and <b>.b</b> portion of the CCAG SAP identifier is required and is used to define the CCA bandwidth path with will be associated with the SAP. The path association must be specified and <b>.a</b> and <b>.b</b> are mutually exclusive. The <b>.a</b> designation identifies the SAP as being on the Alpha path and the <b>.b</b> designation identifies the SAP as being on the Beta path. The paired SAP or network IP interface using the same <i>cc-id</i> as the SAP must be associated with the opposite path. The leading period must be included as a separator between the <i>ccag-id</i> and the path designator.</p> <p><b>Values</b>        .a or .b</p> <p><b>Default</b>        None</p> <p><b>.sap-net</b> — The <b>.sap-net</b> portion of the CCAG SAP identifier specifies that the SAP is of the SAP-2-Net pairing type and is required when the <i>cc-id</i> is paired with a network IP interface. The pairing type <b>.sap-net</b> is mutually exclusive with pairing type <b>.sap-sap</b>. If <b>.sap-net</b> is not specified, <b>.sap-sap</b> is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.</p> <p><b>Values</b>        .sap-net or .sap-sap</p> <p><b>Default</b>        .sap-sap</p> <p><b>.sap-sap</b> — The <b>.sap-sap</b> portion of the CCAG SAP identifier is mutually exclusive to <b>.sap-sap</b> and is used to define the pairing type as SAP-2-SAP. The <b>.sap-sap</b> pairing type is only used when the cross connect object sharing the same <i>cc-id</i> on the opposite path is a CCAG SAP. If the other cross connect object is a network IP interface, the pairing type must be defined as <b>.sap-net</b>. If <b>.sap-net</b> is not specified, <b>.sap-sap</b> is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.</p> |

**Values** .sap-net or .sap-sap

**Default** .sap-sap

**:cc-id** — The *:cc-id* portion of the CCAG SAP identifier is required and specifies the unique *cc-id* in use by the CCAG SAP and the cross connect object on the other path.

**Values** 0 1 to 4094

**Default** None

**create** — Explicitly indicates that the specified CCAG SAP is being created by the **sap** command. Handling the inclusion or exclusion state of the create keyword is dependent on the system environment variable create.

When the system environment variable create is enabled, the system requires the explicit use of the **create** keyword when creating objects such as SAPs. If the keyword is not included and the specified CCAG SAP has not already been created, an error will occur and the CLI will not change context to the specified CCAG SAP instance. This is designed to prevent the inadvertent creation of a CCAG SAP in the event where the wrong CCAG SAP identifier is specified during an attempt to edit an existing CCAG SAP. If the **create** keyword is specified, the CCAG SAP will be created if it does not already exist or if it does exist, the CLI context will change to the specified CCAG SAP.

When the system environment variable create is disabled (using the **no create** command), the system will not require the **create** keyword when creating a CCAG SAP. In the event that the **sap** command is issued with a CCAG SAP identifier that previously had not been created, that CCAG SAP will be created.

Once a CCAG SAP has been created, the **create** keyword is ignored when a **sap** command is executed with that CCAG SAP identifier and the CLI context will change to the specified CCAG SAP.

## sap

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|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap ccag-ccag-id.{a   b}[.sap-net   .sap-sap]:cc-id [create]</b><br><b>no sap ccag-ccag-id.{a   b}[.sap-net   .sap-sap]:cc-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | config>service>ies>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command creates a cross connect SAP on the <i>ccag-id</i> referenced in the IES service. A CCAG SAP is identified by four items; the <i>ccag-id</i>, the CCAG path, the pairing type and the <i>cc-id</i>. A CCAG SAP on an IES IP interface supports all the available QoS, filtering and accounting features as an IES IP interface Dot1Q SAP.</p> <p>The <b>no</b> form of the command removes a SAP from the IES service IP interface context. Once removed, all information and resources concerning the SAP is deleted from the system including the CCAG <i>cc-id</i> in use on the CCA path.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><b>ccag</b> — The <b>ccag</b> portion of the SAP identifier is required and specifies that the ies SAP is of the CCAG type.</p> <p><i>ccag-id</i> — The <i>ccag-id</i> portion of the SAP identifier is required and specifies which <i>ccag-id</i> on which the SAP must be created. The specified <i>ccag-id</i> must exist on the system or the SAP creation will fail. The leading dash must be included as a separator between ccag and the <i>ccag-id</i>.</p> <p><b>Values</b>        -1 (dash 1) to -8 (dash 8)</p> <p><b>Default</b>        None</p> <p><b>.a   .b</b> — The .a and .b portion of the CCAG SAP identifier is required and is used to define the CCA bandwidth path with will be associated with the SAP. The path association must be specified and .a and .b are mutually exclusive. The .a designation identifies the SAP as being on the Alpha path and the .b designation identifies the SAP as being on the Beta path. The paired SAP or network IP interface using the same <i>cc-id</i> as the SAP must be associated with the opposite path. The leading period must be included as a separator between the <i>ccag-id</i> and the path designator.</p> <p><b>Values</b>        .a or .b</p> <p><b>Default</b>        None</p> <p><b>.sap-sap</b> — The .sap-sap portion of the CCAG SAP identifier is optional and is used to explicitly define the pairing type as SAP-2-SAP. The .sap-sap pairing type is only used when the cross connect object sharing the same <i>cc-id</i> on the opposite path is a CCAG SAP. A cross connection between an IES CCAG SAP and a network IP interface is not currently allowed. If .sap-sap is not specified, .sap-sap is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.</p> <p><b>Default</b>        .sap-sap</p> <p><b>:cc-id</b> — The <i>:cc-id</i> portion of the CCAG SAP identifier is required and specifies the unique <i>cc-id</i> in use by the CCAG SAP and the cross connect object on the other path.</p> <p><b>Values</b>        1 to 4094</p> <p><b>Default</b>        None</p> |

**create** — Explicitly indicates that the specified CCAG SAP is being created by the **sap** command. Handling the inclusion or exclusion state of the create keyword is dependent on the system environment variable create.

When the system environment variable create is enabled, the system requires the explicit use of the **create** keyword when creating objects such as SAPs. If the keyword is not included and the specified CCAG SAP has not already been created, an error will occur and the CLI will not change context to the specified CCAG SAP instance. This is designed to prevent the inadvertent creation of a CCAG SAP in the event where the wrong CCAG SAP identifier is specified during an attempt to edit an existing CCAG SAP. If the **create** keyword is specified, the CCAG SAP will be created if it does not already exist or if it does exist, the CLI context will change to the specified CCAG SAP.

When the system environment variable create is disabled (using the **no create** command), the system will not require the **create** keyword when creating a CCAG SAP. In the event that the **sap** command is issued with a CCAG SAP identifier that previously had not been created, that CCAG SAP will be created.

Once a CCAG SAP has been created, the **create** keyword is ignored when a **sap** command is executed with that CCAG SAP identifier and the CLI context will change to the specified CCAG SAP.

## sap

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|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap ccag-ccag-id.{a   b}[.sap-net   .sap-sap]:cc-id [create]</b><br><b>no sap ccag-ccag-id.{a   b}[.sap-net   .sap-sap]:cc-id</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | config>service>vprn>interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command creates a cross connect SAP on the <i>ccag-id</i> referenced in the VPRN service. A CCAG SAP is identified by four items; the <i>ccag-id</i>, the CCAG path, the pairing type and the <i>cc-id</i>. A CCAG SAP on a VPRN IP interface supports all the available QoS, filtering and accounting features as a VPRN IP interface Dot1Q SAP.</p> <p>The <b>no</b> form of the command removes a SAP from the VPRN service IP interface context. Once removed, all information and resources concerning the SAP is deleted from the system including the CCAG <i>cc-id</i> in use on the CCA path.</p>                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><b>ccag</b> — The ccag portion of the SAP identifier is required and specifies that the vprn SAP is of the CCAG type.</p> <p><b>-ccag-id</b> — Specifies which <i>ccag-id</i> on which the SAP must be created. The specified <i>ccag-id</i> must exist on the system or the SAP creation will fail. The leading dash must be included as a separator between <b>ccag</b> and the <i>ccag-id</i>.</p> <p><b>Values</b>      -1 (dash 1) to -8 (dash 8)</p> <p><b>Default</b>      None</p> <p><b>.a   .b</b> — The <b>.a</b> and <b>.b</b> portion of the CCAG SAP identifier is required and is used to define the CCA bandwidth path with will be associated with the SAP. The path association must be specified and <b>.a</b> and <b>.b</b> are mutually exclusive. The <b>.a</b> designation identifies the SAP as being on the alpha path and the <b>.b</b> designation identifies the SAP as being on the beta path. The paired SAP or network</p> |

IP interface using the same *cc-id* as the SAP must be associated with the opposite path. The leading period must be included as a separator between the *ccag-id* and the path designator.

**Values** .a or .b

**Default** None

*.sap-net* — Specifies that the SAP is of the SAP-2-Net pairing type and is required when the *cc-id* is paired with a network IP interface. The pairing type *.sap-net* is mutually exclusive with pairing type *.sap-sap*. If *.sap-net* is not specified, *.sap-sap* is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

**Values** .sap-net or .sap-sap

**Default** .sap-sap

*.sap-sap* — The *.sap-sap* portion of the CCAG SAP identifier is mutually exclusive to *.sap-net* and is used to define the pairing type as SAP-2-SAP. The *.sap-sap* pairing type is only used when the cross connect object sharing the same *cc-id* on the opposite path is a CCAG SAP. If the other cross connect object is a network IP interface, the pairing type must be defined as *.sap-net*. If *.sap-net* is not specified, *.sap-sap* is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

**Values** .sap-net or .sap-sap

**Default** .sap-sap

*:cc-id* — The *:cc-id* portion of the CCAG SAP identifier is required and specifies the unique *cc-id* in use by the CCAG SAP and the cross connect object on the other path.

**Values** 1 to 4094

**Default** None

**create** — Explicitly indicates that the specified CCAG SAP is being created by the **sap** command. Handling the inclusion or exclusion state of the **create** keyword is dependent on the system environment variable `create`.

When the system environment variable `create` is enabled, the system requires the explicit use of the **create** keyword when creating objects such as SAPs. If the keyword is not included and the specified CCAG SAP has not already been created, an error will occur and the CLI will not change context to the specified CCAG SAP instance. This is designed to prevent the inadvertent creation of a CCAG SAP in the event where the wrong CCAG SAP identifier is specified during an attempt to edit an existing CCAG SAP. If the `create` keyword is specified, the CCAG SAP will be created if it does not already exist or if it does exist, the CLI context will change to the specified CCAG SAP.

When the system environment variable `create` is disabled (using the `no create` command), the system will not require the `create` keyword when creating a CCAG SAP. In the event that the `sap` command is issued with a CCAG SAP identifier that previously had not been created, that CCAG SAP will be created.

Once a CCAG SAP has been created, the **create** keyword is ignored when a **sap** command is executed with that CCAG SAP identifier and the CLI context will change to the specified CCAG SAP.





# Show, Clear, Debug, Commands

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## Show, Clear, Debug Commands

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## Services Show Commands

---

### Service Commands

#### customer

**Syntax** **customer** [*customer-id*] [**site** *customer-site-name*]

**Context** show>service

**Description** This command displays service customer information.

**Parameters** *customer-id* — Displays only information for the specified customer ID.

**Default** All customer IDs display.

**Values** 1 — 2147483647

**site** *customer-site-name* — Specifies the customer site which is an anchor point for an ingress and egress virtual scheduler hierarchy.

**Output** **Show Customer Command Output** — The following table describes show customer command output fields:

| Label           | Description                                                                                                               |
|-----------------|---------------------------------------------------------------------------------------------------------------------------|
| Customer-ID     | The ID that uniquely identifies a customer.                                                                               |
| Contact         | The name of the primary contact person.                                                                                   |
| Description     | Generic information about the customer.                                                                                   |
| Phone           | The phone/pager number to reach the primary contact person.                                                               |
| Total Customers | The total number of customers configured.                                                                                 |
| Site            | Multi-service site name. A multi-service customer site is a group of SAPs with common origination and termination points. |
| Description     | Displays information about a specific customer's multi-service site.                                                      |
| Assignment      | The port ID, MDA, or card number, where the SAP's that are members of this multi- service site are defined.               |
| I. Sched Pol    | The ingress QoS scheduler policy assigned to this multi-service site.                                                     |
| E. Sched Pol    | The egress QoS scheduler policy assigned to this multi-service site.                                                      |
| Service-ID      | The ID that uniquely identifies a service.                                                                                |
| SAP             | Specifies the SAP assigned to the service.                                                                                |

### Sample Output

```
*A:ALA-12# show service customer
```

```
=====
```

```
Customers
```

```
=====
```

```
Customer-ID : 1
Contact : Manager
Description : Default customer
Phone : (123) 555-1212
```

```
Customer-ID : 2
Contact : Tech Support
Description : TiMetra Networks
Phone : (234) 555-1212
```

```
Customer-ID : 3
Contact : Fred
Description : TiMetra Networks
Phone : (345) 555-1212
```

```
Customer-ID : 6
Contact : Ethel
Description : Epipe Customer
Phone : (456) 555-1212
```

```
Customer-ID : 7
Contact : Lucy
Description : VPLS Customer
Phone : (567) 555-1212
```

```
Customer-ID : 8
Contact : Customer Service
Description : IES Customer
Phone : (678) 555-1212
```

```
Customer-ID : 274
Contact : Mssrs. Beaucoup
Description : ABC Company
Phone : 650 123-4567
```

```
Customer-ID : 94043
Contact : Test Engineer on Duty
Description : TEST Customer
Phone : (789) 555-1212
```

```

```

```
Total Customers : 8
```

```

```

```
*A:ALA-12#
```

```
*A:ALA-12# show service customer 274
```

```
=====
```

```
Customer 274
```

```
=====
```

```
Customer-ID : 274
Contact : Mssrs. Beaucoup
Description : ABC Company
Phone : 650 123-4567
```

```

Multi Service Site

Site : west
Description : (Not Specified)
=====
*A:ALA-12#

*A:ALA-12# show service customer 274 site west
=====
Customer 274
=====
Customer-ID : 274
Contact : Mssrs. Beaucoup
Description : ABC Company
Phone : 650 123-4567

Multi Service Site

Site : west
Description : (Not Specified)
Assignment : Card 1
I. Sched Pol : SLA1
E. Sched Pol : (Not Specified)

Service Association

No Service Association Found.
=====
*A:ALA-12#

```

## fdb-mac

**Syntax** **fdb-mac** [*ieee-address*] [*expiry*]

**Context** show>service

**Description** This command displays the FDB entry for a given MAC address.

**Parameters** *ieee-address* — Specifies the 48-bit MAC address in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers.

**expiry** — shows amount of time until MAC is aged out.

### Sample Output

```

*A:ALA-48# show service fdb-mac
=====
Service Forwarding Database
=====

```

| ServId | MAC               | Source-Identifier | Type/Age | Last Change         |
|--------|-------------------|-------------------|----------|---------------------|
| 103    | 12:34:56:78:90:0f | sap:1/1/7:0       | Static   | 02/02/2009 09:27:57 |
| 700    | 90:30:ff:ff:ff:8f | cpm               | Host     | 02/02/2009 09:27:57 |

```

```

## Show, Clear, Debug Commands

```
No. of Entries: 2
=====
*A:ALA-48#

*A:ALA-48# show service fdb-mac expiry
=====
Service Forwarding Database
=====
ServId MAC Source-Identifier Type/ Last Change
 Source-Identifier Expiry

103 12:34:56:78:90:0f sap:1/1/7:0 Static 02/02/2009 09:27:57
700 90:30:ff:ff:ff:8f cpm Host 02/02/2009 09:27:57

No. of Entries: 2
=====
*A:ALA-48#
```

## isid-using

- Syntax** **isid-using** [/ISID]
- Context** show>service
- Description** This command displays services using ISID.
- Parameters** **ISID** — Displays the service using the specified I-component Service ID (ISID).
- Values** 0 — 16777215

**Output**

```
*A:SetupCLI# show service isid-using
=====
Services
=====
SvcId ISID Type b-Vpls Adm Opr SvcMtu CustId

2001 122 i-VPLS 2002 Up Down 1514 1
2005 2005 i-mVP* 2004 Down Down 1500 1

Matching Services : 2

*A:SetupCLI#
```

## l2-route-table

- Syntax** **l2-route-table** [detail] [bgp-ad] [multi-homing] [bg-vpls]
- Context** show>service
- Description** This command displays L2 route table information.
- detail** — Displays detailed information.

## sap-using

**Syntax**     **sap-using** [**msap**]  
**sap-using** [**sap** *sap-id*] [**vlan-translation** | **anti-spoof**]  
**sap-using** **app-profile** *app-profile-name*  
**sap-using** **authentication-policy** *policy-name* [**msap**]  
**sap-using** **encap-type** *encap-type*  
**sap-using** **eth-tunnel** [**tunnel-id** *eth-tunnel-id*]  
**sap-using** *ingress|egress* **atm-td-profile** *td-profile-id*  
**sap-using** *ingress|egress* **filter** *filter-id*  
**sap-using** *ingress|egress* **qos-policy** *qos-policy-id* [**msap**]  
**sap-using** **interface** *ip-address|ip-int-name* [**msap**]  
**sap-using** **mc-ring** **peer** *ip-address* **ring** *sync-tag*

**Context**     show>service

**Description**     This command displays SAP information.

**Sample Output**

```
show service sap-using eth-tunnel [tunnel-id ##]
```

```
*A:Dut-C>config>service>epipe# show service sap-using eth-tunnel
```

```
=====
Service Access Points (Ethernet Tunnel)
=====
```

| SapId                | SvcId | Path | Port  | Tag    |
|----------------------|-------|------|-------|--------|
| eth-tunnel-1         | 50    | 1    | 1/1/2 | 4030   |
|                      |       | 2    | 3/1/3 | 4031   |
| eth-tunnel-2         | 51    | 1    | 3/1/1 | 100    |
|                      |       | 2    | 3/1/3 | 4032   |
| eth-tunnel-67        | 52    | 2    | 3/1/3 | 672    |
|                      |       | 8    | 1/1/2 | 678    |
| eth-tunnel-1:3       | 3133  | 1    | 1/1/2 | 4      |
|                      |       | 2    | 3/1/3 | 4      |
| eth-tunnel-2:3       | 3233  | 1    | 3/1/1 | 7      |
|                      |       | 2    | 3/1/3 | 7      |
| eth-tunnel-65:4094   | 4094  | 2    | -     | 4094.* |
|                      |       | 3    | 2/1/4 | 4094.* |
|                      |       | 8    | 1/1/3 | 4094.* |
|                      |       | 16   | 2/1/3 | 4094.* |
| eth-tunnel-1024:4094 | 4094  | 1    | 2/1/1 | -      |
|                      |       | 2    | 3/1/2 | -      |
| eth-tunnel-1:4       | 5154  | 1    | 1/1/2 | 5      |
|                      |       | 2    | 3/1/3 | 5      |
| eth-tunnel-2:4       | 5254  | 1    | 3/1/1 | 8      |
|                      |       | 2    | 3/1/3 | 8      |
| eth-tunnel-1:5       | 6165  | 1    | 1/1/2 | 6      |
|                      |       | 2    | 3/1/3 | 6      |
| eth-tunnel-2:5       | 6265  | 1    | 3/1/1 | 9      |
|                      |       | 2    | 3/1/3 | 9      |
| eth-tunnel-65:3      | 36533 | 3    | 2/1/4 | 65.10  |
|                      |       | 8    | 1/1/3 | 65.10  |

## Show, Clear, Debug Commands

|                 |       |    |       |       |
|-----------------|-------|----|-------|-------|
|                 |       | 16 | 2/1/3 | 65.10 |
| eth-tunnel-66:3 | 36633 | 2  | 2/1/4 | 66.13 |
|                 |       | 4  | 1/1/3 | 66.13 |
| eth-tunnel-67:3 | 36733 | 2  | 3/1/3 | 16    |
|                 |       | 8  | 1/1/2 | 16    |
| eth-tunnel-68:3 | 36833 | 2  | 3/1/3 | 19    |
|                 |       | 3  | 3/1/1 | 19    |
| eth-tunnel-65:4 | 56554 | 3  | 2/1/4 | 65.11 |
|                 |       | 8  | 1/1/3 | 65.11 |
|                 |       | 16 | 2/1/3 | 65.11 |
| eth-tunnel-66:4 | 56654 | 2  | 2/1/4 | 66.14 |
|                 |       | 4  | 1/1/3 | 66.14 |
| eth-tunnel-67:4 | 56754 | 2  | 3/1/3 | 17    |
|                 |       | 8  | 1/1/2 | 17    |
| eth-tunnel-68:4 | 56854 | 2  | 3/1/3 | 20    |
|                 |       | 3  | 3/1/1 | 20    |
| eth-tunnel-65:5 | 66565 | 3  | 2/1/4 | 65.12 |
|                 |       | 8  | 1/1/3 | 65.12 |
|                 |       | 16 | 2/1/3 | 65.12 |
| eth-tunnel-66:5 | 66665 | 2  | 2/1/4 | 66.15 |
|                 |       | 4  | 1/1/3 | 66.15 |
| eth-tunnel-67:5 | 66765 | 2  | 3/1/3 | 18    |
|                 |       | 8  | 1/1/2 | 18    |
| eth-tunnel-68:5 | 66865 | 2  | 3/1/3 | 21    |
|                 |       | 3  | 3/1/1 | 21    |

-----  
Number of SAPs : 23

This command can also be used to identify SAPs with the "EthTunTagMismatch" flag and can be used to prevent the flag from occurring before activating paths through the following CLI example:

```
*A:Dut-C>config>service>epipe# show service sap-using eth-tunnel | match "-"
```

|                      |       |   |       |        |
|----------------------|-------|---|-------|--------|
| eth-tunnel-1         | 50    | 1 | 1/1/2 | 4030   |
| eth-tunnel-2         | 51    | 1 | 3/1/1 | 100    |
| eth-tunnel-67        | 52    | 2 | 3/1/3 | 672    |
| eth-tunnel-1:3       | 3133  | 1 | 1/1/2 | 4      |
| eth-tunnel-2:3       | 3233  | 1 | 3/1/1 | 7      |
| eth-tunnel-65:4094   | 4094  | 2 | -     | 4094.* |
| eth-tunnel-1024:4094 | 4094  | 1 | 2/1/1 | -      |
|                      |       | 2 | 3/1/2 | -      |
| ...                  |       |   |       |        |
| eth-tunnel-65:3      | 36533 | 3 | 2/1/4 | 65.10  |
| eth-tunnel-66:3      | 36633 | 2 | 2/1/4 | 66.13  |
| ...                  |       |   |       |        |

SAP eth-tunnel-1024:4094 does not have the eth-tunnel tags configured for the corresponding paths which causes the SAP to be oper down.

Ethernet tunnel 65 does not have path 2 configured. However, SAP eth-tunnel-65:4094 has a tag configured for path 2. This is acceptable and allows the operator to pre-provision tags under the same-fate SAPs before the corresponding path is configured under the Ethernet tunnel. This is the recommended configuration order so that there is no traffic disruption on the same-fate SAPs.

SAP eth-tunnel-65:5 currently has tags configured for paths 3, 8 and 16 and is operationally up. Note that if path 2 of Ethernet tunnel 65 was properly configured and active, SAP eth-tunnel-65:5 would be operationally down since it does not have a corresponding tag for path 2.

Any other tunnel is fine since it has no dash present in the port or tag location.



'show eth-tunnel status' summarizes the MEP status in one screen and also identifies the ports and tags associated in summary format for all loadsharing tunnels (similar to show eth-tunnel aps for g8031-1to1 mode)

## sdp

**Syntax** **sdp** [*sdp-id* | **far-end** *ip-address*] [**detail** | **keep-alive-history**]

**Context** show>service

**Description** This command displays SDP information.

If no optional parameters are specified, a summary SDP output for all SDPs is displayed.

**Parameters** *sdp-id* — The SDP ID for which to display information.

**Default** All SDPs.

**Values** 1 — 17407

**far-end** *ip-address* — Displays only SDPs matching with the specified far-end IP address.

**Default** SDPs with any far-end IP address.

**detail** — Displays detailed SDP information.

**Default** SDP summary output.

**keep-alive-history** — Displays the last fifty SDP keepalive events for the SDP.

**Default** SDP summary output.

**Output** **Show Service SDP** — The following table describes show service SDP output fields.

| Label          | Description                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDP Id         | The SDP identifier.                                                                                                                                                                                                                                                                                                                                                                         |
| Description    | Displays a text string describing the SDP.                                                                                                                                                                                                                                                                                                                                                  |
| Admin Path MTU | Displays the desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end ESR, without requiring the packet to be fragmented. The default value of zero indicates that the path MTU should be computed dynamically from the corresponding MTU of the tunnel.                                                                                      |
| Opr Path MTU   | Displays the actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end ESR, without requiring the packet to be fragmented. In order to be able to bind this SDP to a given service, the value of this object minus the control word size (if applicable) must be equal to or larger than the MTU of the service, as defined by its service MTU. |
| Far End        | Displays the far end IP address.                                                                                                                                                                                                                                                                                                                                                            |
| Delivery       | The type of delivery used by the SDP: GRE or MPLS.                                                                                                                                                                                                                                                                                                                                          |
| IP address     | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                                                                                                                                                                                                                                   |

| Label                          | Description (Continued)                                                                                                                                                                                                                                                              |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adm<br>Admin State             | The desired state of the SDP.                                                                                                                                                                                                                                                        |
| Opr<br>Oper State              | The operating state of the SDP.                                                                                                                                                                                                                                                      |
| Flags                          | Specifies all the conditions that affect the operating status of this SDP.                                                                                                                                                                                                           |
| Signal<br>Signaling            | The signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                                                                                                                                              |
| Last Status Change             | The time of the most recent operating status change to this SDP.                                                                                                                                                                                                                     |
| Adv. NTU Over                  | Specifies whether the advertised MTU of a VLL spoke SDP bind includes the 14-byte L2 header, so that it is backward compatible with pre-2.0 software.                                                                                                                                |
| Last Mgmt Change               | The time of the most recent management-initiated change to this SDP.                                                                                                                                                                                                                 |
| KeepAlive Infor-<br>mation     | This section displays Keepalive information.                                                                                                                                                                                                                                         |
| Hello Time                     | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Msg Len                  | The length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                                 |
| Hello Timeout                  | The number of seconds to wait for an SDP echo response message before declaring a timeout.                                                                                                                                                                                           |
| Unmatched Replies              | The number of SDP unmatched message replies timer expired.                                                                                                                                                                                                                           |
| Max Drop Count                 | The maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                                |
| Hold Down Time                 | The amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                               |
| TX Hello Msgs                  | The number of SDP echo request messages transmitted since the keepalive was administratively enabled or the counter was cleared.                                                                                                                                                     |
| Rx Hello Msgs                  | The number of SDP echo request messages received since the keepalive was administratively enabled or the counter was cleared.                                                                                                                                                        |
| Associated LSP<br>List         | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far end field.<br>If the SDP type is GRE, then the following message displays:<br>SDP Delivery Mechanism is not MPLS |
| Lsp Name                       | Displays the LSP name.                                                                                                                                                                                                                                                               |
| Time Since Last<br>Transaction | Displays the time of the last transaction.                                                                                                                                                                                                                                           |

| Label              | Description (Continued)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Signaling          | Specifies the signaling type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Metric             | Displays the metric to be used within the Tunnel Table Manager for decision making purposes. When multiple SDPs going to the same destination exist, this value is used as a tie-breaker by Tunnel Table Manager users like MP-BGP to select route with lower value.                                                                                                                                                                                                                                                                                          |
| Acct. Pol          | Displays the policy to use to collect accounting statistics on this SDP. The value zero indicates that the agent should use the default accounting policy, if one exists.                                                                                                                                                                                                                                                                                                                                                                                     |
| Collect Stats      | Specifies whether the agent collects accounting statistics for this SDP. When the value is true the agent collects accounting statistics on this SDP.                                                                                                                                                                                                                                                                                                                                                                                                         |
| VLAN VC Etype      | Displays the VLAN VC type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| BW Booking Factor  | Specifies the value used to calculate the max SDP available bandwidth. The value specifies the percentage of the SDP max available bandwidth for VLL call admission. When the value of is set to zero (0), no new VLL spoke-sdp bindings with non-zero bandwidth are permitted with this SDP. Overbooking, >100% is allowed.                                                                                                                                                                                                                                  |
| PBB Etype          | Displays the Ethertype used in frames sent out on this SDP when specfied as <b>vlan</b> for Provider Backbone Bridging frames.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Oper Max BW (Kbps) | Indicates the operational bandwidth in kilo-bits per seconds (Kbps) available for this SDP. The value is determined by the sum of the bandwidth of all the RSVP LSPs used by the SDP.                                                                                                                                                                                                                                                                                                                                                                         |
| Avail BW (Kbps)    | Indicates the bandwidth that is still free for booking by the SDP bindings on the SDP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Net-Domain         | Specifies the network-domain name configured on this SDP. The default value of this object is the default'network-domain.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Egr Interface      | Indicates whether all the egress network interfaces that can carry traffic on this SDP are associated with the network-domain configured on this SDP.<br>not applicable. indicates that there is no egress network interface that can carry traffic on this SDP.<br>consistent. Indicates that the network-domains for all the egress network interfaces that can carry traffic on this SDP are consistent.<br>inconsistent. indicates that the network-domain for one or more egress network interfaces that can carry traffic on this SDP are inconsistent. |
| Revert Time        | Specifies the time to wait before reverting back from LDP to the configured LSPs, after having failed over to LDP.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Revert Count Down  | Indicates the timer countdown before reverting back from LDP on this SDP. The timer countdown begins after the first configured LSP becomes active.                                                                                                                                                                                                                                                                                                                                                                                                           |
| Flags              | Displays all the conditions that affect the operating status of this SDP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Label            | Description (Continued)                                                                                                                                                                                                                                  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Class Forwarding | Indicates the admin state of class-based forwarding on this SDP. When the value is true, class-based forwarding is enabled.                                                                                                                              |
| EnforceDSTELspFc | Specifies whether service manager must validate with RSVP the support of the FC by the LSP.                                                                                                                                                              |
| Default LSP      | Specifies the LSP ID that is used as a default when class-based forwarding is enabled on this SDP. This object must be set when enabling class-based forwarding.                                                                                         |
| Multicast LSP    | Displays the LSP ID that all multicast traffic will be forwarded on when class-based forwarding is enabled on this SDP. When this object has its default value, multicast traffic will be forwarded on an LSP according to its forwarding class mapping. |
| Number of SDPs   | The total number of SDPs displayed according to the criteria specified.                                                                                                                                                                                  |

### Sample Output

```
*A:ALA-12# show service sdp
=====
Services: Service Destination Points
=====
SdpId Adm MTU Opr MTU IP address Adm Opr Deliver Signal

10 4462 4462 10.20.1.3 Up Dn NotReady MPLS TLDP
40 4462 1534 10.20.1.20 Up Up MPLS TLDP
60 4462 1514 10.20.1.21 Up Up GRE TLDP
100 4462 4462 180.0.0.2 Down Down GRE TLDP
500 4462 4462 10.20.1.50 Up Dn NotReady GRE TLDP

Number of SDPs : 5
=====
*A:ALA-12#

*A:Dut-A# show service sdp 1 detail
=====
Service Destination Point (Sdp Id : 1) Details

Sdp Id 1 - (10.20.1.3)

Description : epipe sdp 1 for lspId 00:00:00:01:00:00:00:00
SDP Id : 1 SDP Source : manual
Admin Path MTU : 0 Oper Path MTU : 1492
Far End : 10.20.1.3 Delivery : MPLS
Admin State : Up Oper State : Up
Signaling : TLDP Metric : 0
Acct. Pol : None Collect Stats : Disabled
Last Status Change : 12/08/2008 22:54:30 Adv. MTU Over. : No
Last Mgmt Change : 12/08/2008 22:54:01 VLAN VC Etype : 0x8100
Bw BookingFactor : 100 PBB Etype : 0x88e7
Oper Max BW(Kbps) : 1000 Avail BW(Kbps) : 1000
Flags : None
```

## Show, Clear, Debug Commands

```

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Hello Timeout : 5 Unmatched Replies : 0
Max Drop Count : 3 Hold Down Time : 10
Tx Hello Msgs : 0 Rx Hello Msgs : 0

Associated LSP LIST :
Lsp Name : tofl
Admin State : Up Oper State : Up
Time Since Last Tran* : 00h04m01s

Class-based forwarding :

Class forwarding : disabled EnforceDSTELspFc : disabled
Default LSP : Uknwn Multicast LSP : None
=====
FC Mapping Table
=====
FC Name LSP Name

No FC Mappings
=====
* indicates that the corresponding row element may have been truncated.
*A:Dut-A>config>service#

*A:ALA-12# show service sdp 8
=====
Service Destination Point (Sdp Id : 8)
=====
SdpId Adm MTU Opr MTU IP address Adm Opr Deliver Signal

8 4462 4462 10.10.10.104 Up Dn NotReady MPLS TLDP
=====
*A:ALA-12#

*A:ALA-12#
=====
Service Destination Point (Sdp Id : 8) Details
=====
Sdp Id 8 -(10.10.10.104)

Description : MPLS-10.10.10.104
SDP Id : 8
Admin Path MTU : 0 Oper Path MTU : 0
Far End : 10.10.10.104 Delivery : MPLS
Admin State : Up Oper State : Down
Flags : SignalingSessDown TransportTunnDown
Signaling : TLDP VLAN VC Etype : 0x8100
Last Status Change : 02/01/2007 09:11:39 Adv. MTU Over. : No
Last Mgmt Change : 02/01/2007 09:11:46
KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Hello Timeout : 5 Unmatched Replies : 0
Max Drop Count : 3 Hold Down Time : 10
Tx Hello Msgs : 0 Rx Hello Msgs : 0
Associated LSP LIST :

```

```

Lsp Name : to-104
Admin State : Up Oper State : Down
Time Since Last Tran*: 01d07h36m
=====
* indicates that the corresponding row element may have been truncated.
*A:ALA-12#

*A:MV-SR12>config>service>vprn# show service sdp 10 detail
=====
Service Destination Point (Sdp Id : 10) Details
=====
Sdp Id 10 -(200.20.1.201)

Description : (Not Specified)
SDP Id : 10 SDP Source : manual
Admin Path MTU : 0 Oper Path MTU : 9182
Far End : 200.20.1.201 Delivery : MPLS/LDP
Admin State : Up Oper State : Up
Signaling : TLDP Metric : 0
Acct. Pol : None Collect Stats : Disabled
Last Status Change : 02/12/2010 22:37:08 Adv. MTU Over. : No
Last Mgmt Change : 02/12/2010 22:37:03 VLAN VC Etype : 0x8100
Bw BookingFactor : 100 PBB Etype : 0x88e7
Oper Max BW(Kbps) : 0 Avail BW(Kbps) : 0
Net-Domain : default Egr Interfaces : Consistent
Mixed LSP Mode : Enabled
Revert Time : 0 Revert Count Down : n/a
Flags : None

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Hello Timeout : 5 Unmatched Replies : 0
Max Drop Count : 3 Hold Down Time : 10
Tx Hello Msgs : 0 Rx Hello Msgs : 0

LDP Information :

LDP LSP Id : 65539 LDP Active : No

RSVP/Static LSPs

Associated LSP LIST :
Lsp Name : To_7710
Admin State : Up Oper State : Up
Time Since Last Tran*: 01h20m56s

Class-based forwarding :

Class forwarding : Disabled EnforcedSTELspFc : Disabled
Default LSP : Uknwn Multicast LSP : None
=====
FC Mapping Table
=====
FC Name LSP Name

No FC Mappings
=====
* indicates that the corresponding row element may have been truncated.

```

## Show, Clear, Debug Commands

```
*A:MV-SR12>config>service>vprn#
```

When network domains are configured, the SDP egress interface state can be verified by using the following command:

```
*A:Dut-Tr# show service sdp egressifs
=====
SDP Egress Ifs State Table
=====
SDP Id Network Domain State

100 net1 consistent

SDPs : 1
=====
*A:Dut-Tr#
```

## sdp-using

**Syntax** **sdp-using** [*sdp-id[:vc-id]* | **far-end** *ip-address*]

**Context** show>service

**Description** This command displays services using SDP or far-end address options.

**Parameters** *sdp-id* — Displays only services bound to the specified SDP ID.

**Values** 1 — 17407

*vc-id* — The virtual circuit identifier.

**Values** 1 — 4294967295

**far-end** *ip-address* — Displays only services matching with the specified far-end IP address.

**Default** Services with any far-end IP address.

**Output** **Show Service SDP Using X** — The following table describes show service sdp-using output fields.

| Label      | Description                           |
|------------|---------------------------------------|
| Svc ID     | The service identifier.               |
| Sdp ID     | The SDP identifier.                   |
| Type       | Type of SDP: spoke or mesh.           |
| Far End    | The far end address of the SDP.       |
| Oper State | The operational state of the service. |



| Label         | Description (Continued)                                                                          |
|---------------|--------------------------------------------------------------------------------------------------|
| Ingress Label | The label used by the far-end device to send packets to this device in this service by this SDP. |
| Egress Label  | The label used by this device to send packets to the far-end device in this service by this SDP. |

### Sample Output

```
*A:ALA-1# show service sdp-using 300
=====
Service Destination Point (Sdp Id : 300)
=====
SvcId SdpId Type Far End Opr State I.Label E.Label

1 300:1 Mesh 10.0.0.13 Up 131071 131071
2 300:2 Spok 10.0.0.13 Up 131070 131070
100 300:100 Mesh 10.0.0.13 Up 131069 131069
101 300:101 Mesh 10.0.0.13 Up 131068 131068

Number of SDPs : 4
=====
*A:ALA-1#
```

## service-using

**Syntax** **service-using** [**epipe**] [**ies**] [**vpls**] [**vprn**] [**mirror**] [**b-vpls**] [**i-vpls**] [**m-vpls**] [**apipe**] [**fpipe**] [**ipipe**] [**sdp** *sdp-id*] [**customer** *customer-id*]

**Context** show>service

**Description** This command displays the services matching certain usage properties. If no optional parameters are specified, all services defined on the system are displayed.

**Parameters**

- epipe** — Displays matching Epipe services.
- ies** — Displays matching IES instances.
- vpls** — Displays matching VPLS instances.
- i-vpls** — Displays matching I-VPLS instances.
- b-vpls** — Displays matching B-VPLS instances.
- m-vpls** — Displays matching M-VPLS instances.
- vprn** — Displays matching VPRN services.
- mirror** — Displays matching mirror services.
- apipe** — Displays matching Apipe services.
- fpipe** — Displays matching Fpipe services.
- ipipe** — Displays matching Ipipe services.
- sdp** *sdp-id* — Displays only services bound to the specified SDP ID.

**Default** Services bound to any SDP ID.

**Values** 1 — 17407

**customer** *customer-id* — Displays services only associated with the specified customer ID.

**Default** Services associated with a customer.

**Values** 1 — 2147483647

**Output** **Show Service Service-Using** — The following table describes show service service-using output fields.

| Label      | Description                                               |
|------------|-----------------------------------------------------------|
| Service Id | The service identifier.                                   |
| Type       | Specifies the service type configured for the service ID. |
| Adm        | The desired state of the service.                         |
| Opr        | The operating state of the service.                       |
| CustomerID | The ID of the customer who owns this service.             |

| Label            | Description (Continued)                                                           |
|------------------|-----------------------------------------------------------------------------------|
| Last Mgmt Change | The date and time of the most recent management-initiated change to this service. |

### Sample Output

```
*A:ALA-12# show service service-using customer 10
=====
Services
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

1 VPLS Up Up 10 09/05/2006 13:24:15
100 IES Up Up 10 09/05/2006 13:24:15
300 Epipe Up Up 10 09/05/2006 13:24:15

Matching Services : 3
=====
*A:ALA-12#
*A:ALA-12# show service service-using epipe
=====
Services [epipe]
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

6 Epipe Up Up 6 09/22/2006 23:05:58
7 Epipe Up Up 6 09/22/2006 23:05:58
8 Epipe Up Up 3 09/22/2006 23:05:58
103 Epipe Up Up 6 09/22/2006 23:05:58

Matching Services : 4
=====
*A:ALA-12#

*A:ALA-14# show service service-using
=====
Services
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

10 mVPLS Down Down 1 10/26/2006 15:44:57
11 mVPLS Down Down 1 10/26/2006 15:44:57
100 mVPLS Up Up 1 10/26/2006 15:44:57
101 mVPLS Up Up 1 10/26/2006 15:44:57
102 mVPLS Up Up 1 10/26/2006 15:44:57

Matching Services : 5

*A:ALA-14#

*A:SetupCLI# show service service-using
- service-using [epipe] [ies] [vpls] [mirror] [ipipe] [b-vpls] [i-vpls] [m-vpls] [sdp
<sdp-id>] [customer <customer-id>]
```

## Show, Clear, Debug Commands

```

<epipe> : keyword - displays epipe services
<ies> : keyword - displays ies services
<vpls> : keyword - displays vpls services
<mirror> : keyword - displays mirror services
<ipipe> : keyword - displays ipipe services
<sdp-id> : [1..17407] - display services using this sdp
<customer-id> : [1..2147483647] - display services using this customer
<b-vpls> : keyword - displays b-vpls services
<i-vpls> : keyword - displays i-vpls services
<m-vpls> : keyword - displays m-vpls services

```

\*A:SetupCLI# show service service-using

Services

| ServiceId | Type    | Adm  | Opr  | CustomerId | Last Mgmt  | Change   |
|-----------|---------|------|------|------------|------------|----------|
| 23        | mVPLS   | Up   | Down | 2          | 09/25/2007 | 21:45:58 |
| 100       | Epipe   | Up   | Down | 2          | 09/25/2007 | 21:45:58 |
| 101       | Epipe   | Up   | Down | 2          | 09/25/2007 | 21:45:58 |
| 102       | Epipe   | Up   | Down | 2          | 09/25/2007 | 21:45:58 |
| 105       | Epipe   | Up   | Down | 2          | 09/25/2007 | 21:45:58 |
| 110       | Epipe   | Up   | Down | 1          | 09/25/2007 | 21:45:58 |
| 990       | IES     | Up   | Down | 1          | 09/25/2007 | 21:45:58 |
| 1000      | Mirror  | Up   | Down | 1          | 09/25/2007 | 21:45:59 |
| 1001      | Epipe   | Up   | Down | 1          | 09/25/2007 | 21:45:58 |
| 1002      | Epipe   | Up   | Down | 1          | 09/25/2007 | 21:45:58 |
| 1003      | Epipe   | Up   | Down | 1          | 09/25/2007 | 21:45:58 |
| 1004      | Epipe   | Up   | Down | 1          | 09/25/2007 | 21:45:58 |
| 2000      | Mirror  | Up   | Down | 1          | 09/25/2007 | 21:45:59 |
| 2001      | i-VPLS  | Up   | Down | 1          | 09/25/2007 | 21:45:59 |
| 2002      | b-VPLS  | Up   | Down | 1          | 09/25/2007 | 21:45:59 |
| 2003      | i-VPLS  | Down | Down | 1          | 09/25/2007 | 21:45:59 |
| 2004      | b-mVPLS | Down | Down | 1          | 09/25/2007 | 21:45:59 |
| 2005      | i-mVPLS | Down | Down | 1          | 09/25/2007 | 21:45:59 |
| 8787      | IES     | Up   | Down | 2          | 09/25/2007 | 21:45:58 |
| 8888      | IES     | Up   | Down | 1          | 09/25/2007 | 21:45:58 |
| 10000     | IES     | Down | Down | 1          | 09/25/2007 | 21:45:59 |
| 10001     | VPLS    | Up   | Down | 1          | 09/25/2007 | 21:45:58 |
| 483000    | Ipipe   | Down | Down | 2          | 09/25/2007 | 21:45:59 |
| 483001    | Ipipe   | Up   | Down | 2          | 09/25/2007 | 21:45:59 |
| 483004    | Ipipe   | Down | Down | 2          | 09/25/2007 | 21:45:59 |
| 483007    | VPLS    | Down | Down | 2          | 09/25/2007 | 21:45:59 |
| 483010    | Ipipe   | Down | Down | 1          | 09/25/2007 | 21:45:59 |

Matching Services : 27

\*A:ALA-14#

## Show Commands

### eth-cfm

|                    |                                                                  |
|--------------------|------------------------------------------------------------------|
| <b>Syntax</b>      | <b>eth-cfm</b>                                                   |
| <b>Context</b>     | show                                                             |
| <b>Description</b> | This command enables the context to display eth-cfm information. |

### eth-tunnel

|                    |                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>eth-tunnel {aps status}</b><br><b>eth-tunnel tunnel-index [path path-index] [detail]</b>                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | show                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command displays ethernet tunnel information. Any data SAP missing a tag for a defined path has the EthTunTagMismatch flag generated. In the example provided below, SAP eth-tunnel-1:1 does not have the tag for path 2 configured. Therefore, it is operationally down with the reason indicated by the EthTunTagMismatch flag.                                                  |
| <b>Parameters</b>  | <p><i>tunnel-index</i> — Specifies the tunnel index.</p> <p><b>Values</b> 1..1024</p> <p><i>path-index</i> — Specifies the path index.</p> <p><b>Values</b> 1..16</p> <p><b>detail</b> — Keyword; displays detailed information</p> <p><b>status</b> — Keyword; displays ethernet tunnel status information.</p> <p><b>aps</b> — Keyword; displays APS ethernet tunnel information.</p> |

#### Sample Output

```
*A:Dut-C>show>service>id# show eth-tunnel status
=====
Ethernet Tunnel Groups (Status information)
=====
```

| Tunnel ID | Admin State | Oper State | Member Information |         | State | MEP Information |          |         |
|-----------|-------------|------------|--------------------|---------|-------|-----------------|----------|---------|
|           |             |            | Path               | Tag     |       | Ctrl-MEP        | CC-Intvl | Defects |
| 1         | Up          | Up         | 1 - 1/1/2          | 4030    | Up    | Yes             | 1        | -----   |
|           |             |            | 2 - 3/1/3          | 4031    | Up    | Yes             | 1        | -----   |
| 2         | Up          | Up         | 1 - 3/1/1          | 100     | Up    | Yes             | 1        | -----   |
|           |             |            | 2 - 3/1/3          | 4032    | Up    | Yes             | 1        | -----   |
| 65        | Up          | Up         | 3 - 2/1/4          | 65.4003 | Up    | -               | -        | -----   |
|           |             |            | 8 - 1/1/3          | 65.4008 | Up    | -               | -        | -----   |

## Show, Clear, Debug Commands

```

 16 - 2/1/3 65.4016 Up - - -----
66 Up Up 2 - 2/1/4 66.4002 Up - - -----
 4 - 1/1/3 66.4004 Up - - -----
67 Up Up 2 - 3/1/3 672 Up Yes 1 -----
 8 - 1/1/2 678 Up Yes 1 -----
68 Up Up 2 - 3/1/3 682 Up - - -----
 3 - 3/1/1 683 Up - - -----
1024 Up Up 1 - 2/1/1 1024 Up - - -----
 2 - 3/1/2 1024 Up - - -----

```

=====

Ethernet Tunnel MEP Defect Legend:

R = Rdi, M = MacStatus, C = RemoteCCM, E = ErrorCCM, X = XconCCM

\*A:TOP\_NODE# show eth-tunnel aps

=====

Ethernet Tunnel APS Groups

```

=====
Tunnel Admin Oper Working Path Path Active Rx PDU
ID State State Protecting Path State Path Tx PDU

1 Up Up 1 - 5/1/14 3070 Up Yes 0F000000 (NR)
 2 - 2/1/9 3070 Up No 0F000000 (NR)
2 Up Up 1 - 5/1/6 3071 Up Yes 0F000000 (NR)
 2 - 2/1/13 3071 Up No 0F000000 (NR)
3 Up Up 1 - 5/1/6 3072 Up Yes 0F000000 (NR)
 2 - 2/1/13 3072 Up No 0F000000 (NR)
4 Up Up 1 - 2/1/10 4.3073 Up Yes 0F000000 (NR)
 2 - 2/1/4 4.3073 Up No 0F000000 (NR)
5 Up Up 1 - 2/1/16 5.3074 Up Yes 0F000000 (NR)

```

show service id 3131 sap eth-tunnel-1:1

Flags : EthTunTagMismatch

-----

SAP eth-tunnel-1:1

```

Service Id : 3131
SAP : eth-tunnel-1:1 Encap : q-tag
Description : (Not Specified)
Admin State : Up Oper State : Down
Flags : EthTunTagMismatch
Multi Svc Site : None
Last Status Change : 01/13/2010 19:05:05
Last Mgmt Change : 01/13/2010 17:01:33
Sub Type : regular
Split Horizon Group: (Not Specified)

Admin MTU : 2023 Oper MTU : 2023
Ingr IP Fltr-Id : n/a Egr IP Fltr-Id : n/a
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a Egr IPv6 Fltr-Id : n/a
tod-suite : None qinq-pbit-marking : both
Ing Agg Rate Limit : max Egr Agg Rate Limit: max
Endpoint : N/A
Vlan-translation : None

Acct. Pol : None Collect Stats : Disabled

```

Application Profile: None

```

Eth-Tunnel Data Information

```

```
Path : 2 Tag : 1
```

## association

**Syntax**     **association** [*ma-index*] [**detail**]

**Context**    show>eth-cfm

**Description**    This command displays eth-cfm association information.

**Parameters**    *ma-index* — Specifies the maintenance association (MA) index.

**Values**        1— 4294967295

**detail** — Displays detailed information for the eth-cfm association.

**Output**        **Show eth-cfm Association Command Output** — The following table describes show eth-cfm association command output fields:

| Label         | Description                                                                                                     |
|---------------|-----------------------------------------------------------------------------------------------------------------|
| Md-index      | Displays the the maintenance domain (MD) index.                                                                 |
| Ma-index      | Displays the the maintenance association (MA) index.                                                            |
| Name          | Displays the part of the maintenance association identifier which is unique within the maintenance domain name. |
| CCM-interval  | Displays the CCM transmission interval for all MEPs in the association.                                         |
| Bridge-id     | Displays the bridge-identifier value for the domain association.                                                |
| MHF Creation  | Displays the MIP half function (MHF) for the association.                                                       |
| Primary VLAN  | Displays the primary bridge-identifier VLAN ID.                                                                 |
| Num Vids      | Displays the number of VIDs associated with the VLAN.                                                           |
| Remote Mep Id | Displays the remote maintenance association end point (MEP) identifier                                          |

### Sample Output

```
*A:node-1# show eth-cfm association
=====
eth-cfm CFM Association Table
=====
Md-index Ma-index Name CCM-interval Bridge-id
```

## Show, Clear, Debug Commands

```

1 1 test-ma-1 10 2
1 2 2 10 20
=====
*A:node-1#

*A:node-1# show eth-cfm association 1 detail

Domain 1 Associations:

Md-index : 1 Ma-index : 1
Name Format : charString CCM-interval : 10
Name : test-ma-1
Bridge-id : 2 MHF Creation : defMHFnone
PrimaryVlan : 0 Num Vids : 0
Remote Mep Id : 1
Remote Mep Id : 4
Remote Mep Id : 5

*A:node-1#
```



## cfm-stack-table

**Syntax** **cfm-stack-table** [**port** [*port-id* [**vlan** *vlan-id*]] | **sdp** *sdp-id[:vc-id]*] [**level** 0..7] [**direction** **up** | **down**]

**Context** show>eth-cfm

**Description** This command displays stack-table information.

**Parameters** **port** *port-id* — Displays the bridge port or aggregated port on which MEPs or MHFs are configured.

**vlan** *vlan-id* — Displays the associated VLAN ID.

**sdp** *sdp-id[:vc-id]* — Displays the SDP binding for the bridge.

**level** — Display the MD level of the maintenance point.

**Values** 0 — 7

**direction** **up** | **down** — Displays the direction in which the MP faces on the bridge port.

**Output** **Show eth-cfm CFM Stack Table Command Output** — The following table describes show eth-cfm CFM stack table command output fields:

| Label       | Description                                                            |
|-------------|------------------------------------------------------------------------|
| Sap         | Displays associated SAP IDs.                                           |
| Sdp         | Displays the SDP binding for the bridge.                               |
| Level Dir   | Displays the MD level of the maintenance point.                        |
| Md-index    | Displays the the maintenance domain (MD) index.                        |
| Ma-index    | Displays the the maintenance association (MA) index.                   |
| Mep-id      | Displays the integer that is unique among all the MEPs in the same MA. |
| Mac-address | Displays the MAC address of the MP.                                    |

## Sample Output

```
*A:node-1# show eth-cfm cfm-stack-table
=====
eth-cfm CFM SAP Stack Table
=====
Sap Level Dir Md-index Ma-index Mep-id Mac-address

1/2/1 4 Up 1 1 5 ac:48:01:02:00:01
1/2/3:100 4 Up 1 1 1 ac:48:01:02:00:03
1/2/3:* 4 Up 1 1 4 ac:48:01:02:00:03
=====
eth-cfm CFM SDP Stack Table
=====
Sdp Level Dir Md-index Ma-index Mep-id Mac-address
```

```

No Matching Entries
=====
*A:node-1#

```

## domain

**Syntax** **domain** [*md-index*] [**association** *ma-index* | **all-associations**] [**detail**]

**Context** show>eth-cfm

**Description** This command displays domain information.

**Parameters** *md-index* — Displays the index of the MD to which the MP is associated, or 0, if none.  
**association** *ma-index* — Displays the index to which the MP is associated, or 0, if none.  
**all-associations** — Displays all associations to the MD.  
**detail** — Displays detailed domain information.

**Output** **Show eth-cfm Domain Command Output** — The following table describes show eth-cfm domain command output fields:

| Label    | Description                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Md-index | Displays the Maintenance Domain (MD) index value.                                                                                                                                                                                                                                                                                                                                                          |
| Level    | Displays an integer identifying the Maintenance Domain Level (MD Level). Higher numbers correspond to higher Maintenance Domains, those with the greatest physical reach, with the highest values for customers' CFM PDUs. Lower numbers correspond to lower Maintenance Domains, those with more limited physical reach, with the lowest values for CFM PDUs protecting single bridges or physical links. |
| Name     | Displays a generic Maintenance Domain (MD) name.                                                                                                                                                                                                                                                                                                                                                           |
| Format   | Displays the type of the Maintenance Domain (MD) name. Values include <b>dns</b> , <b>mac</b> , and <i>string</i> .                                                                                                                                                                                                                                                                                        |

### Sample Output

```

*A:node-1# show eth-cfm domain
=====
eth-cfm CFM Domain Table
=====
Md-index Level Name Format

1 4 test-1 charString
7 4 AA:BB:CC:DD:EE:FF-0 macAddressAndUint

```

```
=====
*A:node-1#

*A:node-1# show eth-cfm domain 1 detail
=====
Domain 1
Md-index : 1 Level : 4
Permission : sendIdNone MHF Creation : defMHFnone
Name Format : charString Next Ma Index : 3
Name : test-1
=====
*A:node-1#
```

## mep

**Syntax** **mep** *mep-id* **domain** *md-index* **association** *ma-index* [**loopback**] [**linktrace**]  
**mep** *mep-id* **domain** *md-index* **association** *ma-index* **remote-mepid** *mep-id* | **all-remote-mepids**  
**mep** *mep-id* **domain** *md-index* **association** *ma-index* **eth-test-results** [**remote-peer** *mac-address*]  
**mep** *mep-id* **domain** *md-index* **association** *ma-index* **one-way-delay-test** [**remote-peer** *mac-address*]  
**mep** *mep-id* **domain** *md-index* **association** *ma-index* **two-way-delay-test** [**remote-peer** *mac-address*]

**Context** show>eth-cfm

**Description** This command displays Maintenance Endpoint (MEP) information.

**Parameters** *mep-id* — Displays the integer that is unique among all the MEPs in the same MA.  
**domain** *md-index* — Displays the index of the MD to which the MP is associated, or 0, if none.  
**association** *ma-index* — Displays the index to which the MP is associated, or 0, if none.  
**loopback** — Displays loopback information for the specified MEP.  
**linktrace** — Displays linktrace information for the specified MEP.  
**remote-mepid** *mep-id* — Includes specified remote mep-id information for specified the MEP.  
**all-remote-mepids** — Includes all remote mep-id information for the specified MEP.  
**eth-test-results** — Includes eth-test-result information for the specified MEP.  
**one-way-delay-test** — Includes one-way-test information for the specified MEP.  
**two-way-delay-test** — Includes two-way-test information for the specified MEP.  
**remote-peer** *mac-address* — Includes specified remote mep-id information for the specified MEP.

## Sample Output

```
*A:node-1# show eth-cfm mep 4 domain 1 association 1 loopback linktrace
```

```

Mep Information

```

|                       |                     |                |           |
|-----------------------|---------------------|----------------|-----------|
| Md-index              | : 1                 | Direction      | : Up      |
| Ma-index              | : 1                 | Admin          | : Enabled |
| MepId                 | : 4                 | CCM-Enable     | : Enabled |
| IfIndex               | : 37847040          | PrimaryVid     | : 4095    |
| FngState              | : fngReset          |                |           |
| LowestDefectPri       | : remErrXcon        | HighestDefect  | : none    |
| Defect Flags          | : None              |                |           |
| Mac Address           | : ac:48:01:02:00:03 | CcmLtmPriority | : 7       |
| CcmTx                 | : 16863             | CcmSequenceErr | : 0       |
| CcmLastFailure Frame: | None                |                |           |
| XconCcmFailure Frame: | None                |                |           |

-----  
Mep Loopback Information  
-----

|                |                     |                |         |
|----------------|---------------------|----------------|---------|
| LbRxReply      | : 0                 | LbRxBadOrder   | : 0     |
| LbRxBadMsdu    | : 0                 | LbTxReply      | : 0     |
| LbSequence     | : 1                 | LbNextSequence | : 1     |
| LbStatus       | : False             | LbResultOk     | : False |
| DestIsMepId    | : False             | DestMepId      | : 0     |
| DestMac        | : 00:00:00:00:00:00 | SendCount      | : 0     |
| VlanDropEnable | : True              | VlanPriority   | : 7     |

Data TLV:  
None

-----  
Mep Linktrace Message Information  
-----

|                 |                           |                |         |
|-----------------|---------------------------|----------------|---------|
| LtRxUnexplained | : 0                       | LtNextSequence | : 1     |
| LtStatus        | : False                   | LtResult       | : False |
| TargIsMepId     | : False                   | TargMepId      | : 0     |
| TargMac         | : 00:00:00:00:00:00       | TTL            | : 64    |
| EgressId        | : ac:48:01:02:00:03:00:00 | SequenceNum    | : 1     |
| LtFlags         | : None                    |                |         |

-----  
Mep Linktrace Replies  
-----

\*A:node-1#

\*A:sr7\_A# show eth-cfm mep 1 domain 103 association 99 all-remote-mepids

## =====

## Eth-CFM Remote-Mep Table

| R-mepId | Rx   | CC    | Rx Rdi | Port-Tlv | If-Tlv | peer Mac          | Addr       | CCM      | status | since |
|---------|------|-------|--------|----------|--------|-------------------|------------|----------|--------|-------|
| 2       | True | False | Up     |          | Up     | 8a:d9:ff:00:00:00 | 02/17/2009 | 16:27:48 |        |       |
| 3       | True | False | Up     |          | Up     | 8a:da:01:01:00:02 | 02/17/2009 | 16:27:48 |        |       |

\*A:sr7\_A#

\*A:sr7\_A# show eth-cfm mep 1 domain 103 association 99 remote-mepid 3

## =====

## Eth-CFM Remote-Mep Table

| R-mepId | Rx   | CC    | Rx Rdi | Port-Tlv | If-Tlv | peer Mac          | Addr       | CCM      | status | since |
|---------|------|-------|--------|----------|--------|-------------------|------------|----------|--------|-------|
| 3       | True | False | Up     |          | Up     | 8a:da:01:01:00:02 | 02/17/2009 | 16:27:48 |        |       |

\*A:sr7\_A#

\*A:7710\_C# show eth-cfm mep 1 domain 103 association 99 eth-test-results

## =====

## Eth CFM ETH-Test Result Table

| Peer Mac Addr       | FrameCount | Current ErrBits | Accumulate ErrBits |
|---------------------|------------|-----------------|--------------------|
|                     | ByteCount  | CrcErrs         | CrcErrs            |
| 22:34:56:78:9a:bc 1 |            | 0               | 0                  |

## Show, Clear, Debug Commands

```

 100 0 0
32:34:56:78:9a:bc 1 0 0
 100 0 0
42:34:56:78:9a:bc 1 0 0
 100 0 0
52:34:56:78:9a:bc 1 0 0
 100 0 0
62:34:56:78:9a:bc 1 0 0
 100 0 0
72:34:56:78:9a:bc 1 0 0
 100 0 0
82:34:56:78:9a:bc 1 0 0
 100 0 0
92:34:56:78:9a:bc 1 0 0
 100 0 0
c2:34:56:78:9a:bc 1 0 0
 100 0 0
d2:34:56:78:9a:bc 1 0 0
 100 0 0
=====
*A:7710_C#

*A:7710_C# show eth-cfm mep 1 domain 103 association 99 eth-test-results remote-peer
22:34:56:78:9a:bc
=====
Eth CFM ETH-Test Result Table
=====
Peer Mac Addr FrameCount Current Accumulate
 ByteCount ErrBits ErrBits
 ByteCount CrcErrs CrcErrs

22:34:56:78:9a:bc 1 0 0
 100 0 0
=====
*A:7710_C#

*A:7710_C# show eth-cfm mep 1 domain 103 association 99 one-way-delay-test
=====
Eth CFM One-way Delay Test Result Table
=====
Peer Mac Addr Delay (us) Delay Variation (us)

8a:d8:01:01:00:01 759606 2840
aa:bb:cc:dd:ee:ff 760256 760256
=====
*A:7710_C#

*A:7710_C# show eth-cfm mep 1 domain 103 association 99 one-way-delay-test remote-peer
8a:d8:01:01:00:01
=====
Eth CFM One-way Delay Test Result Table
=====
Peer Mac Addr Delay (us) Delay Variation (us)

8a:d8:01:01:00:01 759606 2840
=====
```

```
*A:7710_C#
```

```
*A:sim_B# show eth-cfm mep 2 domain 103 association 99 two-way-delay-test
```

```
=====
```

```
Eth CFM Two-way Delay Test Result Table
```

```
=====
```

```
Peer Mac Addr Delay (us) Delay Variation (us)
```

```

```

```
00:16:4d:54:49:db 10190 13710
```

```
=====
```

```
*A:sim_B#
```

```
*A:sim_B# show eth-cfm mep 2 domain 103 association 99 two-way-delay-test remote-peer
00:16:4D:54:49:DB
```

```
=====
```

```
Eth CFM Two-way Delay Test Result Table
```

```
=====
```

```
Peer Mac Addr Delay (us) Delay Variation (us)
```

```

```

```
00:16:4d:54:49:db 10190 13710
```

```
=====
```

```
*A:sim_B#
```

## mip

**Syntax**     **mip**

**Context**    show>eth-cfm

**Description**   This command displays SAPs/bindings provisioned for allowing the default MIP creation.

## sdp

**Syntax**     **sdp** [*sdp-id* | **far-end** *ip-address*] [**detail** | **keep-alive-history**]

**Context**    show>service

**Description**   This command displays SDP information.

**Parameters**   *sdp-id* — Specifies the SDP ID.

**Values**     1..17407

*ip-address* — Specifies the IP address (a..b.c.d).

**detail** — Adds details to the display

**keep-alive-history** — Displays the keep-alive-history

**Sample Output**

```

*A:Dut-A# show service sdp 1 detail
=====
Service Destination Point (Sdp Id : 1) Details

 Sdp Id 1 -(10.20.1.3)

Description : epipe sdp 1 for lspId 00:00:00:01:00:00:00:00
SDP Id : 1 SDP Source : manual
Admin Path MTU : 0 Oper Path MTU : 1492
Far End : 10.20.1.3 Delivery : MPLS
Admin State : Up Oper State : Up
Signaling : TLDP Metric : 0
Acct. Pol : None Collect Stats : Disabled
Last Status Change : 12/08/2008 22:54:30 Adv. MTU Over. : No
Last Mgmt Change : 12/08/2008 22:54:01 VLAN VC Etype : 0x8100
Bw BookingFactor : 100 PBB Etype : 0x88e7
Oper Max BW(Kbps) : 1000 Avail BW(Kbps) : 1000
Flags : None

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Hello Timeout : 5 Unmatched Replies : 0
Max Drop Count : 3 Hold Down Time : 10
Tx Hello Msgs : 0 Rx Hello Msgs : 0

Associated LSP LIST :
Lsp Name : tof1
Admin State : Up Oper State : Up
Time Since Last Tran* : 00h04m01s

Class-based forwarding :

Class forwarding : disabled EnforceDSTELspFc : disabled
Default LSP : Uknwn Multicast LSP : None

=====
FC Mapping Table
=====
FC Name LSP Name

No FC Mappings

=====
* indicates that the corresponding row element may have been truncated.

```



## VLL Show Commands

### egress-label

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress-label</b> <i>egress-label1</i> [ <i>egress-label2</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command displays services using the range of egress labels. If only the mandatory <i>egress-label1</i> parameter is specified, only services using the specified label are displayed.</p> <p>If both <i>egress-label1</i> and <i>egress-label2</i> parameters are specified, the services using the range of labels X where <i>egress-label1</i> &lt;= X &lt;= <i>egress-label2</i> are displayed.</p> <p>Use the <b>show router ldp bindings</b> command to display dynamic labels.</p> |
| <b>Parameters</b>  | <p><i>egress-label1</i> — The starting egress label value for which to display services using the label range. If only <i>egress-label1</i> is specified, services only using <i>egress-label1</i> are displayed.</p> <p><b>Values</b> 0, 2049 — 131071</p> <p><i>egress-label2</i> — The ending egress label value for which to display services using the label range.</p> <p><b>Default</b> The <i>egress-label1</i> value.</p> <p><b>Values</b> 2049 — 131071</p>                            |
| <b>Output</b>      | <b>Show Service Egress Command Output</b> — The following table describes show service egress label output fields.                                                                                                                                                                                                                                                                                                                                                                               |

**Table 27: Show Service Egress Label Output Fields**

| Label                    | Description                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------|
| Svc Id                   | The ID that identifies a service.                                                                  |
| Sdp Id                   | The ID that identifies an SDP.                                                                     |
| Type                     | Indicates whether the SDP binding is spoke or mesh.                                                |
| I. Lbl                   | The VC label used by the far-end device to send packets to this device in this service by the SDP. |
| E. Lbl                   | The VC label used by this device to send packets to the far-end device in this service by the SDP. |
| Number of bindings found | The total number of SDP bindings that exist within the specified egress label range.               |

Sample Output

```
*A:ALA-12# show service egress-label 0 10000
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 100:1 Mesh 0 0
...
1 107:1 Mesh 0 0
1 108:1 Mesh 0 0
1 300:1 Mesh 0 0
1 301:1 Mesh 0 0
1 302:1 Mesh 0 0
1 400:1 Mesh 0 0
1 500:2 Spok 131070 2001
1 501:1 Mesh 131069 2000
100 300:100 Spok 0 0
200 301:200 Spok 0 0
300 302:300 Spok 0 0
400 400:400 Spok 0 0

Number of Bindings Found : 23
=====
*A:ALA-12#
```

ingress-label

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <code>ingress-label start-label [end-label]</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Context     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Description | <p>This command displays services using the range of ingress labels. If only the mandatory <i>start-label</i> parameter is specified, only services using the specified label are displayed.</p> <p>If both <i>start-label</i> and <i>end-label</i> parameters are specified, the services using the range of labels X where <i>start-label</i> &lt;= X &lt;= <i>end-label</i> are displayed.</p> <p>Use the <b>show router vprn-service-id ldp bindings</b> command to display dynamic labels.</p> |
| Parameters  | <p><i>start-label</i> — The starting ingress label value for which to display services using the label range. If only <i>start-label</i> is specified, services only using <i>start-label</i> are displayed.</p> <p><b>Values</b>      0, 2048 — 131071</p> <p><i>end-label</i> — The ending ingress label value for which to display services using the label range.</p> <p><b>Default</b>      The <i>start-label</i> value.</p> <p><b>Values</b>      2049 — 131071</p>                          |
| Output      | <b>Show Service Ingress-Label</b> — The following table describes show service ingress-label output fields:                                                                                                                                                                                                                                                                                                                                                                                         |

| Label                    | Description                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------|
| Svc ID                   | The service identifier.                                                                                 |
| SDP Id                   | The SDP identifier.                                                                                     |
| Type                     | Indicates whether the SDP is a spoke or a mesh.                                                         |
| I.Lbl                    | The ingress label used by the far-end device to send packets to this device in this service by the SDP. |
| E.Lbl                    | The egress label used by this device to send packets to the far-end device in this service by the SDP.  |
| Number of Bindings Found | The number of SDP bindings within the label range specified.                                            |

### Sample Output

```
*A:ALA-12# show service ingress-label 0
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 50:1 Mesh 0 0
1 100:1 Mesh 0 0
1 101:1 Mesh 0 0
1 102:1 Mesh 0 0
1 103:1 Mesh 0 0
1 104:1 Mesh 0 0
1 105:1 Mesh 0 0
1 106:1 Mesh 0 0
1 107:1 Mesh 0 0
1 108:1 Mesh 0 0
1 300:1 Mesh 0 0
1 301:1 Mesh 0 0
1 302:1 Mesh 0 0
1 400:1 Mesh 0 0
100 300:100 Spok 0 0
200 301:200 Spok 0 0
300 302:300 Spok 0 0
400 400:400 Spok 0 0

Number of Bindings Found : 21

*A:ALA-12#
```

## sap-using

**Syntax**    **sap-using** [sap sap-id]

**sap-using interface** [*ip-address* | *ip-int-name*]  
**sap-using** [ingress | egress] **atm-td-profile** *td-profile-id*  
**sap-using** [ingress | egress] **filter** *filter-id*  
**sap-using** [ingress | egress] **qos-policy** *qos-policy-id*  
**sap-using authentication-policy** *policy-name*

**Context** show>service

**Description** This command displays SAP information.  
 If no optional parameters are specified, the command displays a summary of all defined SAPs.  
 The optional parameters restrict output to only SAPs matching the specified properties.

**Parameters** **ingress** — Specifies matching an ingress policy.  
**egress** — Specifies matching an egress policy.  
**qos-policy** *qos-policy-id* — The ingress or egress QoS Policy ID for which to display matching SAPs.  
**Values** 1 — 65535  
**atm-td-profile** *td-profile-id* — Displays SAPs using this traffic description.  
**filter** *filter-id* — The ingress or egress filter policy ID for which to display matching SAPs.  
**Values** 1 — 65535  
**sap** *sap-id* — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.  
**interface** *ip-address* — The IP address of the interface for which to display matching SAPs.  
**Values** 1.0.0.0 — 223.255.255.255  
**interface** *ip-int-name* — The IP interface name for which to display matching SAPs.  
**authentication-policy** *policy name* — Specifies an existing authentication policy.

**Output** **Show Service SAP** — The following table describes show service SAP output fields:

| Label     | Description                                                     |
|-----------|-----------------------------------------------------------------|
| Port ID   | The ID of the access port where the SAP is defined.             |
| Svc ID    | The service identifier.                                         |
| Sap MTU   | The SAPMTU value.                                               |
| Ing. QoS  | The SAP ingress QoS policy number specified on the ingress SAP. |
| Ing Fltr  | The MAC or IP filter policy ID applied to the ingress SAP.      |
| Egr. QoS  | The SAP egress QoS policy number specified on the egress SAP.   |
| Egr. Fltr | The MAC or IP filter policy ID applied to the egress SAP.       |
| Adm       | The administrative state of the SAP.                            |

| Label | Description (Continued)           |
|-------|-----------------------------------|
| Opr   | The operational state of the SAP. |

**Sample Output**

A:ALA-42# show service sap-using

=====

Service Access Points

=====

| PortId       | SvcId | Ing.<br>QoS | Ing.<br>Fltr | Egr.<br>QoS | Egr.<br>Fltr | Adm | Opr  |
|--------------|-------|-------------|--------------|-------------|--------------|-----|------|
| 1/1/2:100    | 1     | 1           | none         | 1           | none         | Up  | Down |
| 1/1/4:0      | 2     | 1           | none         | 1           | none         | Up  | Down |
| 1/2/9:0      | 6     | 1           | none         | 1           | none         | Up  | Down |
| 1/1/3:0      | 88    | 1           | none         | 1           | none         | Up  | Down |
| 1/1/5:0      | 88    | 1           | none         | 1           | none         | Up  | Down |
| 1/1/2:0      | 218   | 1           | none         | 1           | none         | Up  | Down |
| 1/1/9:0      | 700   | 1           | none         | 1           | none         | Up  | Down |
| 1/1/9:10     | 1000  | 1           | none         | 1           | none         | Up  | Down |
| 1/1/12:11    | 1000  | 1           | none         | 1           | none         | Up  | Down |
| 1/1/13:10.20 | 1000  | 1           | none         | 1           | none         | Up  | Down |

-----

Number of SAPs : 10

-----

=====

A:ALA-42#

\*A:ALA-48# show service sap-using sap 1/1/21:0

=====

Service Access Points Using Port 1/1/21:0

=====

| PortId   | SvcId | Ing.<br>QoS | Ing.<br>Fltr | Egr.<br>QoS | Egr.<br>Fltr | Anti<br>Spoof | Adm | Opr  |
|----------|-------|-------------|--------------|-------------|--------------|---------------|-----|------|
| 1/1/21:0 | 1     | 1           | none         | 1           | none         | none          | Up  | Down |

-----

Number of SAPs : 1

-----

=====

\*A:ALA-48#

\*A:ALA-12# show service sap-using egress atm-td-profile 2

=====

Service Access Point Using ATM Traffic Profile 2

=====

| PortId     | SvcId  | I.QoS | I.Fltr | E.QoS | E.Fltr | A.Pol | Adm | Opr |
|------------|--------|-------|--------|-------|--------|-------|-----|-----|
| 5/1/1:0/11 | 511111 | 2     | none   | 2     | none   | none  | Up  | Up  |
| 5/1/1:0/12 | 511112 | 2     | none   | 2     | none   | none  | Up  | Up  |
| 5/1/1:0/13 | 511113 | 2     | none   | 2     | none   | none  | Up  | Up  |
| 5/1/1:0/14 | 511114 | 2     | none   | 2     | none   | none  | Up  | Up  |
| 5/1/1:0/15 | 511115 | 2     | none   | 2     | none   | none  | Up  | Up  |
| 5/1/1:0/16 | 511116 | 2     | none   | 2     | none   | none  | Up  | Up  |
| 5/1/1:0/17 | 511117 | 2     | none   | 2     | none   | none  | Up  | Up  |
| 5/1/1:0/18 | 511118 | 2     | none   | 2     | none   | none  | Up  | Up  |
| 5/1/1:0/19 | 511119 | 2     | none   | 2     | none   | none  | Up  | Up  |

## Show, Clear, Debug Commands

|            |        |   |      |   |      |      |    |    |
|------------|--------|---|------|---|------|------|----|----|
| 5/1/1:0/20 | 511120 | 2 | none | 2 | none | none | Up | Up |
| 5/1/1:0/21 | 511121 | 2 | none | 2 | none | none | Up | Up |
| 5/1/1:0/22 | 511122 | 2 | none | 2 | none | none | Up | Up |
| 5/1/1:0/23 | 511123 | 2 | none | 2 | none | none | Up | Up |
| 5/1/1:0/24 | 511124 | 2 | none | 2 | none | none | Up | Up |
| 5/1/1:0/25 | 511125 | 2 | none | 2 | none | none | Up | Up |

...

=====

\*A:ALA-12#

## sdp

- Syntax** **sdp** [*sdp-id* | **far-end** *ip-address*] [**detail** | **keep-alive-history**]
- Context** show>service
- Description** This command displays SDP information.  
If no optional parameters are specified, a summary SDP output for all SDPs is displayed.
- Parameters** *sdp-id* — The SDP ID for which to display information.  
**Default** All SDPs.  
**Values** 1 — 17407  
*far-end ip-address* — Displays only SDPs matching with the specified far-end IP address.  
**Default** SDPs with any far-end IP address.  
**detail** — Displays detailed SDP information.  
**Default** SDP summary output.  
**keep-alive-history** — Displays the last fifty SDP keepalive events for the SDP.  
**Default** SDP summary output.
- Output** **Show Service SDP** — The following table describes show service SDP output fields:

| Label               | Description                                                                                                                                                                 |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDP Id              | The SDP identifier.                                                                                                                                                         |
| Adm MTU             | Specifies the desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Opr MTU             | Specifies the actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.  |
| IP address          | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                   |
| Adm<br>Admin State  | Specifies the desired state of the SDP.                                                                                                                                     |
| Opr<br>Oper State   | Specifies the operating state of the SDP.                                                                                                                                   |
| Deliver<br>Delivery | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                |
| Flags               | Specifies all the conditions that affect the operating status of this SDP.                                                                                                  |
| Signal<br>Signaling | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                           |

| Label               | Description (Continued)                                                                                                                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last Status Change  | Specifies the time of the most recent operating status change to this SDP.                                                                                                                                                                                                           |
| Last Mgmt Change    | Specifies the time of the most recent management-initiated change to this SDP.                                                                                                                                                                                                       |
| Number of SDPs      | Specifies the total number of SDPs displayed according to the criteria specified.                                                                                                                                                                                                    |
| Hello Time          | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                       |
| Number of SDPs      | Specifies the total number of SDPs displayed according to the criteria specified.                                                                                                                                                                                                    |
| Hello Time          | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Msg Len       | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Timeout       | Specifies the number of seconds to wait for an SDP echo response message before declaring a timeout.                                                                                                                                                                                 |
| Unmatched Replies   | Specifies the number of SDP unmatched message replies.                                                                                                                                                                                                                               |
| Max Drop Count      | Specifies the maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                      |
| Hold Down Time      | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                     |
| TX Hello Msgs       | Specifies the number of SDP echo request messages transmitted since the keepalive was administratively enabled or the counter was cleared.                                                                                                                                           |
| Rx Hello Msgs       | Specifies the number of SDP echo request messages received since the keepalive was administratively enabled or the counter was cleared.                                                                                                                                              |
| Associated LSP List | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far end field.<br>If the SDP type is GRE, then the following message displays:<br>SDP Delivery Mechanism is not MPLS |

### Sample Output

```
*A:ALA-12# show service sdp
=====
Services: Service Destination Points
=====
SdpId Adm MTU Opr MTU IP address Adm Opr Deliver Signal

```



```

10 4462 4462 10.20.1.3 Up Dn NotReady MPLS TLDP
40 4462 1534 10.20.1.20 Up Up MPLS TLDP
60 4462 1514 10.20.1.21 Up Up GRE TLDP
100 4462 4462 180.0.0.2 Down Down GRE TLDP
500 4462 4462 10.20.1.50 Up Dn NotReady GRE TLDP

```

```

Number of SDPs : 5
=====
```

```
*A:ALA-12#
```

```
*A:ALA-12# show service sdp 2 detail
```

```
=====
Service Destination Point (Sdp Id : 2) Details
=====
```

```
Sdp Id 2 -(10.10.10.104)

```

```

Description : GRE-10.10.10.104
SDP Id : 2
Admin Path MTU : 0 Oper Path MTU : 0
Far End : 10.10.10.104 Delivery : GRE
Admin State : Up Oper State : Down
Flags : SignalingSessDown TransportTunnDown
Signaling : TLDP VLAN VC Etype : 0x8100
Last Status Change : 02/01/2007 09:11:39 Adv. MTU Over. : No
Last Mgmt Change : 02/01/2007 09:11:46

```

```
KeepAlive Information :
```

```

Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Hello Timeout : 5 Unmatched Replies : 0
Max Drop Count : 3 Hold Down Time : 10
Tx Hello Msgs : 0 Rx Hello Msgs : 0

```

```
Associated LSP LIST :
```

```
SDP Delivery Mechanism is not MPLS
=====
```

```
*A:ALA-12#
```

```
*A:ALA-12# show service sdp 8
```

```
=====
Service Destination Point (Sdp Id : 8)
=====
```

```

SdpId Adm MTU Opr MTU IP address Adm Opr Deliver Signal

8 4462 4462 10.10.10.104 Up Dn NotReady MPLS TLDP
=====

```

```
*A:ALA-12#
```

```
*A:ALA-12# show service sdp 8 detail
```

```
=====
Service Destination Point (Sdp Id : 8) Details
=====
```

```
Sdp Id 8 -(10.10.10.104)

```

```

Description : MPLS-10.10.10.104
SDP Id : 8
Admin Path MTU : 0 Oper Path MTU : 0
Far End : 10.10.10.104 Delivery : MPLS
Admin State : Up Oper State : Down
Flags : SignalingSessDown TransportTunnDown

```

Show, Clear, Debug Commands

```

Signaling : TLDP
Last Status Change : 02/01/2007 09:11:39
Last Mgmt Change : 02/01/2007 09:11:46
VLAN VC Etype : 0x8100
Adv. MTU Over. : No

KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Hello Timeout : 5
Max Drop Count : 3
Tx Hello Msgs : 0
Oper State : Disabled
Hello Msg Len : 0
Unmatched Replies : 0
Hold Down Time : 10
Rx Hello Msgs : 0

Associated LSP LIST :
Lsp Name : to-104
Admin State : Up
Time Since Last Tran* : 01d07h36m
Oper State : Down
=====
* indicates that the corresponding row element may have been truncated.
*A:ALA-12#

```

When network domains are configured, the SDP egress interface state can be verified by using the following command:

```

*A:Dut-T# show service sdp egressifs
=====
SDP Egress Ifs State Table
=====
SDP Id Network Domain State

100 net1 consistent

SDPs : 1
=====
*A:Dut-Tr#

```

sdp-using

|             |                                                                                                                                                                                                                                                                                                                       |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | sdp-using [sdp-id[:vc-id]   far-end ip-address]                                                                                                                                                                                                                                                                       |
| Context     | show>service                                                                                                                                                                                                                                                                                                          |
| Description | Display services using SDP or far-end address options.                                                                                                                                                                                                                                                                |
| Parameters  | sdp-id — Displays only services bound to the specified SDP ID. <div>Values1 — 17407</div> vc-id — The virtual circuit identifier. <div>Values1 — 4294967295</div> far-end ip-address — Displays only services matching with the specified far-end IP address. <div>DefaultServices with any far-end IP address.</div> |

**Output**    **Show Service SDP Using** — The following table describes show service sdp-using output fields.

| Label         | Description                                                                                      |
|---------------|--------------------------------------------------------------------------------------------------|
| Svc ID        | The service identifier.                                                                          |
| Sdp ID        | The SDP identifier.                                                                              |
| Type          | Type of SDP: spoke or mesh.                                                                      |
| Far End       | The far end address of the SDP.                                                                  |
| Oper State    | The operational state of the service.                                                            |
| Ingress Label | The label used by the far-end device to send packets to this device in this service by this SDP. |
| Egress Label  | The label used by this device to send packets to the far-end device in this service by this SDP. |

### Sample Output

```
*A:ALA-1# show service sdp-using 300
=====
Service Destination Point (Sdp Id : 300)
=====
```

| SvcId | SdpId   | Type | Far End   | Opr State | I.Label | E.Label |
|-------|---------|------|-----------|-----------|---------|---------|
| 1     | 300:1   | Mesh | 10.0.0.13 | Up        | 131071  | 131071  |
| 2     | 300:2   | Spok | 10.0.0.13 | Up        | 131070  | 131070  |
| 100   | 300:100 | Mesh | 10.0.0.13 | Up        | 131069  | 131069  |
| 101   | 300:101 | Mesh | 10.0.0.13 | Up        | 131068  | 131068  |
| 102   | 300:102 | Mesh | 10.0.0.13 | Up        | 131067  | 131067  |

```

Number of SDPs : 5

*A:ALA-1#
```

## service-using

|                    |                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>service-using</b> [epipe] [ies] [vpls] [vprn] [mirror] [apipe] [fpipe] [ipipe] [cpipe] [sdp <i>sdp-id</i> ] [customer <i>customer-id</i> ] [b-vpls] [i-vpls] [m-vpls]                                                                                                                                                                                                                        |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command displays the services matching certain usage properties.<br>If no optional parameters are specified, all services defined on the system are displayed.                                                                                                                                                                                                                             |
| <b>Parameters</b>  | [ <b>service</b> ] — Displays information for the specified service type.<br><b>b-vpls</b> — Specifies the B-component instance of the Provider Backbone Bridging (PBB/IEEE 802.1ah) feature. It represents the multi-point tunneling component that multiplexes multiple customer VPNs (ISIDs) together. It is similar to a regular VPLS instance that operates on the backbone MAC addresses. |

**i-vpls** — Specifies the I-component instance of the Provider Backbone Bridging (PBB/IEEE 802.1ah) feature. It identifies the specific VPN entity associated to a customer multipoint (ELAN) service. It is similar to a regular VPLS instance that operates on the customer MAC addresses.

**m-vpls** — Specifies the M-component (managed VPLS) instance of the Provider Backbone Bridging (PBB/IEEE 802.1ah) feature.

**sdp sdp-id** — Displays only services bound to the specified SDP ID.

**Default** Services bound to any SDP ID.

**Values** 1 — 17407

**customer customer-id** — Displays services only associated with the specified customer ID.

**Default** Services associated with any customer.

**Values** 1 — 2147483647

**Output** **Show service-using output** — The following table describes the command output fields:

| Label            | Description                                                                       |
|------------------|-----------------------------------------------------------------------------------|
| Service Id       | The service identifier.                                                           |
| Type             | Specifies the service type configured for the service ID.                         |
| Adm              | The desired state of the service.                                                 |
| Opr              | The operating state of the service.                                               |
| CustomerId       | The ID of the customer who owns this service.                                     |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this service. |

### Sample Output

```
*A:ALA-12# show service service-using customer 10
=====
Services
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

1 VPLS Up Up 10 09/05/2006 13:24:15
100 IES Up Up 10 09/05/2006 13:24:15
300 Epipe Up Up 10 09/05/2006 13:24:15

Matching Services : 3
=====
*A:ALA-12#
```

\*A:ALA-12# show service service-using

Services

| ServiceId | Type  | Adm  | Opr  | CustomerId | Last Mgmt Change    |
|-----------|-------|------|------|------------|---------------------|
| 1         | uVPLS | Up   | Up   | 1          | 10/26/2006 15:44:57 |
| 2         | Epipe | Up   | Down | 1          | 10/26/2006 15:44:57 |
| 10        | mVPLS | Down | Down | 1          | 10/26/2006 15:44:57 |
| 11        | mVPLS | Down | Down | 1          | 10/26/2006 15:44:57 |
| 100       | mVPLS | Up   | Up   | 1          | 10/26/2006 15:44:57 |
| 101       | mVPLS | Up   | Up   | 1          | 10/26/2006 15:44:57 |
| 102       | mVPLS | Up   | Up   | 1          | 10/26/2006 15:44:57 |
| 999       | uVPLS | Down | Down | 1          | 10/26/2006 16:14:33 |

Matching Services : 8

\*A:ALA-12#

\*A:ALA-12# show service service-using epipe

Services [epipe]

| ServiceId | Type  | Adm | Opr | CustomerId | Last Mgmt Change    |
|-----------|-------|-----|-----|------------|---------------------|
| 6         | Epipe | Up  | Up  | 6          | 06/22/2006 23:05:58 |
| 7         | Epipe | Up  | Up  | 6          | 06/22/2006 23:05:58 |
| 8         | Epipe | Up  | Up  | 3          | 06/22/2006 23:05:58 |
| 103       | Epipe | Up  | Up  | 6          | 06/22/2006 23:05:58 |

Matching Services : 4

\*A:ALA-12#

\*A:ALU-76# show service service-using cpipe

Services [cpipe]

| ServiceId | Type  | Adm  | Opr  | CustomerId | Last Mgmt Change    |
|-----------|-------|------|------|------------|---------------------|
| 100       | Cpipe | Up   | Up   | 1          | 09/10/2008 19:51:06 |
| 200       | Cpipe | Down | Down | 1          | 09/10/2008 19:51:06 |
| 210       | Cpipe | Up   | Up   | 1          | 09/10/2008 19:51:06 |
| 220       | Cpipe | Down | Down | 1          | 09/10/2008 19:51:06 |
| 300       | Cpipe | Down | Down | 1          | 09/10/2008 19:51:06 |
| 400       | Cpipe | Down | Down | 1          | 09/10/2008 19:51:06 |
| 444       | Cpipe | Down | Down | 1          | 09/10/2008 19:51:06 |
| 455       | Cpipe | Up   | Up   | 1          | 09/10/2008 19:51:06 |

Matching Services : 8

\*A:ALU-76#

## id

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i> { <b>all</b>   <b>arp</b>   <b>base</b>   <b>endpoint</b>   <b>fdb</b>   <b>interface</b>   <b>labels</b>   <b>sap</b>   <b>sdp</b>   <b>split-horizon-group</b>   <b>stp</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command displays information for a particular service-id.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <p><i>service-id</i> — The service identification number that identifies the service in the domain.</p> <p><b>Values</b></p> <p>service-id: 1 — 214748364</p> <p>svc-name: A string up to 64 characters in length.</p> <p><b>all</b> — Display detailed information about the service.</p> <p><b>arp</b> — Display ARP entries for the service.</p> <p><b>base</b> — Display basic service information.</p> <p><b>endpoint</b> — Display service endpoint information.</p> <p><b>interface</b> — Display service interfaces.</p> <p><b>labels</b> — Display labels being used by this service.</p> <p><b>sap</b> — Display SAPs associated to the service.</p> <p><b>sdp</b> — Display SDPs associated with the service.</p> <p><b>split-horizon-group</b> — Display split horizon group information.</p> <p><b>stp</b> — Display STP information.</p> |

## authentication

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | authentication                                                                     |
| <b>Context</b>     | show>service>id                                                                    |
| <b>Description</b> | This command enables the context to display subscriber authentication information. |

## statistics

|                    |                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <b>policy name</b> ] [ <b>sap sap-id</b> ]                                                                                                                                                                                |
| <b>Context</b>     | show>service>id>authentication                                                                                                                                                                                                                |
| <b>Description</b> | This command displays session authentication statistics for this service.                                                                                                                                                                     |
| <b>Parameters</b>  | <p><b>policy name</b> — Specifies the subscriber authentication policy statistics to display.</p> <p><b>sap sap-id</b> — Specifies the SAP ID statistics to display. See Common CLI Command Descriptions on page 1933 for command syntax.</p> |

**Sample Output**

```

*A:ALA-1# show service id 11 authentication statistics
=====
Authentication statistics
=====
Interface / SAP Authentication Authentication
 Successful Failed

vpls-11-90.1.0.254 1582 3

Number of entries: 1
=====
*A:ALA-1#

```

all

|                    |                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>all</b>                                                                                                               |
| <b>Context</b>     | show>service>id                                                                                                          |
| <b>Description</b> | This command displays detailed information for all aspects of the service.                                               |
| <b>Output</b>      | <b>Show service ID Output</b> — The following table describes the output fields when the <b>all</b> option is specified: |

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id       | The service identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| VPN Id           | The number which identifies the VPN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Service Type     | Specifies the type of service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| VLL Type         | Specifies the VLL type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SDP Id           | The SDP identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Description      | Generic information about the service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Customer Id      | The customer identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Last Mgmt Change | The date and time of the most recent management-initiated change.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Endpoint         | Specifies the name of the service endpoint.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Flags            | Specifies the conditions that affect the operating status of this SAP. Display output includes: ServiceAdminDown, SapAdminDown, InterfaceAdminDown, PortOperDown, PortMTUTooSmall, L2OperDown, SapIngressQoSMismatch, SapEgressQoSMismatch, RelearnLimitExceeded, RxProtSrcMac, ParentIfAdminDown, NoSapIpipeCeIpAddr, TodResourceUnavail, TodMssResourceUnavail, SapParamMismatch, CemSapNoEcidOrMacAddr, StandByForMcRing, ServiceMTUTooSmall, SapIngressNamedPoolMismatch, SapEgressNamedPoolMismatch, NoSapEpipeRingNode. |

| Label                             | Description (Continued)                                                                                                                                           |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAP Count                         | The number of SAPs specified for this service.                                                                                                                    |
| SDP Bind Count                    | The number of SDPs bound to this service.                                                                                                                         |
| Split Horizon Group specifics     |                                                                                                                                                                   |
| Split Horizon Group               | Name of the split horizon group for this VPLS.                                                                                                                    |
| Description                       | Description of the split horizon group.                                                                                                                           |
| Last Changed                      | The date and time of the most recent management-initiated change to this split horizon group.                                                                     |
| Service Destination Points (SDPs) |                                                                                                                                                                   |
| SDP Id                            | The SDP identifier.                                                                                                                                               |
| Type                              | Indicates whether this Service SDP binding is a spoke or a mesh.                                                                                                  |
| Admin Path MTU                    | The desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Oper Path MTU                     | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.  |
| Delivery                          | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                      |
| Admin State                       | The administrative state of this SDP.                                                                                                                             |
| Oper State                        | The operational state of this SDP.                                                                                                                                |
| Jitter Buffer (packets)           | Indicates the jitter buffer length in number of packet buffers.                                                                                                   |
| Playout Threshold (packets)       | Indicates the playout buffer packets threshold in number of packet buffers.                                                                                       |
| Playout Threshold (packets)       | Indicates the current packet depth of the jitter buffer.                                                                                                          |

### Sample Output

```
*B:ALA-Dut-H# show service id 100 all
=====
Service Detailed Information
=====
Service Id : 100 Vpn Id : 100
Service Type : Epipe
Description : Default epipe description for service id 100
Customer Id : 100
Last Status Change: 02/06/2007 10:03:11
Last Mgmt Change : 02/06/2007 09:43:27
Admin State : Up Oper State : Up
```



```

MTU : 1514
Vc Switching : False
SAP Count : 1 SDP Bind Count : 4

Service Destination Points(SDPs)

Sdp Id 1:10100 - (10.20.1.7)

SDP Id : 1:10100 Type : Spoke
VC Type : Ether VC Tag : n/a
Admin Path MTU : 1560 Oper Path MTU : 1560
Far End : 10.20.1.7 Delivery : MPLS

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 130065 Egress Label : 130368
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Ing ipv6 Fltr : n/a Egr ipv6 Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Last Status Change : 02/06/2007 10:03:24 Signaling : TLDP
Last Mgmt Change : 02/06/2007 09:43:27
Endpoint : y Precedence : 4
Flags : SapOperDown
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : lspPing
Peer Vccv CC Bits : mplsRouterAlertLabel
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Enabled Oper State : Alive
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0

Associated LSP LIST :
Lsp Name : lsp1_G
Admin State : Up Oper State : Up
Time Since Last Tr*: 01h40m15s

Sdp Id 2:100 - (10.20.1.4)

SDP Id : 2:100 Type : Spoke
VC Type : Ether VC Tag : n/a
Admin Path MTU : 1560 Oper Path MTU : 1560
Far End : 10.20.1.4 Delivery : MPLS
Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 130671 Egress Label : 130367
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Ing ipv6 Fltr : n/a Egr ipv6 Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Last Status Change : 02/06/2007 10:03:11 Signaling : TLDP
Last Mgmt Change : 02/06/2007 09:43:27
Endpoint : y Precedence : 0
Flags : None

```

## Show, Clear, Debug Commands

```

Peer Pw Bits : pwFwdingStandby
Peer Fault Ip : None
Peer Vccv CV Bits : lspPing
Peer Vccv CC Bits : mplsRouterAlertLabel
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Enabled
Hello Time : 10
Max Drop Count : 3
Oper State : Alive
Hello Msg Len : 0
Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0
E. Fwd. Pkts. : 0
I. Dro. Pkts. : 0
E. Fwd. Octets : 0

Associated LSP LIST :
Lsp Name : lsp2_D
Admin State : Up
Time Since Last Tr*: 01h40m16s
Oper State : Up

Sdp Id 3:100 -(10.20.1.5)

SDP Id : 3:100
VC Type : Ether
Admin Path MTU : 1560
Far End : 10.20.1.5
Type : Spoke
VC Tag : n/a
Oper Path MTU : 1560
Delivery : MPLS

Admin State : Up
Acct. Pol : None
Ingress Label : 130971
Ing mac Fltr : n/a
Ing ip Fltr : n/a
Ing ipv6 Fltr : n/a
Admin ControlWord : Not Preferred
Last Status Change : 02/06/2007 10:03:17
Last Mgmt Change : 02/06/2007 09:43:27
Endpoint : Y
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : lspPing
Peer Vccv CC Bits : mplsRouterAlertLabel
MAC Pinning : Disabled

Oper State : Up
Collect Stats : Disabled
Egress Label : 130368
Egr mac Fltr : n/a
Egr ip Fltr : n/a
Egr ipv6 Fltr : n/a
Oper ControlWord : False
Signaling : TLDP
Precedence : 4

KeepAlive Information :
Admin State : Enabled
Hello Time : 10
Max Drop Count : 3
Oper State : Alive
Hello Msg Len : 0
Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0
E. Fwd. Pkts. : 0
I. Dro. Pkts. : 0
E. Fwd. Octets : 0

Associated LSP LIST :
Lsp Name : lsp3_E
Admin State : Up
Time Since Last Tr*: 01h40m16s
Oper State : Up

...
=====
*B:ALA-Dut-H#

```

```

*A:ALA-DutC>config>service# show service id 100 all
=====
Service Detailed Information
=====
Service Id : 100 Vpn Id : 1
Service Type : Apipe VLL Type : AAL5SDU
Description : Default apipe description for service id 100
Customer Id : 1
Last Status Change: 04/04/2007 20:53:13
Last Mgmt Change : 04/04/2007 20:48:24
Admin State : Up Oper State : Up
MTU : 1508
Vc Switching : True
SAP Count : 0 SDP Bind Count : 2

APIPE SDU-mode specifics

Interworking : None

Service Destination Points(SDPs)

Sdp Id 3:1 -(1.1.1.1)

Description : Default sdp description
SDP Id : 3:1 Type : Spoke
VC Type : AAL5SDU VC Tag : 0
Admin Path MTU : 1600 Oper Path MTU : 1600
Far End : 1.1.1.1 Delivery : GRE

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 119665 Egress Label : 103665
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Admin ControlWord : Preferred Oper ControlWord : True
Last Status Change : 04/04/2007 20:52:24
Last Mgmt Change : 04/04/2007 20:48:24
Signaling : TLDP
Endpoint : N/A Precedence : 4
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : lspPing
Peer Vccv CC Bits : pwe3ControlWord
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0
Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

Sdp Id 6:2 -(4.4.4.4)

Description : Default sdp description
SDP Id : 6:2 Type : Spoke

```

## Show, Clear, Debug Commands

```

VC Type : AAL5SDU
Admin Path MTU : 1600
Far End : 4.4.4.4
VC Tag : 0
Oper Path MTU : 1600
Delivery : GRE

Admin State : Up
Acct. Pol : None
Ingress Label : 103664
Ing mac Fltr : n/a
Ing ip Fltr : n/a
Admin ControlWord : Preferred
Last Status Change : 04/04/2007 20:53:13
Last Mgmt Change : 04/04/2007 20:48:24
Endpoint : N/A
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : lspPing
Peer Vccv CC Bits : pwe3ControlWord mplsRouterAlertLabel
MAC Pinning : Disabled

Oper State : Up
Collect Stats : Disabled
Egress Label : 119665
Egr mac Fltr : n/a
Egr ip Fltr : n/a
Oper ControlWord : True
Signaling : TLDP
Precedence : 4

```

```

KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Max Drop Count : 3
Oper State : Disabled
Hello Msg Len : 0
Hold Down Time : 10

```

```

Statistics :
I. Fwd. Pkts. : 0
E. Fwd. Pkts. : 0
I. Dro. Pkts. : 0
E. Fwd. Octets : 0

```

```

Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

```

```

Number of SDPs : 2

```

```

Service Access Points

```

```

No Sap Associations

```

```

Service Endpoints

```

```

No Endpoints found.

```

```

=====
*A:ALA-DutC>config>service#

```

```

*A:ALU-76# show service id 200 all

```

```

=====
Service Detailed Information
=====

```

```

Service Id : 200
Service Type : Cpipe
Customer Id : 1
Last Status Change : 09/11/2008 19:05:29
Last Mgmt Change : 09/10/2008 19:51:06
Admin State : Up
MTU : 1400
Vc Switching : False
SAP Count : 1
Vpn Id : 0
VLL Type : CESoPSN
Oper State : Up
SDP Bind Count : 1

```

```

Service Destination Points(SDPs)

```

```

Sdp Id 5:200 - (5.5.5.5)

```

```

SDP Id : 5:200 Type : Spoke
VC Type : CESoPSN VC Tag : 0
Admin Path MTU : 0 Oper Path MTU : 1568
Far End : 5.5.5.5 Delivery : MPLS

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 131061 Egress Label : 131066
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Admin ControlWord : Preferred Oper ControlWord : True
Admin BW(Kbps) : 0 Oper BW(Kbps) : 0
Last Status Change : 09/11/2008 19:05:29 Signaling : TLDP
Last Mgmt Change : 09/10/2008 19:51:06
Endpoint : N/A Precedence : 4
Class Fwding State : Down
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : lsping
Peer Vccv CC Bits : pwe3ControlWord mplsRouterAlertLabel

```

```

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

```

```

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
I. Fwd. Octs. : 0 I. Dro. Octs. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0

```

```

Associated LSP LIST :
Lsp Name : to-ALU-80-1
Admin State : Up Oper State : Up
Time Since Last Tr* : 03d21h52m

```

#### Class-based forwarding :

```

Class forwarding : disabled EnforcedSTELspFc : disabled
Default LSP : Uknwn Multicast LSP : None

```

#### FC Mapping Table

```

=====
FC Name LSP Name

```

No FC Mappings

#### CPIPE Service Destination Point specifics

```

Local Bit-rate : 12 Peer Bit-rate : 12
Local Payload Size : 192 Peer Payload Size : 192
Local Sig Pkts : No Sig. Peer Sig Pkts : No Sig.
Local CAS Framing : No CAS Peer CAS Framing : No CAS
Local RTP Header : No Peer RTP Header : No
Local Differential : No Peer Differential : No
Local Timestamp : 0 Peer Timestamp : 0

```

```

Number of SDPs : 1

```

## Show, Clear, Debug Commands

```
Service Access Points

SAP 1/5/1.1.1.1

Service Id : 200
SAP : 1/5/1.1.1.1 Encap : cem
Admin State : Up Oper State : Up
Flags : None
Multi Svc Site : None
Last Status Change : 09/10/2008 19:51:27
Last Mgmt Change : 09/10/2008 19:51:06
Sub Type : regular

Admin MTU : 1578 Oper MTU : 1578
Ingr IP Fltr-Id : n/a Egr IP Fltr-Id : n/a
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a Egr IPv6 Fltr-Id : n/a
tod-suite : None qinq-pbit-marking : both
Ing Agg Rate Limit : max Egr Agg Rate Limit: max
Endpoint : N/A

Acct. Pol : None Collect Stats : Disabled

QOS

Ingress qos-policy : 1 Egress qos-policy : 1
Shared Q plcy : n/a Multipoint shared : Disabled

Sap Statistics

Last Cleared Time : N/A
 Packets Octets
Forwarding Engine Stats
Dropped : 0 0
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0
Queueing Stats(Ingress QoS Policy 1)
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

 Packets Octets

Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 11 (Multipoint) (Priority)
```

```

Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

```

```

Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0

```

-----  
CEM SAP Configuration Information  
-----

```

Endpoint Type : NxDS0 Bit-rate : 12
Payload Size : 192 Jitter Buffer (ms) : 8
Jitter Buffer (packets): 4 Playout Threshold (packets): 3
Use RTP Header : No Differential : No
Timestamp Freq : 0 CAS Framing : No CAS

```

```

Cfg Alarm : stray malformed pktloss overrun underrun
Alarm Status :

```

-----  
CEM SAP Statistics  
-----

|                     | Packets | Seconds | Events |
|---------------------|---------|---------|--------|
| Egress Stats        |         |         |        |
| Forwarded           | : 0     |         |        |
| Dropped             | : 0     |         |        |
| Missing             | : 0     |         |        |
| Reordered Forwarded | : 0     |         |        |
| Underrun            | : 0     |         | 0      |
| Overrun             | : 0     |         | 0      |
| Misordered Dropped  | : 0     |         |        |
| Malformed Dropped   | : 0     |         |        |
| LBit Dropped        | : 0     |         |        |
| Multiple Dropped    | : 0     |         |        |
| Error               | :       | 0       |        |
| Severely Error      | :       | 0       |        |
| Unavailable         | :       | 0       |        |
| Failure Count       | :       |         | 0      |
| Jitter Buffer Depth | : 0     |         |        |
| Ingress Stats       |         |         |        |
| Forwarded           | : 0     |         |        |
| Dropped             | : 0     |         |        |

-----  
Service Endpoints  
-----

No Endpoints found.

=====

\*A:ALU-76#

\*A:bksim180# show service id 1000 all

=====

```

Service Detailed Information
=====
Service Id : 1000 Vpn Id : 0
Service Type : Ipipe
Customer Id : 1

```

## Show, Clear, Debug Commands

```

Last Status Change: 03/11/1973 10:20:24
Last Mgmt Change : 03/11/1973 10:20:23
Admin State : Up Oper State : Up
MTU : 1400
Vc Switching : False
SAP Count : 1 SDP Bind Count : 1
CE Addr Discovery : enabled

Service Destination Points(SDPs)

Sdp Id 22:1000 - (2.2.2.2)

SDP Id : 22:1000 Type : Spoke
VC Type : Ipipe VC Tag : 0
Admin Path MTU : 0 Oper Path MTU : 1568
Far End : 2.2.2.2 Delivery : MPLS

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 131070 Egress Label : 131062
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Admin BW(Kbps) : 0 Oper BW(Kbps) : 0
Last Status Change : 03/11/1973 10:20:24 Signaling : TLDP
Last Mgmt Change : 03/11/1973 10:19:21
Endpoint : N/A Precedence : 4
Class Fwding State : Down
Flags : None
Time to RetryReset : 1999616832 seconds Retries Left : 2984947
Mac Move : Ukwn Blockable Level : Unknown
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : lspPing
Peer Vccv CC Bits : mplsRouterAlertLabel

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
I. Fwd. Octs. : 0 I. Dro. Octs. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0

Associated LSP LIST :
Lsp Name : to-bksim176-1
Admin State : Up Oper State : Up
Time Since Last Tr* : 00h01m28s

Class-based forwarding :

Class forwarding : disabled
Default LSP : Ukwn Multicast LSP : None
=====
FC Mapping Table
=====
FC Name LSP Name

No FC Mappings

```



-----  
IPIPE Service Destination Point specifics  
-----Configured CE IP Addr : n/a Peer CE IP Addr : 1.1.1.2  
-----Number of SDPs : 1  
-----Service Access Points  
-----SAP 1/7/1  
-----

|                     |                       |                    |          |
|---------------------|-----------------------|--------------------|----------|
| Service Id          | : 1000                |                    |          |
| SAP                 | : 1/7/1               | Encap              | : null   |
| Admin State         | : Up                  | Oper State         | : Up     |
| Flags               | : None                |                    |          |
| Multi Svc Site      | : None                |                    |          |
| Last Status Change  | : 03/11/1973 10:20:23 |                    |          |
| Last Mgmt Change    | : 03/11/1973 10:19:21 |                    |          |
| Sub Type            | : regular             |                    |          |
| Dot1Q Ethertype     | : 0x8100              | QinQ Ethertype     | : 0x8100 |
| Admin MTU           | : 1514                | Oper MTU           | : 1514   |
| Ingr IP Fltr-Id     | : n/a                 | Egr IP Fltr-Id     | : n/a    |
| Ingr Mac Fltr-Id    | : n/a                 | Egr Mac Fltr-Id    | : n/a    |
| Ingr IPv6 Fltr-Id   | : n/a                 | Egr IPv6 Fltr-Id   | : n/a    |
| tod-suite           | : None                | qinq-pbit-marking  | : both   |
| Ingr Agg Rate Limit | : max                 | Egr Agg Rate Limit | : max    |
| Endpoint            | : N/A                 |                    |          |

Q Frame-Based Acct : Disabled \

Acct. Pol : None Collect Stats : Disabled  
-----Ipipe SAP Info  
-----

|                  |                     |                    |           |
|------------------|---------------------|--------------------|-----------|
| Configured CE IP | : n/a               | Discovered CE IP   | : 1.1.1.1 |
| SAP MAC Address  | : 8c:c7:01:07:00:01 | Mac Refresh Inter* | : 14400   |

Ipipe SAP ARP Entry Info  
-----

|         |                   |         |           |
|---------|-------------------|---------|-----------|
| 1.1.1.1 | 8c:c7:01:07:00:03 | dynamic | 04h00m00s |
|---------|-------------------|---------|-----------|

QOS  
-----

|                    |       |                   |            |
|--------------------|-------|-------------------|------------|
| Ingress qos-policy | : 1   | Egress qos-policy | : 1        |
| Shared Q ploy      | : n/a | Multipoint shared | : Disabled |

Sap Statistics  
-----

|                                      |         |        |
|--------------------------------------|---------|--------|
| Last Cleared Time                    | : N/A   |        |
|                                      | Packets | Octets |
| Forwarding Engine Stats              |         |        |
| Dropped                              | : 0     | 0      |
| Off. HiPrio                          | : 0     | 0      |
| Off. LowPrio                         | : 0     | 0      |
| Off. Uncolor                         | : 0     | 0      |
| Queueing Stats(Ingress QoS Policy 1) |         |        |
| Dro. HiPrio                          | : 0     | 0      |
| Dro. LowPrio                         | : 0     | 0      |
| For. InProf                          | : 0     | 0      |

## Show, Clear, Debug Commands

```
For. OutProf : 0 0

Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

 Packets Octets

Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 11 (Multipoint) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0

Service Endpoints

No Endpoints found.
=====
*A:bksim180#
```

## base

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>base</b>                                                                                         |
| <b>Context</b>     | show>service>id                                                                                     |
| <b>Description</b> | Displays basic information about the service ID including service type, description, SAPs and SDPs. |
| <b>Output</b>      | <b>Show Service-ID Base</b> — The following table describes show service-id base output fields:     |

| Label             | Description                                                                                                                                                                          |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id        | The service identifier.                                                                                                                                                              |
| Vpn Id            | Specifies the VPN ID assigned to the service.                                                                                                                                        |
| Service Type      | The type of service: Epipe, Apipe, Fpipe, Ipipe, VPLS, IES, VPRN.                                                                                                                    |
| Description       | Generic information about the service.                                                                                                                                               |
| Customer Id       | The customer identifier.                                                                                                                                                             |
| Last Mgmt Change  | The date and time of the most recent management-initiated change to this customer.                                                                                                   |
| Adm               | The desired state of the service.                                                                                                                                                    |
| Oper              | The operating state of the service.                                                                                                                                                  |
| Mtu               | The largest frame size (in octets) that the service can handle.                                                                                                                      |
| Def. Mesh VC Id   | This object is only valid in services that accept mesh SDP bindings. It is used to validate the VC ID portion of each mesh SDP binding defined in the service.                       |
| SAP Count         | The number of SAPs defined on the service.                                                                                                                                           |
| SDP Bind Count    | The number of SDPs bound to the service.                                                                                                                                             |
| Identifier        | Specifies the service access (SAP) and destination (SDP) points.                                                                                                                     |
| Type              | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                                    |
| AdmMTU            | Specifies the desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end ESR, without requiring the packet to be fragmented.             |
| PBB Tunnel Point  | Specifies the endpoint in the B-VPLS environment where the Epipe terminates.                                                                                                         |
| Admin MTU         | Specifies the B-VPLS admin MTU.                                                                                                                                                      |
| Backbone-Flooding | Specifies whether or not the traffic is flooded in the B-VPLS for the destination instead of unicast. If the backbone destination MAC is in the B-VPLS FDB, then it will be unicast. |

| Label | Description (Continued)                                                                                                                         |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| ISID  | The 24 bit field carrying the service instance identifier associated with the frame. It is used at the destination PE as a demultiplexor field. |

Sample Output

```
*A:ALA-48>config>service>epipe>sap# show service id 6 base
=====
Service Basic Information
=====
Service Id : 6 Vpn Id : 6
Service Type : Epipe
Description : Distributed Epipe service to east coast
Customer Id : 6
Last Status Change: 02/02/2009 09:27:55
Last Mgmt Change : 02/02/2009 09:27:57
Admin State : Up Oper State : Down
MTU : 1514
Vc Switching : False
SAP Count : 1 SDP Bind Count : 1

Service Access & Destination Points

Identifier Type AdmMTU OprMTU Adm Opr

sap:1/2/9:0 q-tag 1518 1518 Up Down
sdp:2:6 S(10.10.10.104) n/a 0 0 Up Down
=====
*A:ALA-48>config>service>epipe>sap#
```

endpoint

- Syntax** endpoint [endpoint-name]
- Context** show>service>id
- Description** This command displays service endpoint information.
- Parameters** endpoint-name — Specifies the name of an existing endpoint for the service.

Sample Output

```
*A:ALA-48>config>service>epipe# show service id 6 endpoint
=====
Service 6 endpoints
=====
Endpoint name : x
Revert time : 0
Act Hold Delay : 0
Tx Active : none

Members
```

```

No members found.
=====
```

|                |        |
|----------------|--------|
| Endpoint name  | : Y    |
| Revert time    | : 0    |
| Act Hold Delay | : 0    |
| Tx Active      | : none |

```

Members

No members found.
=====
```

\*A:ALA-48>config>service>epipe#

## labels

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>labels</b>                                                                                       |
| <b>Context</b>     | show>service>id                                                                                     |
| <b>Description</b> | Displays the labels being used by the service.                                                      |
| <b>Output</b>      | <b>Show Service-ID Labels</b> — The following table describes show service-id labels output fields: |

| Label  | Description                                                                                        |
|--------|----------------------------------------------------------------------------------------------------|
| Svc Id | The service identifier.                                                                            |
| Sdp Id | The SDP identifier.                                                                                |
| Type   | Indicates whether the SDP is a spoke or a mesh.                                                    |
| I. Lbl | The VC label used by the far-end device to send packets to this device in this service by the SDP. |
| E. Lbl | The VC label used by this device to send packets to the far-end device in this service by the SDP. |

## Sample Output

```
*A:ALA-12# show service id 1 labels
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 40:1 Mesh 130081 131061
1 60:1 Mesh 131019 131016
1 100:1 Mesh 0 0

Number of Bound SDPs : 6

*A:ALA-12#
```

## retailers

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>retailers</b>                                                                                          |
| <b>Context</b>     | show>service>id                                                                                           |
| <b>Description</b> | This command displays the service ID of the retailer subscriber service to which this DHCP lease belongs. |

## wholesalers

|                    |                                                       |
|--------------------|-------------------------------------------------------|
| <b>Syntax</b>      | <b>wholesalers</b>                                    |
| <b>Context</b>     | show>service>id                                       |
| <b>Description</b> | This command displays service wholesaler information. |

## sap

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> [ <b>detail</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command displays information for the SAPs associated with the service. If no optional parameters are specified, a summary of all associated SAPs is displayed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>sap-id</i> — The ID that displays SAPs for the service in the form <i>slot/mda/port[channel]</i>. See Common CLI Command Descriptions on page 1933 for command syntax.</p> <p><b>interface</b> <i>interface-name</i> — Displays information for the specified IP interface.</p> <p><b>ip-address</b> <i>ip-address</i> — Displays information associated with the specified IP address.</p> <p><b>detail</b> — Displays detailed information.</p> <p><b>wholesaler</b> <i>service-id</i> — The VPRN service ID of the wholesaler. When specified in this context, SAP, SDP, interface, IP address and MAC parameters are ignored.</p> <p><b>Values</b>      1 — 2147483648</p> <p><b>detail</b> — Displays detailed information for the SAP.</p> |
| <b>Output</b>      | <b>Show Service-ID SAP</b> — The following table describes show service SAP fields:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Label              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id         | The service identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| SAP                | The SAP and qtag.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Encap              | The encapsulation type of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Ethertype          | Specifies an Ethernet type II Ether type value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Admin State        | The administrative state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Oper State         | The operating state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Flags              | Specifies the conditions that affect the operating status of this SAP. Display output includes: ServiceAdminDown, SapAdminDown, InterfaceAdminDown, PortOperDown, PortMTUTooSmall, L2OperDown, SapIngressQoSMismatch, SapEgressQoSMismatch, RelearnLimitExceeded, RxProtSrcMac, ParentIfAdminDown, NoSapIpipeCeIpAddr, TodResourceUnavail, TodMssResourceUnavail, SapParamMismatch, CemSapNoEcidOrMacAddr, StandBy-ForMcRing, ServiceMTUTooSmall, SapIngressNamedPoolMismatch, SapEgressNamedPoolMismatch, NoSapEpipeRingNode. |
| Last Status Change | The time of the most recent operating status change to this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Last Mgmt Change   | The time of the most recent management-initiated change to this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |



| Label              | Description (Continued)                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin MTU          | The desired largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented. |
| Oper MTU           | The actual largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented.  |
| Ingress qos-policy | The ingress QoS policy ID assigned to the SAP.                                                                                                                   |
| Egress qos-policy  | The egress QoS policy ID assigned to the SAP.                                                                                                                    |
| Ingress Filter-Id  | The ingress filter policy ID assigned to the SAP.                                                                                                                |
| Egress Filter-Id   | The egress filter policy ID assigned to the SAP.                                                                                                                 |
| Acct. Pol          | The accounting policy ID assigned to the SAP.                                                                                                                    |
| Collect Stats      | Specifies whether collect stats is enabled.                                                                                                                      |
| LLF Admin State    | Displays the Link Loss Forwarding administrative state.                                                                                                          |
| LLF Oper State     | Displays the Link Loss Forwarding operational state.                                                                                                             |

### Sample Output

```

A:ALA-48>config>service>epipe# show service id 8 sap 8/1/2:4094
=====
Service Access Points(SAP)
=====
Service Id : 8
SAP : 8/1/2:4094 Encap : bcpDot1q

Admin State : Up Oper State : Down
Flags : ServiceAdminDown
 PortOperDown
Last Status Change : 02/06/2007 12:01:14
Last Mgmt Change : 02/06/2007 12:01:17
Admin MTU : 1522 Oper MTU : 1522
Ingress qos-policy : 1 Egress qos-policy : 1
Shared Q plcy : n/a Multipoint shared : Disabled
Ingress Filter-Id : n/a Egress Filter-Id : n/a
tod-suite : None

Multi Svc Site : None
Acct. Pol : None Collect Stats : Disabled
=====
A:ALA-48>config>service>epipe#
A:ALA-48>config>service>epipe# show service id 8 sap 881/1/2:4094 detail
=====
Service Access Points(SAP)
=====
Service Id : 8
SAP : 8/1/2:4094 Encap : bcpDot1q
Admin State : Up Oper State : Down

```

## Show, Clear, Debug Commands

```
Flags : ServiceAdminDown
 : PortOperDown
Last Status Change : 02/06/2007 12:01:14
Last Mgmt Change : 02/06/2007 12:01:17
Admin MTU : 1522
Oper MTU : 1522
Ingress qos-policy : 1
Egress qos-policy : 1
Shared Q plcy : n/a
Multipoint shared : Disabled
Ingress Filter-Id : n/a
Egress Filter-Id : n/a
tod-suite : None

Multi Svc Site : None
Acct. Pol : None
Collect Stats : Disabled

Sap Statistics

Packets Octets
Forwarding Engine Stats
Dropped : 0 0
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0
Queueing Stats(Ingress QoS Policy 1)
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

Packets Octets
Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0
=====
A:ALA-48>config>service>epipe#
```

If a TOD Suite is configured on a SAP, the name of the suite is shown in the show command output. The values of the policies may be different from those configured on the SAP, because the configured policy assignments may have been overruled by policy assignments of the TOD Suite.

### Sample Output

```
A:ALA-48# show service id 1 sap 1/1/1:2
=====
```

```

Service Access Points(SAP)
=====
Service Id : 1
SAP : 1/1/1:5 Encap : q-tag
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100

Admin State : Up Oper State : Up
Flags : None
Last Status Change : 10/05/2006 17:06:03
Last Mgmt Change : 10/05/2006 22:30:03
Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0
Admin MTU : 1518 Oper MTU : 1518
Ingress qos-policy : 1190 Egress qos-policy : 1190
Shared Q plcy : n/a Multipoint shared : Disabled
Ingr IP Fltr-Id : n/a Egr IP Fltr-Id : n/a
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a Egr IPv6 Fltr-Id : n/a
tod-suite : suite_sixteen qinq-pbit-marking : both
Egr Agg Rate Limit : max
ARP Reply Agent : Unknown Host Conn Verify : Disabled
Mac Learning : Enabled Discard Unkwn Srce: Disabled
Mac Aging : Enabled Mac Pinning : Disabled
L2PT Termination : Disabled BPDU Translation : Disabled
Multi Svc Site : None
I. Sched Pol : SchedPolCust1_Night
E. Sched Pol : SchedPolCust1Egress_Night
Acct. Pol : None Collect Stats : Disabled
Anti Spoofing : None Nbr Static Hosts : 0
=====
A:ALA-48#

A:kerckhot_4# show service id 1 sap 1/1/1:6
=====
Service Access Points(SAP)
=====
Service Id : 1
SAP : 1/1/1:6 Encap : q-tag
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100
Admin State : Up Oper State : Down
Flags : TodResourceUnavail
Last Status Change : 12/01/2006 09:59:42
Last Mgmt Change : 12/01/2006 09:59:45
...
A:kerckhot_4#

```

## sdp

|                    |                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp</b> [ <i>sdp-id</i>   <b>far-end</b> <i>ip-addr</i> ] [ <b>detail</b> ]                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command displays information for the SDPs associated with the service.<br>If no optional parameters are specified, a summary of all associated SDPs is displayed.                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>sdp-id</i> — Displays only information for the specified SDP ID.</p> <p><b>Default</b> All SDPs.</p> <p><b>Values</b> 1 — 17407</p> <p><b>far-end ip-addr</b> — Displays only SDPs matching the specified far-end IP address.</p> <p><b>Default</b> SDPs with any far-end IP address.</p> <p><b>detail</b> — Displays detailed SDP information.</p> |
| <b>Output</b>      | <b>Show Service-ID SDP</b> — The following table describes show service-id SDP output fields:                                                                                                                                                                                                                                                             |

| Label               | Description                                                                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sdp Id              | The SDP identifier.                                                                                                                                                          |
| Type                | Indicates whether the SDP is a spoke or a mesh.                                                                                                                              |
| Split Horizon Group | Name of the split horizon group that the SDP belongs to.                                                                                                                     |
| VC Type             | The VC type, ether, vlan, or vpls.                                                                                                                                           |
| VC Tag              | The explicit dot1Q value used when encapsulating to the SDP far end.                                                                                                         |
| I. Lbl              | The VC label used by the far-end device to send packets to this device in this service by the SDP.                                                                           |
| Admin Path MTU      | The operating path MTU of the SDP is equal to the admin path MTU (when one is set) or the dynamically computed tunnel MTU, when no admin path MTU is set (the default case). |
| Oper Path MTU       | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.             |
| Far End             | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                    |
| Delivery            | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                 |
| Admin State         | The administrative state of this SDP.                                                                                                                                        |
| Oper State          | The current state of this SDP.                                                                                                                                               |

| Label               | Description (Continued)                                                                                                                                                                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ingress Label       | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                                                                                                                                      |
| Egress Label        | The label used by this device to send packets to the far-end device in this service by the SDP.                                                                                                                                                                                       |
| Last Changed        | The date and time of the most recent change to the SDP.                                                                                                                                                                                                                               |
| Signaling           | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on this SDP.                                                                                                                                                    |
| Admin State         | The administrative state of the Keepalive process.                                                                                                                                                                                                                                    |
| Oper State          | The operational state of the Keepalive process.                                                                                                                                                                                                                                       |
| Hello Time          | Transmission frequency of the SDP echo request messages.                                                                                                                                                                                                                              |
| Max Drop Count      | Specifies the maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                       |
| Hello Msg Len       | The length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                                  |
| Hold Down Time      | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                      |
| I. Fwd. Pkts.       | Specifies the number of forwarded ingress packets.                                                                                                                                                                                                                                    |
| I. Dro. Pkts        | Specifies the number of dropped ingress packets.                                                                                                                                                                                                                                      |
| E. Fwd. Pkts.       | Specifies the number of forwarded egress packets.                                                                                                                                                                                                                                     |
| Associated LSP List | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the Far End field.<br>If the SDP type is GRE, then the following message displays:<br>SDP delivery mechanism is not MPLS. |

### Sample Output

```
A:Dut-A# show service id 1 sdp detail
=====
Services: Service Destination Points Details
=====
Sdp Id 1:1 -(10.20.1.2)

Description : Default sdp description
SDP Id : 1:1 Type : Spoke
VC Type : Ether VC Tag : n/a
Admin Path MTU : 0 Oper Path MTU : 9186
Far End : 10.20.1.2 Delivery : MPLS

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 2048 Egress Label : 2048
```

## Show, Clear, Debug Commands

```

Ing mac Fltr : n/a
Ing ip Fltr : n/a
Ing ipv6 Fltr : n/a
Admin ControlWord : Not Preferred
Last Status Change : 05/31/2007 00:45:43
Last Mgmt Change : 05/31/2007 00:45:43
Class Fwding State : Up
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None
Max Nbr of MAC Addr: No Limit
Learned MAC Addr : 0

MAC Learning : Enabled
MAC Aging : Enabled
L2PT Termination : Disabled
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Max Drop Count : 3

Statistics :
I. Fwd. Pkts. : 0
I. Fwd. Octs. : 0
E. Fwd. Pkts. : 0
MCAC Policy Name :
MCAC Max Unconst BW: no limit
MCAC In use Mand BW: 0
MCAC In use Opnl BW: 0
Associated LSP LIST :
Lsp Name : A_B_1
Admin State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_2
Admin State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_3
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_4
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_5
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_6
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_7
Admin State : Up
Time Since Last Tr*: 00h26m34s

Egr mac Fltr : n/a
Egr ip Fltr : n/a
Egr ipv6 Fltr : n/a
Oper ControlWord : False
Signaling : None

Total MAC Addr : 0
Static MAC Addr : 0

Discard Unkwn Srce: Disabled
BPDU Translation : Disabled

Oper State : Disabled
Hello Msg Len : 0
Hold Down Time : 10

I. Dro. Pkts. : 0
I. Dro. Octs. : 0
E. Fwd. Octets : 0

MCAC Max Mand BW : no limit
MCAC Avail Mand BW: unlimited
MCAC Avail Opnl BW: unlimited

Oper State : Up

Oper State : Up

Oper State : Up

Oper State : Up

Oper State : Up

Oper State : Up

```

```

Lsp Name : A_B_8
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_9
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_10
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Class-based forwarding :

Class forwarding : enabled
Default LSP : A_B_10
Multicast LSP : A_B_9
=====
FC Mapping Table
=====
FC Name LSP Name

af A_B_3
be A_B_1
ef A_B_6
h1 A_B_7
h2 A_B_5
l1 A_B_4
l2 A_B_2
nc A_B_8
=====
Stp Service Destination Point specifics

Mac Move : Blockable
Stp Admin State : Up
Core Connectivity : Down
Port Role : N/A
Port Number : 2049
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDU from : N/A
Designated Bridge : N/A
Fwd Transitions : 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
Stp Oper State : Down
Port State : Forwarding
Port Priority : 128
Auto Edge : Enabled
Oper Edge : N/A
BPDU Encap : Dot1d
Active Protocol : N/A
Designated Port Id: 0
Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0

Number of SDPs : 1

* indicates that the corresponding row element may have been truncated.

A:Dut-A#

```

**control-word**

The following examples show both sides (PE nodes) when control word is enabled:

```
*A:ALA-Dut-B>config>service>epipe# show service id 2100 sdp detail
=====
Services: Service Destination Points Details

Sdp Id 1:2001 -(1.1.1.1)

Description : Default sdp description
SDP Id : 1:2001 Type : Spoke
VC Type : Ether VC Tag : n/a
Admin Path MTU : 1600 Oper Path MTU : 1600
Far End : 1.1.1.1 Delivery : GRE

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 115066 Egress Label : 119068
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Ing ipv6 Fltr : n/a Egr ipv6 Fltr : n/a
Admin ControlWord : Preferred Oper ControlWord : True
Last Status Change : 02/05/2007 16:39:22 Signaling : TLDP
Last Mgmt Change : 02/05/2007 16:39:22
Class Fwding State : Up
Endpoint : N/A Precedence : 4
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None
Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0

MAC Learning : Enabled Discard Unkwn Srce: Disabled
MAC Aging : Enabled
L2PT Termination : Disabled BPDU Translation : Disabled
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0

Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

Number of SDPs : 1
=====
*A:ALA-Dut-B>config>service>epipe#
```



The following is an example when one side (PE) has the control word enabled (the pipe will be down):

This is the side with control word disabled:

```
*A:ALA-Dut-B>config>service>epipe# show service id 2100 sdp detail
=====
Services: Service Destination Points Details
=====
Sdp Id 1:2001 -(1.1.1.1)

Description : Default sdp description
SDP Id : 1:2001 Type : Spoke
VC Type : Ether VC Tag : n/a
Admin Path MTU : 1600 Oper Path MTU : 1600
Far End : 1.1.1.1 Delivery : GRE

Admin State : Up Oper State : Down
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 115066 Egress Label : 119068
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Ing ipv6 Fltr : n/a Egr ipv6 Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Last Status Change : 02/05/2007 16:47:54 Signaling : TLDP
Last Mgmt Change : 02/05/2007 16:47:54
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None
Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0
MAC Learning : Enabled Discard Unkwn Srce: Disabled
MAC Aging : Enabled
L2PT Termination : Disabled BPDU Translation : Disabled
MAC Pinning : Disabled
KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10
Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0
Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

Number of SDPs : 1
=====
*A:ALA-Dut-B>config>service>epipe#
```

This is the side with control word enabled:

```
*A:ALA-B# show service id 2100 sdp detail
=====
Services: Service Destination Points Details
=====
Sdp Id 1:12000 -(3.3.3.3)

```

## Show, Clear, Debug Commands

```

Description : Default sdp description
SDP Id : 1:12000
VC Type : Ether
Admin Path MTU : 1600
Far End : 3.3.3.3
Admin State : Up
Acct. Pol : None
Ingress Label : 119066
Ing mac Fltr : n/a
Ing ip Fltr : n/a
Ing ipv6 Fltr : n/a
Admin ControlWord : Preferred
Last Status Change : 02/04/2007 22:52:43
Last Mgmt Change : 02/04/2007 02:06:08
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None
Max Nbr of MAC Addr: No Limit
Learned MAC Addr : 0
MAC Learning : Enabled
MAC Aging : Enabled
L2PT Termination : Disabled
MAC Pinning : Disabled
KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Max Drop Count : 3

Type : Spoke
VC Tag : n/a
Oper Path MTU : 1600
Delivery : GRE
Oper State : Down
Collect Stats : Disabled
Egress Label : 0
Egr mac Fltr : n/a
Egr ip Fltr : n/a
Egr ipv6 Fltr : n/a
Oper ControlWord : True
Signaling : TLDP

Total MAC Addr : 0
Static MAC Addr : 0
Discard Unkwn Srce: Disabled
BPDU Translation : Disabled

Oper State : Disabled
Hello Msg Len : 0
Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0
E. Fwd. Pkts. : 0
Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

```

Number of SDPs : 1

\*A:ALA-B#

The following is an example when both sides have control word disabled:

```

*A:ALA-Dut-B>config>service>epipe# show service id 2100 sdp detail
=====
Services: Service Destination Points Details
=====
Sdp Id 1:2001 -(1.1.1.1)

Description : Default sdp description
SDP Id : 1:2001
VC Type : Ether
Admin Path MTU : 1600
Far End : 1.1.1.1
Admin State : Up
Acct. Pol : None
Ingress Label : 115066
Ing mac Fltr : n/a
Ing ip Fltr : n/a
Ing ipv6 Fltr : n/a
Admin ControlWord : Not Preferred

Type : Spoke
VC Tag : n/a
Oper Path MTU : 1600
Delivery : GRE
Oper State : Up
Collect Stats : Disabled
Egress Label : 119068
Egr mac Fltr : n/a
Egr ip Fltr : n/a
Egr ipv6 Fltr : n/a
Oper ControlWord : False

```

```

Last Status Change : 02/05/2007 16:49:05 Signaling : TLDP
Last Mgmt Change : 02/05/2007 16:47:54
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None
Max Nbr of MAC Addr: No Limit
Learned MAC Addr : 0
MAC Learning : Enabled
MAC Aging : Enabled
L2PT Termination : Disabled
MAC Pinning : Disabled
KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Max Drop Count : 3
Statistics :
I. Fwd. Pkts. : 0
E. Fwd. Pkts. : 0
Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

```

```

Total MAC Addr : 0
Static MAC Addr : 0
Discard Unkwn Srce: Disabled
BPDU Translation : Disabled
Oper State : Disabled
Hello Msg Len : 0
Hold Down Time : 10
I. Dro. Pkts. : 0
E. Fwd. Octets : 0

```

```

Number of SDPs : 1

```

```

=====
*A:ALA-Dut-B>config>service>epipe#

```

## stp

|                    |                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>stp [detail]</b>                                                                        |
| <b>Context</b>     | show>service>id                                                                            |
| <b>Description</b> | This command displays information for the spanning tree protocol instance for the service. |
| <b>Parameters</b>  | <b>detail</b> — Displays detailed information.                                             |

## VLL Clear Commands

---

### id

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                                    |
| <b>Context</b>     | clear>service<br>clear>service>statistics                                      |
| <b>Description</b> | This command clears commands for a specific service.                           |
| <b>Parameters</b>  | <i>service-id</i> — The ID that uniquely identifies a service.                 |
| <b>Values</b>      | service-id: 1 — 214748364<br>svc-name: A string up to 64 characters in length. |

### arp

|                    |                                                                                     |
|--------------------|-------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp</b>                                                                          |
| <b>Context</b>     | clear>service>id                                                                    |
| <b>Description</b> | This command clears all ARP entries. This command is only valid for Ipipe services. |

### host-tracking

|                    |                                                                                     |
|--------------------|-------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host-tracking</b> [ <b>sap</b> <i>sap-id</i> ] [ <b>host</b> <i>ip-address</i> ] |
| <b>Context</b>     | clear>service>id                                                                    |
| <b>Description</b> | This command clears host tracking data.                                             |

### mesh-sdp

|                    |                                                                         |
|--------------------|-------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mesh-sdp</b> <i>sdp-id</i> [: <i>vc-id</i> ] <b>ingress-vc-label</b> |
| <b>Context</b>     | clear>service>id                                                        |
| <b>Description</b> | This command clears and reset sthe mesh SDP binding.                    |
| <b>Parameters</b>  | <i>sdp-id</i> — The spoke SDP ID for which to clear statistics.         |
| <b>Values</b>      | 1 — 17407                                                               |
|                    | <i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.        |
| <b>Values</b>      | 1 — 4294967295                                                          |
|                    | <b>ingress-vc-label</b> — Specifies to clear the ingress VC label.      |

## spoke-sdp

|                    |                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>spoke-sdp</b> <i>sdp-id:vc-id ingress-vc-label</i>                                                                                                                                                                                                                     |
| <b>Context</b>     | clear>service>id                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command clears and resets the spoke SDP bindings for the service.                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>sdp-id</i> — The spoke SDP ID to be reset.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>ingress-vc-label</b> — Specifies to clear the ingress VC label.</p> |

## sap

|                    |                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> { <b>all</b>   <b>counters</b>   <b>stp</b> }                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | clear>service>statistics                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command clears SAP statistics for a SAP.                                                                                                                                                                                                                                                                                                                                                  |
| <b>Parameters</b>  | <p><i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.</p> <p><b>all</b> — Clears all SAP queue statistics and STP statistics.</p> <p><b>counters</b> — Clears all queue statistics associated with the SAP.</p> <p><b>stp</b> — Clears all STP statistics associated with the SAP.</p> |

## sdp

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp</b> <i>sdp-id</i> <b>keep-alive</b>                                                                |
| <b>Context</b>     | clear>service>statistics                                                                                  |
| <b>Description</b> | This command clears keepalive statistics associated with the SDP ID.                                      |
| <b>Parameters</b>  | <p><i>sdp-id</i> — The SDP ID for which to clear keepalive statistics.</p> <p><b>Values</b> 1 — 17407</p> |

## counters

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>counters</b>                                                                |
| <b>Context</b>     | clear>service>statistics>id                                                    |
| <b>Description</b> | This command clears all traffic queue counters associated with the service ID. |

## spoke-sdp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>spoke-sdp</b> <i>sdp-id[:vc-id]</i> { <b>all</b>   <b>counters</b>   <b>stp</b> }                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | clear>service>statistics>id                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command clears statistics for the spoke SDP bound to the service.                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>sdp-id</i> — The spoke SDP ID for which to clear statistics.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>all</b> — Clears all queue statistics and STP statistics associated with the SDP.</p> <p><b>counters</b> — Clears all queue statistics associated with the SDP.</p> <p><b>stp</b> — Clears all STP statistics associated with the SDP.</p> |

## stp

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| <b>Syntax</b>      | <b>stp</b>                                              |
| <b>Context</b>     | clear>service>statistics>id                             |
| <b>Description</b> | Clears all spanning tree statistics for the service ID. |

## VLL Debug Commands

### id

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                                    |
| <b>Context</b>     | debug>service                                                                  |
| <b>Description</b> | This command debugs commands for a specific service.                           |
| <b>Parameters</b>  | <i>service-id</i> — The ID that uniquely identifies a service.                 |
| <b>Values</b>      | service-id: 1 — 214748364<br>svc-name: A string up to 64 characters in length. |

### sap

|                    |                                                      |
|--------------------|------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>sap</b> <i>sap-id</i>                        |
| <b>Context</b>     | debug>service>id                                     |
| <b>Description</b> | This command enables debugging for a particular SAP. |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the SAP ID.                |

### event-type

|                    |                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] <b>event-type</b> {arp   <b>config-change</b>   <b>oper-status-change</b> }                                                                                              |
| <b>Context</b>     | debug>service>id                                                                                                                                                              |
| <b>Description</b> | This command enables a particular debugging event type.<br>The <b>no</b> form of the command disables the event type debugging.                                               |
| <b>Parameters</b>  | <b>arp</b> — Displays ARP events.<br><b>config-change</b> — Debugs configuration change events.<br><b>svc-oper-status-change</b> — Debugs service operational status changes. |

#### Sample Output

```
A:bksim180# debug service id 1000 sap 1/7/1 event-type arp
DEBUG OUTPUT show on CLI is as follows:
3 2008/11/17 18:13:24.35 UTC MINOR: DEBUG #2001 Base Service 1000 SAP 1/7/1 "Service
1000 SAP 1/7/1:
RX: ARP_REQUEST (0x0001)
hwType : 0x0001
prType : 0x0800
```



```

hwLength : 0x06
prLength : 0x04
srcMac : 8c:c7:01:07:00:03
destMac : 00:00:00:00:00:00
srcIp : 200.1.1.2
destIp : 200.1.1.1
"

4 2008/11/17 18:13:24.35 UTC MINOR: DEBUG #2001 Base Service 1000 SAP 1/7/1 "Service
1000 SAP 1/7/1:
TX: ARP_RESPONSE (0x0002)
hwType : 0x0001
prType : 0x0800
hwLength : 0x06
prLength : 0x04
srcMac : 00:03:0a:0a:0a:0a
destMac : 8c:c7:01:07:00:03
srcIp : 200.1.1.1
destIp : 200.1.1.2
"

```

## sdp

|                    |                                                      |
|--------------------|------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sdp</b> <i>sdp-id:vc-id</i>                  |
| <b>Context</b>     | debug>service>id                                     |
| <b>Description</b> | This command enables debugging for a particular SDP. |
| <b>Parameters</b>  | <i>sdp-id</i> — Specifies the SDP ID.                |

Show, Clear, Debug Commands

# VPLS Show Commands

## active-subscribers

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>active-subscribers summary</b><br><b>active-subscribers</b> [ <b>subscriber</b> <i>sub-ident-string</i> [ <b>sap</b> <i>sap-id</i> <b>sla-profile</b> <i>sla-profile-name</i> ]]<br><b>[detail]</b><br><b>active-subscribers hierarchy</b> [ <b>subscriber</b> <i>sub-ident-string</i> ]                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command displays active subscriber information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <b>sap</b> <i>sap-id</i> — Displays SAP information for the specified SAP ID. See <a href="#">Common Service Commands on page 956</a> for <i>sap-id</i> command syntax.<br><b>sla-profile</b> <i>sla-profile-name</i> — Displays information for the specified SLA profile name.<br><b>summary</b> — Displays active subscriber information in a brief format.<br><b>subscriber</b> <i>sub-ident-string</i> — Displays information for the specified subscriber identification string.<br><b>hierarchy</b> — Displays the subscriber hierarchy.<br><b>detail</b> — Displays detailed output. |

### Sample Output

```
A:Dut-A# show service active-subscribers summary
=====
Active Subscriber table summary
=====
Total Count : 6
=====
A:Dut-A#

A:Dut-A# show service active-subscribers hierarchy
=====
Active Subscriber hierarchy
=====
-- alcatel_100 (sub_default)
|
|-- sap:1/2/1:100 - sla:sla_default
|
| |-- 10.100.1.3 - 00:10:00:00:00:01 (-/D/-)
| |
| |
| |-- sap:1/2/1:101 - sla:sla_default
| |
| | |-- 10.100.1.4 - 00:10:00:00:00:02 (-/D/-)
| | |
| | |
| |
|
```

## Show, Clear, Debug Commands

```
|-- sap:1/2/1:102 - sla:sla_default
|
|
|-- 10.100.1.5 - 00:10:00:00:00:03 (-/D/-)
|
|

-- alcatel_110 (sub_default)
|
|-- sap:1/2/1:110 - sla:sla_default
|
|
|-- 10.110.1.3 - 00:10:10:00:00:01 (-/D/-)
|
|
|-- sap:1/2/1:111 - sla:sla_default
|
|
|-- 10.110.1.4 - 00:10:10:00:00:02 (-/D/-)
|
|
|-- sap:1/2/1:112 - sla:sla_default
|
|
|-- 10.110.1.5 - 00:10:10:00:00:03 (-/D/-)
|
|

-- alcatel_120 (sub_default)
|
|-- sap:1/2/1:120 - sla:sla_default
|
|
|-- 10.120.1.3 - 00:10:20:00:00:01 (-/D/-)
|
|
|-- sap:1/2/1:121 - sla:sla_default
|
|
|-- 10.120.1.4 - 00:10:20:00:00:02 (-/D/-)
|
|
|-- sap:1/2/1:122 - sla:sla_prof120_VOIP
|
|
|-- 10.120.1.5 - 00:10:20:00:00:03 (-/D/-)
|
|

-- alcatel_130 (sub_default)
|
|-- sap:1/2/1:130 - sla:sla_default
|
|
|-- 10.130.1.3 - 00:10:30:00:00:01 (-/D/-)
|
|

-- alcatel_140 (sub_default)
|
|-- sap:1/2/1:140 - sla:sla_default
|
|
|-- 10.140.1.3 - 00:10:40:00:00:01 (-/D/-)
|
|

-- alcatel_80 (sub_default)
|
|-- sap:1/2/1:80 - sla:sla_default
|
|
|-- 10.80.1.3 - 00:80:00:00:00:01 (-/D/-)
|
|
|-- 10.80.1.4 - 00:80:00:00:00:02 (-/D/-)
|
|
```

```

| | -- 10.80.1.5 - 00:80:00:00:00:03 (-/D/-)
| |
-- alcatel_81 (sub_prof81)
|
| -- sap:1/2/1:80 - sla:sla_prof81_VOIP
| |
| | -- 10.80.1.6 - 00:80:00:00:00:04 (-/D/-)
| |
-- alcatel_90 (sub_default)
|
| -- sap:1/2/1:90 - sla:sla_default
| |
| | -- 10.90.1.3 - 00:90:00:00:00:01 (-/D/-)
| |
-- client_PC1 (sub_profPC1)
|
| -- sap:1/2/2:4000 - sla:sla_profPC1
| |
| | -- 0.0.0.0 - 00:00:00:00:00:00 (-/-/N)
| |
| | -- 10.24.1.253 - 00:13:21:67:a4:cd (-/D/-)
| |
| -- sap:lag-1 - sla:sla_profPC1
| |
| | -- 1.2.3.4 - 00:05:04:03:02:01 (S/-/-)
| |
-- static (sub_default)
|
| -- sap:1/2/1:80 - sla:sla_default
| |
| | -- 10.80.123.123 - 00:00:12:34:56:78 (S/-/-)
| |
=====
A:Dut-A#

A:Dut-A# show service active-subscribers subscriber alcatel_100 hierarchy
=====
Active Subscriber hierarchy
=====
-- alcatel_100 (sub_prof100)
|
| -- sap:1/2/1:101 - sla:sla_prof100_VOIP
| |
| | -- 10.100.1.4 - 00:10:00:00:00:02 (-/D/-)
| |
| -- sap:1/2/1:102 - sla:sla_default
| |
| | -- 10.100.1.5 - 00:10:00:00:00:03 (-/D/-)
| |
=====
A:Dut-A#

```

## Show, Clear, Debug Commands

```
A:Dut-A# show service active-subscribers subscriber alcatel_100
=====
Active Subscribers

Subscriber alcatel_100 (sub_default)

(1) SLA Profile Instance sap:1/2/1:100 - sla:sla_default

IP Address MAC Address Origin(*)

10.100.1.3 00:10:00:00:00:01 -/D/-

(2) SLA Profile Instance sap:1/2/1:101 - sla:sla_default

IP Address MAC Address Origin(*)

10.100.1.4 00:10:00:00:00:02 -/D/-

(3) SLA Profile Instance sap:1/2/1:102 - sla:sla_default

IP Address MAC Address Origin(*)

10.100.1.5 00:10:00:00:00:03 -/D/-
=====
(*) S=Static Host, D=DHCP Lease, N=Non-Sub-Traffic
=====
A:Dut-A#

A:Dut-A# show service active-subscribers subscriber alcatel_100 sap 1/2/1:100 sla-
profile sla_default
=====
Active Subscribers
=====
Subscriber alcatel_100 (sub_default)

(1) SLA Profile Instance sap:1/2/1:100 - sla:sla_default

IP Address MAC Address Origin(*)

10.100.1.3 00:10:00:00:00:01 -/D/-
=====
(*) S=Static Host, D=DHCP Lease, N=Non-Sub-Traffic
=====
A:Dut-A#

A:Dut-A# show service active-subscribers subscriber alcatel_100 sap 1/2/1:100 sla-
profile sla_default detail
=====
Active Subscribers
=====
Subscriber alcatel_100 (sub_default)

I. Sched. Policy : service_all
E. Sched. Policy : service_all
Acct. Policy : N/A Collect Stats : Disabled

(1) SLA Profile Instance
 - sap:1/2/1:100 (VPLS 100)
 - sla:sla_default
```

```

Host Limit : No Limit
Ingress Qos-Policy : 1000 Egress Qos-Policy : 1000
Ingress Queuing Type : Service-queuing
Ingress Filter-Id : N/A Egress Filter-Id : N/A

IP Address MAC Address Origin(*)

10.100.1.3 00:10:00:00:00:01 -/D/-

SLA Profile Instance statistics

 Packets Octets
Off. HiPrio : 0 0
Off. LowPrio : 42361 8639977
Off. Uncolor : 0 0

Queueing Stats (Ingress QoS Policy 1000)
Dro. HiPrio : 0 0
Dro. LowPrio : 6783 1392451
For. InProf : 0 0
For. OutProf : 35392 7211148

Queueing Stats (Egress QoS Policy 1000)
Dro. InProf : 6599 1347340
Dro. OutProf : 0 0
For. InProf : 34364 7011246
For. OutProf : 0 0

SLA Profile Instance per Queue statistics

 Packets Octets
Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 2 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 3 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LowPrio : 42361 8639977
Off. Uncolor : 0 0
Dro. HiPrio : 0 0
Dro. LowPrio : 6783 1392451
For. InProf : 0 0
For. OutProf : 35392 7211148

Ingress Queue 11 (Multipoint) (Priority)
Off. HiPrio : 0 0

```

```
Off. LowPrio : 0 0
Off. Uncolor : 0 0
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 1
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 2
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 3
Dro. InProf : 6599 1347340
Dro. OutProf : 0 0
For. InProf : 34364 7011246
For. OutProf : 0 0
=====
(*) S=Static Host, D=DHCP Lease, N=Non-Sub-Traffic
A:Dut-A#
```

egress-label

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>egress-label</b> <i>egress-label1</i> [ <i>egress-label2</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Context     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Description | <p>This command displays service information using the range of egress labels.</p> <p>If only the mandatory <i>egress-label1</i> parameter is specified, only services using the specified label are displayed.</p> <p>If both <i>egress-label1</i> and <i>egress-label2</i> parameters are specified, the services using the range of labels X where <i>egress-label1</i> &lt;= X &lt;= <i>egress-label2</i> are displayed.</p> <p>Use the <b>show router ldp bindings</b> command to display dynamic labels.</p> |
| Parameters  | <p><i>egress-label1</i> — The starting egress label value for which to display services using the label range. If only <i>egress-label1</i> is specified, services only using <i>egress-label1</i> are displayed.</p> <p><b>Values</b>      0, 2049 — 131071</p> <p><i>egress-label2</i> — The ending egress label value for which to display services using the label range.</p> <p><b>Default</b>     The <i>egress-label1</i> value.</p> <p><b>Values</b>      2049 — 131071</p>                                |



**Output**    **Show Service Egress Command Output** — The following table describes show service egress label output fields.

| Label                    | Description                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------|
| Svc Id                   | The ID that identifies a service.                                                                  |
| Sdp Id                   | The ID that identifies an SDP.                                                                     |
| Type                     | Indicates whether the SDP binding is a spoke or a mesh.                                            |
| I. Lbl                   | The VC label used by the far-end device to send packets to this device in this service by the SDP. |
| E. Lbl                   | The VC label used by this device to send packets to the far-end device in this service by the SDP. |
| Number of bindings found | The total number of SDP bindings that exist within the specified egress label range.               |

### Sample Output

```
*A:ALA-12# show service egress-label 0 10000
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 100:1 Mesh 0 0
...
1 107:1 Mesh 0 0
1 108:1 Mesh 0 0
1 300:1 Mesh 0 0
1 301:1 Mesh 0 0
1 302:1 Mesh 0 0
1 400:1 Mesh 0 0
1 500:2 Spok 131070 2001
1 501:1 Mesh 131069 2000
100 300:100 Spok 0 0
200 301:200 Spok 0 0
300 302:300 Spok 0 0
400 400:400 Spok 0 0

Number of Bindings Found : 23
=====
*A:ALA-12#
```

## fdb-info

**Syntax**    **fdb-info**

**Context**    show>service

**Description** Displays global FDB usage information.

**Output** **Show FDB-Info Command Output** — The following table describes show FDB-Info command output.

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service ID       | The value that identifies a service.                                                                                                                                                                                                                                                                                                                                                                                    |
| Mac Move         | Indicates the administrative state of the MAC movement feature associated with the service.                                                                                                                                                                                                                                                                                                                             |
| Mac Move Rate    | The maximum rate at which MAC's can be re-learned in this TLS service, before the SAP where the moving MAC was last seen is automatically disabled in order to protect the system against undetected loops or duplicate MAC's.<br>The rate is computed as the maximum number of re-learns allowed in a 5 second interval. The default rate of 10 re-learns per second corresponds to 50 re-learns in a 5 second period. |
| Mac Move Timeout | Indicates the time in seconds to wait before a SAP that has been disabled after exceeding the maximum re-learn rate is re-enabled. A value of zero indicates that the SAP will not be automatically re-enabled after being disabled. If after the SAP is re-enabled it is disabled again, the effective retry timeout is doubled in order to avoid thrashing.                                                           |
| Table Size       | The maximum number of learned and static entries allowed in the FDB.                                                                                                                                                                                                                                                                                                                                                    |
| Total Count      | The current number of entries (both learned and static) in the FDB of this service.                                                                                                                                                                                                                                                                                                                                     |
| Learned Count    | The current number of learned entries in the FDB of this service.                                                                                                                                                                                                                                                                                                                                                       |
| Static Count     | The current number of static entries in the FDB of this service.                                                                                                                                                                                                                                                                                                                                                        |
| Remote Age       | The number of seconds used to age out FDB entries learned on an SDP. These entries correspond to MAC addresses learned on remote SAPs.                                                                                                                                                                                                                                                                                  |
| Local Age        | The seconds used to age out FDB entries learned on local SAPs.                                                                                                                                                                                                                                                                                                                                                          |
| High WaterMark   | The utilization of the FDB table of this service at which a 'table full' alarm is raised by the agent.                                                                                                                                                                                                                                                                                                                  |
| Low WaterMark    | The utilization of the FDB table of this service at which a 'table full' alarm is cleared by the agent.                                                                                                                                                                                                                                                                                                                 |
| Mac Learning     | Specifies whether the MAC learning process is enabled in this service.                                                                                                                                                                                                                                                                                                                                                  |
| Discard Unknown  | Specifies whether frames received with an unknown destination MAC are discarded in this service.                                                                                                                                                                                                                                                                                                                        |
| MAC Aging        | Specifies whether the MAC aging process is enabled in this service.                                                                                                                                                                                                                                                                                                                                                     |
| MAC Pinning      | Specifies whether MAC pinning is enabled in this service.                                                                                                                                                                                                                                                                                                                                                               |

| Label                     | Description (Continued)                                                                                                                                                                                                                                |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relearn Only              | When enabled, indicates that either the FDB table of this service is full or that the maximum system-wide number of MAC's supported by the agent has been reached, and thus MAC learning is temporary disabled, and only MAC re-learns can take place. |
| Total Service FDB         | The current number of service FDBs configured on this node.                                                                                                                                                                                            |
| Total FDB Configured Size | The sum of configured FDBs.                                                                                                                                                                                                                            |
| Total FDB Entries In Use  | The total number of entries (both learned and static) in use.                                                                                                                                                                                          |

### Sample Output

```
*A:ALA-12# show service fdb-info
=====
Forwarding Database (FDB) Information
=====
Service Id : 700 Mac Move : Disabled
Mac Move Rate : 10 Mac Move Timeout : 10
Table Size : 250 Total Count : 0
Learned Count : 0 Static Count : 0
Remote Age : 900 Local Age : 300
High WaterMark : 95% Low Watermark : 90%
Mac Aging : Enabl Relearn Only : False
Service Id : 725 Mac Move : Disabled
Mac Move Rate : 10 Mac Move Timeout : 10
Table Size : 250 Total Count : 0
Learned Count : 0 Static Count : 0
Remote Age : 900 Local Age : 300
High WaterMark : 95% Low Watermark : 90%
Mac Learning : Enabl Discard Unknown : Dsabl
Mac Aging : Enabl Relearn Only : False
Service Id : 740 Mac Move : Disabled
Mac Move Rate : 10 Mac Move Timeout : 10
Table Size : 250 Total Count : 0
Learned Count : 0 Static Count : 0
Remote Age : 900 Local Age : 300
High WaterMark : 95% Low Watermark : 90%
Mac Learning : Enabl Discard Unknown : Dsabl
Mac Aging : Enabl Relearn Only : False
...

Total Service FDBs : 7
Total FDB Configured Size : 1750
Total FDB Entries In Use : 0
=====
A:*A:ALA-48#
```

## fdb-mac

|                    |                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fdb-mac</b> <i>ieee-address</i> [ <b>expiry</b> ]                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays the FDB entry for a given MAC address.                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>ieee-address</i> — The 48-bit MAC address for which to display the FDB entry in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i>, <i>bb</i>, <i>cc</i>, <i>dd</i>, <i>ee</i> and <i>ff</i> are hexadecimal numbers.</p> <p><b>expiry</b> — Shows the time until the MAC is aged out.</p> |
| <b>Output</b>      | <b>Show FDB-MAC Command Output</b> — The following table describes the show FDB MAC command output fields:                                                                                                                                                                                                                  |

| Label             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service ID        | The service ID number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MAC               | The specified MAC address                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Source-Identifier | The location where the MAC is defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Type/Age          | <p>Static — FDB entries created by management.</p> <p>Learned — Dynamic entries created by the learning process.</p> <p>OAM — Entries created by the OAM process.</p> <p>H — Host, the entry added by the system for a static configured subscriber host.</p> <p>D or DHCP — DHCP-installed MAC. Learned addresses can be temporarily frozen by the DHCP snooping application for the duration of a DHCP lease.</p> <p>P — Indicates the MAC is protected by the MAC protection feature.</p> |

## Sample Output

```
*A:ALA-12# show service fdb-mac 00:99:00:00:00:00
=====
Services Using Forwarding Database Mac 00:99:00:00:00:00
=====
ServId MAC Source-Identifier Type/Age Last Change

1 00:99:00:00:00:00 sap:1/2/7:0 Static
=====
*A:ALA-12#
```

## ingress-label

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress-label</b> <i>start-label</i> [ <i>end-label</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>Display services using the range of ingress labels.</p> <p>If only the mandatory <i>start-label</i> parameter is specified, only services using the specified label are displayed.</p> <p>If both <i>start-label</i> and <i>end-label</i> parameters are specified, the services using the range of labels X where <i>start-label</i> &lt;= X &lt;= <i>end-label</i> are displayed.</p> <p>Use the <b>show router ldp bindings</b> command to display dynamic labels.</p> |
| <b>Parameters</b>  | <p><i>start-label</i> — The starting ingress label value for which to display services using the label range. If only <i>start-label</i> is specified, services only using <i>start-label</i> are displayed.</p> <p><b>Values</b>      0, 2048 — 131071</p> <p><i>end-label</i> — The ending ingress label value for which to display services using the label range.</p> <p><b>Default</b>      The <i>start-label</i> value.</p> <p><b>Values</b>      2049 — 131071</p>   |
| <b>Output</b>      | <b>Show Service Ingress-Label</b> — The following table describes show service ingress-label output fields.                                                                                                                                                                                                                                                                                                                                                                  |

| Label                    | Description                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------|
| Svc ID                   | The service identifier.                                                                                 |
| SDP Id                   | The SDP identifier.                                                                                     |
| Type                     | Indicates whether the SDP is spoke or mesh.                                                             |
| I.Lbl                    | The ingress label used by the far-end device to send packets to this device in this service by the SDP. |
| E.Lbl                    | The egress label used by this device to send packets to the far-end device in this service by the SDP.  |
| Number of Bindings Found | The number of SDP bindings within the label range specified.                                            |

### Sample Output

```
*A:ALA-12# show service ingress-label 0
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
```

## Show, Clear, Debug Commands

|     |         |        |   |
|-----|---------|--------|---|
| 1   | 50:1    | Mesh 0 | 0 |
| 1   | 100:1   | Mesh 0 | 0 |
| 1   | 101:1   | Mesh 0 | 0 |
| 1   | 102:1   | Mesh 0 | 0 |
| 1   | 103:1   | Mesh 0 | 0 |
| 1   | 104:1   | Mesh 0 | 0 |
| 1   | 105:1   | Mesh 0 | 0 |
| 1   | 106:1   | Mesh 0 | 0 |
| 1   | 107:1   | Mesh 0 | 0 |
| 1   | 108:1   | Mesh 0 | 0 |
| 1   | 300:1   | Mesh 0 | 0 |
| 1   | 301:1   | Mesh 0 | 0 |
| 1   | 302:1   | Mesh 0 | 0 |
| 1   | 400:1   | Mesh 0 | 0 |
| 100 | 300:100 | Spok 0 | 0 |
| 200 | 301:200 | Spok 0 | 0 |
| 300 | 302:300 | Spok 0 | 0 |
| 400 | 400:400 | Spok 0 | 0 |

-----  
Number of Bindings Found : 21  
-----

\*A:ALA-12#

## sap-using

**Syntax**     **sap-using interface** [*ip-address* | *ip-int-name*]  
**sap-using** [ingress | egress] **filter** *filter-id*  
**sap-using** [sap *sap-id*]  
**sap-using** [ingress | egress] **atm-td-profile** *td-profile-id*  
**sap-using authentication-policy** *auth-plcy-name*  
**sap-using** [ingress | egress] **qos-policy** *qos-policy-id*

**Context**     show>service

**Description**     This command displays SAP information.  
 If no optional parameters are specified, the command displays a summary of all defined SAPs.  
 The optional parameters restrict output to only SAPs matching the specified properties.

**Parameters**     **ingress** — Specifies matching an ingress policy.  
**egress** — Specifies matching an egress policy.  
**qos-policy** *qos-policy-id* — The ingress or egress QoS Policy ID for which to display matching SAPs.  
                       **Values**     1 — 65535  
**atm-td-profile** *td-profile-id* — Displays SAPs using this traffic description.  
**filter** *filter-id* — The ingress or egress filter policy ID for which to display matching SAPs.  
                       **Values**     1 — 65535  
**authentication** *auth-plcy-name* — The session authentication policy for which to display matching SAPs.  
*sap-id* — Specifies the physical port identifier portion of the SAP definition. See [Common CLI Command Descriptions on page 1933](#) for command syntax.  
**interface** — Specifies matching SAPs with the specified IP interface.  
*ip-address* — The IP address of the interface for which to display matching SAPs.  
                       **Values**     1.0.0.0 — 223.255.255.255  
*ip-int-name* — The IP interface name for which to display matching SAPs.

**Output**     **Show Service SAP** — The following table describes show service SAP output fields:

| Label    | Description                                                     |
|----------|-----------------------------------------------------------------|
| Port ID  | The ID of the access port where the SAP is defined.             |
| Svc ID   | The service identifier.                                         |
| SapMTU   | The SAP MTU value.                                              |
| I.QoS    | The SAP ingress QoS policy number specified on the ingress SAP. |
| I.MAC/IP | The MAC or IP filter policy ID applied to the ingress SAP.      |

| Label     | Description (Continued)                         |
|-----------|-------------------------------------------------|
| Egr. Fltr | The filter policy ID applied to the egress SAP. |
| A.Pol     | The accounting policy ID assigned to the SAP.   |
| Adm       | The administrative state of the SAP.            |
| Opr       | The actual state of the SAP.                    |

### Sample Output

```
A:ALA-701# show service sap-using
=====
Service Access Points
=====
PortId SvcId Ing. Ing. Egr. Egr. Anti Adm Opr
 QoS Fltr QoS Fltr Spoof

1/1/3 10203041 1 ip4 1 none none Up Up
1/1/4 10203042 1 none 1 ip4 none Up Up

Number of SAPs : 2

A:ALA-701#
```



## sdp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp</b> [ <i>sdp-id</i>   <b>far-end</b> <i>ip-address</i> ] [ <b>detail</b>   <b>keep-alive-history</b> ]<br><b>sdp</b> [ <i>sdp-id</i> [: <i>vc-id</i> ]   <b>far-end</b> <i>ip-address</i> ]<br><b>sdp</b> [ <i>sdp-id</i>   <b>far-end</b> <i>ip-addr</i> ] [ <b>detail</b>   <b>keep-alive-history</b> ]                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command displays information for the SDPs associated with the service.<br>If no optional parameters are specified, a summary of all associated SDPs is displayed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <i>sdp-id</i> — Displays only information for the specified SDP ID. An SDP is a logical mechanism that ties a far-end 7750 SR to a particular service without having to specifically define far end SAPs. Each SDP represents a method to reach a 7750 SR router.<br><b>Default</b> All SDPs.<br><b>Values</b> 1 — 17407<br><b>far-end ip-addr</b> — Displays only SDPs matching with the specified system IP address of the far-end destination 7750 SR router for the Service Distribution Point (SDP) that is the termination point for a service.<br><b>Default</b> SDPs with any far-end IP address.<br><b>detail</b> — Displays detailed SDP information. |
| <b>Output</b>      | <b>Show Service SDP</b> — The following table describes show service-id SDP output fields.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Label               | Description                                                                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sdp Id              | The SDP identifier.                                                                                                                                                          |
| Type                | Indicates whether the SDP is a spoke                                                                                                                                         |
| Split Horizon Group | Name of the split horizon group where the SDP belongs.                                                                                                                       |
| VC Type             | Displays the VC type, ether or vlan.                                                                                                                                         |
| VC Tag              | Displays the explicit dot1Q value used when encapsulating to the SDP far end.                                                                                                |
| I. Lbl              | The VC label used by the far-end device to send packets to this device in this service by the SDP.                                                                           |
| Admin Path MTU      | The operating path MTU of the SDP is equal to the admin path MTU (when one is set) or the dynamically computed tunnel MTU, when no admin path MTU is set (the default case.) |
| Oper Path MTU       | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.             |
| Far End             | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                    |

| Label               | Description (Continued)                                                                                                                                                                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Delivery            | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                                                                                                                          |
| Admin State         | The administrative state of this SDP.                                                                                                                                                                                                                                                 |
| Oper State          | The operational state of this SDP.                                                                                                                                                                                                                                                    |
| Ingress Label       | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                                                                                                                                      |
| Egress Label        | The label used by this device to send packets to the far-end device in this service by the SDP.                                                                                                                                                                                       |
| Last Changed        | The date and time of the most recent change to the SDP.                                                                                                                                                                                                                               |
| Signaling           | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on this SDP.                                                                                                                                                    |
| Admin State         | The administrative state of the Keepalive process.                                                                                                                                                                                                                                    |
| Oper State          | The operational state of the Keepalive process.                                                                                                                                                                                                                                       |
| Hello Time          | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                        |
| Max Drop Count      | Specifies the maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                       |
| Hello Msg Len       | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                        |
| Hold Down Time      | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                      |
| I. Fwd. Pkts.       | Specifies the number of forwarded ingress packets.                                                                                                                                                                                                                                    |
| I. Dro. Pkts        | Specifies the number of dropped ingress packets.                                                                                                                                                                                                                                      |
| E. Fwd. Pkts.       | Specifies the number of forwarded egress packets.                                                                                                                                                                                                                                     |
| E. Fwd. Octets      | Specifies the number of forwarded egress octets.                                                                                                                                                                                                                                      |
| Associated LSP List | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the Far End field.<br>If the SDP type is GRE, then the following message displays:<br>SDP Delivery Mechanism is not MPLS. |

## sdp-using

- Syntax** **sdp-using** [*sdp-id[:vc-id]*] | **far-end** *ip-address*]
- Context** show>service
- Description** This command displays services using SDP or far-end address options.
- Parameters** *sdp-id* — Displays only services bound to the specified SDP ID.  
**Values** 1 — 17407  
*vc-id* — The virtual circuit identifier.  
**Values** 1 — 4294967295  
**far-end ip-address** — Displays only services matching with the specified far-end IP address.  
**Default** Services with any far-end IP address.
- Output** **Show Service SDP Using** — The following table describes service-using output fields.

| Label         | Description                                                                                      |
|---------------|--------------------------------------------------------------------------------------------------|
| Svc ID        | The service identifier.                                                                          |
| Sdp ID        | The SDP identifier.                                                                              |
| Type          | Specifies the type of SDP: Spoke or Mesh.                                                        |
| Far End       | The far-end address of the SDP.                                                                  |
| Oper State    | The operational state of the service.                                                            |
| Ingress Label | The label used by the far-end device to send packets to this device in this service by this SDP. |
| Egress Label  | The label used by this device to send packets to the far-end device in this service by this SDP. |

## Sample Output

```
*A:ALA-1# show service sdp-using 300
=====
Service Destination Point (Sdp Id : 300)
=====
SvcId SdpId Type Far End Opr State I.Label E.Label

1 300:1 Mesh 10.0.0.13 Up 131071 131071
2 300:2 Spok 10.0.0.13 Up 131070 131070
100 300:100 Mesh 10.0.0.13 Up 131069 131069
101 300:101 Mesh 10.0.0.13 Up 131068 131068
102 300:102 Mesh 10.0.0.13 Up 131067 131067

Number of SDPs : 5

*A:ALA-1#
```

## service-using

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>service-using</b> [ <b>epipe</b> ] [ <b>ies</b> ] [ <b>vpls</b> ] [ <b>vprn</b> ] [ <b>mirror</b> ] [ <b>b-vpls</b> ] [ <b>i-vpls</b> ] [ <b>m-vpls</b> ] [ <b>apipe</b> ] [ <b>fpipe</b> ] [ <b>ipipe</b> ] <b>sdp</b> <i>sdp-id</i> [ <b>customer</b> <i>customer-id</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command displays the services matching certain usage properties. If no optional parameters are specified, all services defined on the system are displayed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><b>epipe</b> — Displays matching Epipe services.</p> <p><b>ies</b> — Displays matching IES instances.</p> <p><b>vpls</b> — Displays matching VPLS instances.</p> <p><b>vprn</b> — Displays matching VPRN services.</p> <p><b>mirror</b> — Displays matching mirror services.</p> <p><b>b-vpls</b> — Displays matching B-VPLS services.</p> <p><b>i-vpls</b> — Displays matching I-VPLS services.</p> <p><b>apipe</b> — Displays matching Apipe services.</p> <p><b>fpipe</b> — Displays matching Fpipe services.</p> <p><b>ipipe</b> — Displays matching Ipipe services.</p> <p><b>sdp</b> <i>sdp-id</i> — Displays only services bound to the specified SDP ID.</p> <p><b>Default</b> Services bound to any SDP ID.</p> <p><b>Values</b> 1 — 17407</p> <p><b>customer</b> <i>customer-id</i> — Displays services only associated with the specified customer ID.</p> <p><b>Default</b> Services associated with a customer.</p> <p><b>Values</b> 1 — 2147483647</p> |
| <b>Output</b>      | <b>Show Service Service-Using</b> — The following table describes show service service-using output fields:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Label            | Description                                                                       |
|------------------|-----------------------------------------------------------------------------------|
| Service Id       | The service identifier.                                                           |
| Type             | Specifies the service type configured for the service ID.                         |
| Adm              | The administrative state of the service.                                          |
| Opr              | The operating state of the service.                                               |
| CustomerID       | The ID of the customer who owns this service.                                     |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this service. |

**Sample Output**

\*A:ALA-12# show service service-using customer 10

Services

| ServiceId | Type  | Adm | Opr | CustomerId | Last Mgmt Change    |
|-----------|-------|-----|-----|------------|---------------------|
| 1         | VPLS  | Up  | Up  | 10         | 09/05/2006 13:24:15 |
| 100       | IES   | Up  | Up  | 10         | 09/05/2006 13:24:15 |
| 300       | Epipe | Up  | Up  | 10         | 09/05/2006 13:24:15 |

Matching Services : 3

\*A:ALA-12#

\*A:ALA-12# show service service-using epipe

Services [epipe]

| ServiceId | Type  | Adm | Opr | CustomerId | Last Mgmt Change    |
|-----------|-------|-----|-----|------------|---------------------|
| 6         | Epipe | Up  | Up  | 6          | 09/22/2006 23:05:58 |
| 7         | Epipe | Up  | Up  | 6          | 09/22/2006 23:05:58 |
| 8         | Epipe | Up  | Up  | 3          | 09/22/2006 23:05:58 |
| 103       | Epipe | Up  | Up  | 6          | 09/22/2006 23:05:58 |

Matching Services : 4

\*A:ALA-12#

\*A:ALA-14# show service service-using

Services

| ServiceId | Type  | Adm  | Opr  | CustomerId | Last Mgmt Change    |
|-----------|-------|------|------|------------|---------------------|
| 10        | mVPLS | Down | Down | 1          | 10/26/2006 15:44:57 |
| 11        | mVPLS | Down | Down | 1          | 10/26/2006 15:44:57 |
| 100       | mVPLS | Up   | Up   | 1          | 10/26/2006 15:44:57 |
| 101       | mVPLS | Up   | Up   | 1          | 10/26/2006 15:44:57 |
| 102       | mVPLS | Up   | Up   | 1          | 10/26/2006 15:44:57 |

Matching Services : 5

\*A:ALA-14#

\*A:SetupCLI# show service service-using

- service-using [epipe] [ies] [vpls] [mirror] [ipipe] [b-vpls] [i-vpls] [m-vpls]  
[sdp <sdp-id>] [customer <customer-id>]

<epipe> : keyword - displays epipe services  
 <ies> : keyword - displays ies services  
 <vpls> : keyword - displays vpls services  
 <mirror> : keyword - displays mirror services  
 <ipipe> : keyword - displays ipipe services  
 <sdp-id> : [1..17407] - display services using this sdp  
 <customer-id> : [1..2147483647] - display services using this customer  
 <b-vpls> : keyword - displays b-vpls services  
 <i-vpls> : keyword - displays i-vpls services

## Show, Clear, Debug Commands

```
<m-vpls> : keyword - displays m-vpls services

*A:SetupCLI# show service service-using
=====
Services
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

23 mVPLS Up Down 2 09/25/2007 21:45:58
100 Epipe Up Down 2 09/25/2007 21:45:58
101 Epipe Up Down 2 09/25/2007 21:45:58
102 Epipe Up Down 2 09/25/2007 21:45:58
105 Epipe Up Down 2 09/25/2007 21:45:58
110 Epipe Up Down 1 09/25/2007 21:45:58
990 IES Up Down 1 09/25/2007 21:45:58
1000 Mirror Up Down 1 09/25/2007 21:45:59
1001 Epipe Up Down 1 09/25/2007 21:45:58
1002 Epipe Up Down 1 09/25/2007 21:45:58
1003 Epipe Up Down 1 09/25/2007 21:45:58
1004 Epipe Up Down 1 09/25/2007 21:45:58
2000 Mirror Up Down 1 09/25/2007 21:45:59
2001 i-VPLS Up Down 1 09/25/2007 21:45:59
2002 b-VPLS Up Down 1 09/25/2007 21:45:59
2003 i-VPLS Down Down 1 09/25/2007 21:45:59
2004 b-mVPLS Down Down 1 09/25/2007 21:45:59
2005 i-mVPLS Down Down 1 09/25/2007 21:45:59
8787 IES Up Down 2 09/25/2007 21:45:58
8888 IES Up Down 1 09/25/2007 21:45:58
10000 IES Down Down 1 09/25/2007 21:45:59
10001 VPLS Up Down 1 09/25/2007 21:45:58
483000 Ipipe Down Down 2 09/25/2007 21:45:59
483001 Ipipe Up Down 2 09/25/2007 21:45:59
483004 Ipipe Down Down 2 09/25/2007 21:45:59
483007 VPLS Down Down 2 09/25/2007 21:45:59
483010 Ipipe Down Down 1 09/25/2007 21:45:59
...

Matching Services : 27

*A:SetupCLI#

*A:SetupCLI# show service service-using
=====
Services
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

23 mVPLS Up Down 2 09/25/2007 21:45:58
100 Epipe Up Down 2 09/25/2007 21:45:58
101 Epipe Up Down 2 09/25/2007 21:45:58
102 Epipe Up Down 2 09/25/2007 21:45:58
105 Epipe Up Down 2 09/25/2007 21:45:58
110 Epipe Up Down 1 09/25/2007 21:45:58
990 IES Up Down 1 09/25/2007 21:45:58
1000 Mirror Up Down 1 09/25/2007 21:45:59
1001 Epipe Up Down 1 09/25/2007 21:45:58
1002 Epipe Up Down 1 09/25/2007 21:45:58
1003 Epipe Up Down 1 09/25/2007 21:45:58
1004 Epipe Up Down 1 09/25/2007 21:45:58
2000 Mirror Up Down 1 09/25/2007 21:45:59
```

```

2001 i-VPLS Up Down 1 09/25/2007 21:45:59
2002 b-VPLS Up Down 1 09/25/2007 21:45:59
2003 i-VPLS Down Down 1 09/25/2007 21:45:59
2004 b-mVPLS Down Down 1 09/25/2007 21:45:59
2005 i-mVPLS Down Down 1 09/25/2007 21:45:59
8787 IES Up Down 2 09/25/2007 21:45:58
8888 IES Up Down 1 09/25/2007 21:45:58
10000 IES Down Down 1 09/25/2007 21:45:59
10001 VPLS Up Down 1 09/25/2007 21:45:58
483000 Ipipe Down Down 2 09/25/2007 21:45:59
483001 Ipipe Up Down 2 09/25/2007 21:45:59
483004 Ipipe Down Down 2 09/25/2007 21:45:59
483007 VPLS Down Down 2 09/25/2007 21:45:59
483010 Ipipe Down Down 1 09/25/2007 21:45:59
...

```

```

Matching Services : 27

```

```

*A:SetupCLI#

```

```

*A:term17>config>service>epipe# show service id 2000 epipe

```

```

=====
Related Epipe services for bVpls service 2000
=====

```

| Epipe SvcId | Oper | ISID | Admin | Oper |
|-------------|------|------|-------|------|
| 1           | 1    |      | Down  | Down |

```

Number of Entries : 1

```

```

*A:term17>config>service>epipe#

```

## subscriber-using

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subscriber-using</b> [ <b>service-id</b> <i>service-id</i> ] [ <b>sap-id</b> <i>sap-id</i> ] [ <b>interface</b> <i>ip-int-name</i> ] [ <b>ip</b> <i>ip-address</i> [/ <i>mask</i> ]] [ <b>mac</b> <i>ieee-address</i> ] [ <b>sub-profile</b> <i>sub-profile-name</i> ] [ <b>sla-profile</b> <i>sla-profile-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | show>service>subscriber-using                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command displays subscribers using specified options.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><b>service-id</b> <i>service-id</i> — Display subscriber information about the specified service ID.</p> <p><b>Values</b></p> <p>service-id: 1 — 214748364</p> <p>svc-name: A string up to 64 characters in length.</p> <p><b>sap-id</b> <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>interface</b> <i>ip-int-name</i> — Display subscriber information about the specified interface.</p> <p><b>ip</b> <i>ip-address</i>[/<i>mask</i>] — Display subscriber information about the specified IP address.</p> <p><b>mac</b> <i>ieee-address</i> — Display subscriber information about the specified MAC address.</p> <p><b>sub-profile</b> <i>sub-profile-name</i> — Display subscriber information about the specified subscriber profile name.</p> <p><b>sla-profile</b> <i>sla-profile-name</i> — Display subscriber information about the specified SLA profile name.</p> |



id

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command displays information for a particular service-id.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><i>service-id</i> — The unique service identification number that identifies the service in the service domain.</p> <p><b>Values</b></p> <p>service-id: 1 — 214748364</p> <p>svc-name: A string up to 64 characters in length.</p> <p><b>all</b> — Display detailed information about the service.</p> <p><b>arp</b> — Display ARP entries for the service.</p> <p><b>authentication</b> — Display subscriber authentication information</p> <p><b>base</b> — Display basic service information.</p> <p><b>dhcp</b> — Display DHCP information.</p> <p><b>endpoint</b> — Display service endpoint information.</p> <p><b>epipe</b> — Display e-pipe services associated with the b-vpls service.</p> <p><b>fdb</b> — Display FDB entries.</p> <p><b>gsmp</b> — Display GSMP information.</p> <p><b>host</b> — Display static hosts configured on the service.</p> <p><b>i-vpls</b> — Display i-vpls services associated with the b-vpls.</p> <p><b>igmp-snooping</b> — Display IGMP snooping information.</p> <p><b>interface</b> — Display service interfaces.</p> <p><b>l2-route-table</b> — Display Layer-2 route information associated with the service.</p> <p><b>l2pt</b> — Display L2PT information of SAPs and Spokes.</p> <p><b>labels</b> — Display labels being used by this service.</p> <p><b>mac-move</b> — Display Mac Move related information about the service.</p> <p><b>mac-protect</b> — Display MAC protect information.</p> <p><b>mfib</b> — Display MFIB related information.</p> <p><b>mld-snooping</b> — Display MLD snooping information.</p> <p><b>mmrp</b> — Display MMRP information.</p> <p><b>mrp</b> — Display MRP information</p> <p><b>msap</b> — Display MSAPs associated to the service.</p> <p><b>pim-snooping</b> — Display PIM snooping information.</p> <p><b>pppoe</b> — Display PPPoE information.</p> <p><b>retailers</b> — Display service retailer information.</p> |

## Show, Clear, Debug Commands

**sap** — Display SAPs associated to the service.

**sdp** — Display SDPs associated with the service.

**source-address** — Display source-address configured for applications.

**split-horizon-group** — Display split horizon group information.

**stp** — Display STP information.

**subscriber-host** — Display subscriber host information.

**wholesalers** — Display service wholesaler information.

all

|                    |                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>all</b>                                                                                   |
| <b>Context</b>     | show>service>id                                                                              |
| <b>Description</b> | This command displays detailed information for all aspects of the service.                   |
| <b>Output</b>      | <b>Show service ID all output</b> — The following table describes the command output fields. |

| Label               | Description                                                                                                                                                       |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id          | The service identifier.                                                                                                                                           |
| VPN Id              | The number which identifies the VPN.                                                                                                                              |
| Service Type        | Specifies the type of service.                                                                                                                                    |
| SDP Id              | The SDP identifier.                                                                                                                                               |
| Description         | Generic information about the service.                                                                                                                            |
| Customer Id         | The customer identifier.                                                                                                                                          |
| Last Mgmt Change    | The date and time of the most recent management-initiated change to this customer.                                                                                |
| SAP Count           | The number of SAPs specified for this service.                                                                                                                    |
| SDP Bind Count      | The number of SDPs bound to this service.                                                                                                                         |
| Split Horizon Group | Name of the split horizon group for this service.                                                                                                                 |
| Description         | Description of the split horizon group.                                                                                                                           |
| Last Changed        | The date and time of the most recent management-initiated change to this split horizon group.                                                                     |
| SDP Id              | The SDP identifier.                                                                                                                                               |
| Type                | Indicates whether this service SDP binding is a spoke or a mesh.                                                                                                  |
| Admin Path MTU      | The desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Oper Path MTU       | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.  |
| Delivery            | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                      |
| Admin State         | The administrative state of this SDP.                                                                                                                             |
| Oper State          | The operational state of this SDP.                                                                                                                                |

| Label                  | Description (Continued)                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ingress Label          | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                                                                                                                                     |
| Egress Label           | The label used by this device to send packets to the far-end device in this service by this SDP.                                                                                                                                                                                     |
| Ingress Filter         | The ID of the ingress filter policy.                                                                                                                                                                                                                                                 |
| Egress Filter          | The ID of the egress filter policy.                                                                                                                                                                                                                                                  |
| Far End                | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                                                                                                                            |
| Last Changed           | The date and time of the most recent change to this customer.                                                                                                                                                                                                                        |
| Hello Time             | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Msg Len          | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                       |
| Max Drop Count         | Specifies the maximum number of consecutive SDP Echo Request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                      |
| Hold Down Time         | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                     |
| SDP Delivery Mechanism | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the Far End field.<br>If the SDP type is GRE, then the following message displays:<br>SDP Delivery Mechanism is not MPLS |
| Number of SDPs         | The total number SDPs applied to this service ID.                                                                                                                                                                                                                                    |
| Service Id             | The service identifier.                                                                                                                                                                                                                                                              |
| Port Id                | The ID of the access port where this SAP is defined.                                                                                                                                                                                                                                 |
| Description            | Generic information about the SAP.                                                                                                                                                                                                                                                   |
| Encap Value            | The value of the label used to identify this SAP on the access port.                                                                                                                                                                                                                 |
| Admin State            | The administrative state of the SAP.                                                                                                                                                                                                                                                 |
| Oper State             | The operating state of the SAP.                                                                                                                                                                                                                                                      |
| Last Changed           | The date and time of the last change.                                                                                                                                                                                                                                                |
| Admin MTU              | The desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.                                                                                                                    |
| Oper MTU               | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.                                                                                                                     |

| Label                 | Description (Continued)                                                           |
|-----------------------|-----------------------------------------------------------------------------------|
| Ingress qos-policy    | The SAP ingress QoS policy ID.                                                    |
| Egress qos-policy     | The SAP egress QoS policy ID.                                                     |
| Ingress Filter-Id     | The SAP ingress filter policy ID.                                                 |
| Egress Filter-Id      | The SAP egress filter policy ID.                                                  |
| Multi Svc Site        | Indicates the multi-service site that the SAP is a member.                        |
| Ingress sched-policy  | Indicates the ingress QoS scheduler for the SAP.                                  |
| Egress sched-policy   | Indicates the egress QoS scheduler for the SAP.                                   |
| Acct. Pol             | Indicates the accounting policy applied to the SAP.                               |
| Collect Stats         | Specifies whether accounting statistics are collected on the SAP.                 |
| Dropped               | The number of packets or octets dropped.                                          |
| Offered Hi Priority   | The number of high priority packets, as determined by the SAP ingress QoS policy. |
| Offered Low Priority  | The number of low priority packets, as determined by the SAP ingress QoS policy.  |
| Offered Low Priority  | The number of low priority packets, as determined by the SAP ingress QoS policy.  |
| Forwarded In Profile  | The number of in-profile packets or octets (rate below CIR) forwarded.            |
| Forwarded Out Profile | The number of out-of-profile packets or octets (rate above CIR) forwarded.        |
| Dropped In Profile    | The number of in-profile packets or octets discarded.                             |
| Dropped Out Profile   | The number of out-of-profile packets or octets discarded.                         |
| Forwarded In Profile  | The number of in-profile packets or octets (rate below CIR) forwarded.            |
| Forwarded Out Profile | The number of out-of-profile packets or octets (rate above CIR) forwarded.        |
| Ingress Queue 1       | The index of the ingress QoS queue of this SAP.                                   |
| High priority offered | The packets or octets count of the high priority traffic for the SAP.             |
| High priority dropped | The number of high priority traffic packets/octets dropped.                       |
| Low priority offered  | The packets or octets count of the low priority traffic.                          |

| Label                 | Description (Continued)                                                                     |
|-----------------------|---------------------------------------------------------------------------------------------|
| Low priority dropped  | The number of low priority traffic packets/octets dropped.                                  |
| In profile forwarded  | The number of in-profile packets or octets (rate below CIR) forwarded.                      |
| Out profile forwarded | The number of out-of-profile octets (rate above CIR) forwarded.                             |
| Egress Queue 1        | The index of the egress QoS queue of the SAP.                                               |
| In profile forwarded  | The number of in-profile packets or octets (rate below CIR) forwarded.                      |
| In profile dropped    | The number of in-profile packets or octets dropped for the SAP.                             |
| Out profile forwarded | The number of out-of-profile packets or octets (rate above CIR) forwarded.                  |
| Out profile dropped   | The number of out-of-profile packets or octets discarded.                                   |
| State                 | Specifies whether DHCP Relay is enabled on this SAP.                                        |
| Info Option           | Specifies whether Option 82 processing is enabled on this SAP.                              |
| Action                | Specifies the Option 82 processing on this SAP or interface: keep, replace or drop.         |
| Circuit ID            | Specifies whether the If Index is inserted in Circuit ID sub-option of Option 82.           |
| Remote ID             | Specifies whether the far-end MAC address is inserted in Remote ID sub-option of Option 82. |
| Managed by Service    | Specifies the service-id of the management VPLS managing this SAP.                          |
| Managed by MSTI       | Specifies the MST instance inside the management VPLS managing this SAP.                    |
| Last BPDU from        | The bridge ID of the sender of the last BPDU received on this SAP.                          |
| Managed by SAP        | Specifies the sap-id inside the management VPLS managing this SAP.                          |
| Prune state           | Specifies the STP state inherited from the management VPLS.                                 |
| Managed by Service    | Specifies the service-id of the management VPLS managing this spoke SDP.                    |
| Last BPDU from        | The bridge ID of the sender of the last BPDU received on this SAP.                          |
| Managed by Spoke      | Specifies the sap-id inside the management VPLS managing this spoke SDP.                    |
| Prune state           | Specifies the STP state inherited from the management VPLS.                                 |

## Sample Output

```

*A:ALA-48# show service id 700 all
=====
Service Detailed Information
=====
Service Id : 700 Vpn Id : 0
Service Type : VPLS
Description : IMA VPLS
Customer Id : 7
Last Status Change: 02/02/2009 09:27:55
Last Mgmt Change : 02/02/2009 09:27:57
Admin State : Up Oper State : Down
MTU : 1514 Def. Mesh VC Id : 700
SAP Count : 1 SDP Bind Count : 2
Snd Flush on Fail : Disabled Host Conn Verify : Disabled
Propagate MacFlush: Disabled
Def. Gateway IP : None
Def. Gateway MAC : None

BGP Auto-discovery Information

Admin State : Down Vpls Id : None
Route Dist : None Prefix : 10.10.10.103
Rte-Target Import : None Rte-Target Export : None
Vsi-Import : None
Vsi-Export : None
PW-Template Id : None

Split Horizon Group specifics

Split Horizon Group : DSL-group1

Description : (Not Specified)
Instance Id : 1 Last Change : 02/02/2009 09:27:57

Split Horizon Group : SHG_test

Description : test
Instance Id : 2 Last Change : 02/02/2009 09:27:57

Service Destination Points (SDPs)

Sdp Id 2:222 - (10.10.10.104)

Description : GRE-10.10.10.104
SDP Id : 2:222 Type : Spoke
Split Horiz Grp : (Not Specified)
VC Type : Ether VC Tag : n/a
Admin Path MTU : 0 Oper Path MTU : 0
Far End : 10.10.10.104 Delivery : GRE

Admin State : Up Oper State : Down
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 0 Egress Label : 0
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Ing ipv6 Fltr : n/a Egr ipv6 Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Last Status Change : 02/02/2009 09:27:55 Signaling : TLDP

```

## Show, Clear, Debug Commands

```

Last Mgmt Change : 02/02/2009 09:27:57 Force Vlan-Vc : Disabled
Endpoint : N/A Precedence : 4
Class Fwding State : Down
Flags : SdpOperDown
 : NoIngVCLabel NoEgrVCLabel
 : PathMTUTooSmall

Time to RetryReset : never Retries Left : 3
Mac Move : Blockable Blockable Level : Tertiary
Peer Pw Bits : None
Peer Fault Ip : None
Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0

MAC Learning : Enabled Discard Unkwn Srce: Disabled
BPDU Translation : Disabled
L2PT Termination : Disabled
MAC Pinning : Disabled
Ignore Standby Sig : False Block On Mesh Fail: False

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
I. Fwd. Octs. : 0 I. Dro. Octs. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0
MCAC Policy Name :
MCAC Max Unconst BW: no limit MCAC Max Mand BW : no limit
MCAC In use Mand BW: 0 MCAC Avail Mand BW: unlimited
MCAC In use Opnl BW: 0 MCAC Avail Opnl BW: unlimited

Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

Stp Service Destination Point specifics

Stp Admin State : Up Stp Oper State : Down
Core Connectivity : Down
Port Role : Disabled Port State : Discarding
Port Number : 2049 Port Priority : 128
Port Path Cost : 10 Auto Edge : Enabled
Admin Edge : Disabled Oper Edge : False
Link Type : Pt-pt BPDU Encap : Dot1d
Root Guard : Disabled Active Protocol : Rstp
Last BPDU from : N/A
Designated Bridge : N/A Designated Port Id : 0

Fwd Transitions : 0 Bad BPDUs rcvd : 0
Cfg BPDUs rcvd : 0 Cfg BPDUs tx : 0
TCN BPDUs rcvd : 0 TCN BPDUs tx : 0
RST BPDUs rcvd : 0 RST BPDUs tx : 0

Sdp Id 2:700 - (10.10.10.104)

Description : GRE-10.10.10.104
SDP Id : 2:700 Type : Mesh
Split Horiz Grp : (Not Specified)
VC Type : Ether VC Tag : n/a
Admin Path MTU : 0 Oper Path MTU : 0

```



```

Far End : 10.10.10.104 Delivery : GRE

Admin State : Up Oper State : Down
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 0 Egress Label : 0
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Ing ipv6 Fltr : n/a Egr ipv6 Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Last Status Change : 02/02/2009 09:27:55 Signaling : TLDP
Last Mgmt Change : 02/02/2009 09:27:57 Force Vlan-Vc : Disabled
Endpoint : N/A Precedence : 4
Class Fwding State : Down
Flags : SdpOperDown
 NoIngVCLabel NoEgrVCLabel
 PathMTUTooSmall

Peer Pw Bits : None
Peer Fault Ip : None
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
I. Fwd. Octs. : 0 I. Dro. Octs. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0
MCAC Policy Name :
MCAC Max Unconst BW: no limit MCAC Max Mand BW : no limit
MCAC In use Mand BW: 0 MCAC Avail Mand BW: unlimited
MCAC In use Opnl BW: 0 MCAC Avail Opnl BW: unlimited

Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

Number of SDPs : 2

Service Access Points

SAP 1/1/9:0

Service Id : 700
SAP : 1/1/9:0 Encap : q-tag
Description : (Not Specified)
Admin State : Up Oper State : Down
Flags : PortOperDown
Multi Svc Site : None
Last Status Change : 02/02/2009 09:27:55
Last Mgmt Change : 02/02/2009 09:27:57
Sub Type : regular
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100
Split Horizon Group: (Not Specified)

Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0
Admin MTU : 1518 Oper MTU : 1518
Ingr IP Fltr-Id : n/a Egr IP Fltr-Id : 10
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a Egr IPv6 Fltr-Id : n/a

```

## Show, Clear, Debug Commands

```

tod-suite : None
Ing Agg Rate Limit : max
Q Frame-Based Acct : Disabled
ARP Reply Agent : Enabled
Mac Learning : Enabled
Mac Aging : Enabled
BPDU Translation : Disabled
L2PT Termination : Disabled
Vlan-translation : None

Acct. Pol : None

Anti Spoofing : Ip

Calling-Station-Id : n/a
Application Profile: None

MCAC Policy Name :
MCAC Max Unconst BW: no limit
MCAC In use Mand BW: 0
MCAC In use Opnl BW: 0
Restr MacProt Src : Enabled
Time to RetryReset : never
Mac Move : Blockable
Egr MCast Grp :
Auth Policy : none

qinq-pbit-marking : both
Egr Agg Rate Limit: max

Host Conn Verify : Enabled
Discard Unkwn Srce: Disabled
Mac Pinning : Disabled

Collect Stats : Disabled

Avl Static Hosts : 1
Tot Static Hosts : 1

MCAC Const Adm St : Enable
MCAC Max Mand BW : no limit
MCAC Avail Mand BW: unlimited
MCAC Avail Opnl BW: unlimited
Restr MacUnpr Dst : Disabled
Retries Left : 3
Blockable Level : Tertiary

Stp Service Access Point specifics

Stp Admin State : Up
Core Connectivity : Down
Port Role : Disabled
Port Number : 2048
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDU from : N/A
CIST Desig Bridge : N/A

Stp Oper State : Down
Port State : Discarding
Port Priority : 128
Auto Edge : Enabled
Oper Edge : False
BPDU Encap : Dot1d
Active Protocol : Rstp
Designated Port : N/A

Forward transitions: 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
MST BPDUs rcvd : 0

Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0
MST BPDUs tx : 0

ARP host

Admin State : outOfService
Host Limit : 1
Min Auth Interval : 15 minutes

QOS

Ingress qos-policy : 100
Shared Q plcy : default
I. Sched Pol : SLA1
E. Sched Pol : SLA1
Egress qos-policy : 1
Multipoint shared : Enabled

Ingress Queue Override

Queue Id : 1 (no overrides)

```

```

Egress Queue Override

Queue Id : 1 (no overrides)

DHCP

Description : (Not Specified)
Admin State : Down
DHCP Snooping : Down
Lease Populate : 0
Action : Keep

Proxy Admin State : Down
Proxy Lease Time : N/A
Emul. Server Addr : Not Configured

Subscriber Management

Admin State : Down
Def Sub-Id : None
Def Sub-Profile : None
Def SLA-Profile : None
Def App-Profile : None
Sub-Ident-Policy : None
MAC DA Hashing : False

Subscriber Limit : 1
Single-Sub-Parameters
 Prof Traffic Only : False
 Non-Sub-Traffic : N/A

Sap Statistics

Last Cleared Time : N/A

Packets Octets
Forwarding Engine Stats
Dropped : 0 0
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0

Queueing Stats(Ingress QoS Policy 100)
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

Packets Octets
Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0

```

## Show, Clear, Debug Commands

```
For. OutProf : 0 0

Ingress Queue 10 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 12 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 13 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
...

VPLS Spanning Tree Information

VPLS oper state : Down Core Connectivity : Down
Stp Admin State : Up Stp Oper State : Down
Mode : Rstp Vcp Active Prot. : N/A

Bridge Id : 10:02.90:30:ff:00:00:00 Bridge Instance Id: 2
Bridge Priority : 4096 Tx Hold Count : 5
Topology Change : Inactive Bridge Hello Time : 5
Last Top. Change : 0d 00:00:00 Bridge Max Age : 25
Top. Change Count : 0 Bridge Fwd Delay : 20
MST region revision : 0 Bridge max hops : 20
MST region name :

Root Bridge : N/A
Primary Bridge : N/A

Root Path Cost : 0 Root Forward Delay: 20
Rcvd Hello Time : 5 Root Max Age : 25
Root Priority : 4098 Root Port : N/A

Forwarding Database specifics

Service Id : 700 Mac Move : Disabled
Primary Factor : 3 Secondary Factor : 2
Mac Move Rate : 2 Mac Move Timeout : 10
Mac Move Retries : 3
Table Size : 250 Total Count : 1
Learned Count : 0 Static Count : 0
OAM-learned Count : 0 DHCP-learned Count : 0
Host-learned Count : 1
Remote Age : 900 Local Age : 300
High Watermark : 95% Low Watermark : 90%
Mac Learning : Enabled Discard Unknown : Disabled
```

Mac Aging : Enabled Relearn Only : False  
 Mac Subnet Len : 48

-----  
 IGMP Snooping Base info  
 -----

Admin State : Up  
 Querier : No querier found  
 -----

| Sap/Sdp<br>Id | Oper<br>State | MRtr<br>Port | Pim<br>Port | Send<br>Queries | Max Num<br>Grps | Max Num<br>Srcs | MVR<br>From-VPLS | Num<br>Grps |
|---------------|---------------|--------------|-------------|-----------------|-----------------|-----------------|------------------|-------------|
| sap:1/1/9:0   | Down          | No           | No          | No              | None            | None            | Local            | 0           |
| sdp:2:222     | Down          | No           | No          | No              | None            | None            | N/A              | 0           |
| sdp:2:700     | Down          | No           | No          | No              | None            | None            | N/A              | 0           |

-----  
 MLD Snooping Base info  
 -----

Admin State : Down  
 Querier : No querier found  
 -----

| Sap/Sdp<br>Id | Oper<br>State | MRtr<br>Port | Send<br>Queries | Max Num<br>Groups | MVR<br>From-VPLS | Num<br>Groups |
|---------------|---------------|--------------|-----------------|-------------------|------------------|---------------|
| sap:1/1/9:0   | Down          | No           | Disabled        | No Limit          | Local            | 0             |
| sdp:2:222     | Down          | No           | Disabled        | No Limit          | N/A              | 0             |
| sdp:2:700     | Down          | No           | Disabled        | No Limit          | N/A              | 0             |

-----  
 DHCP Summary, service 700  
 -----

| Sap/Sdp     | Snoop | Used/<br>Provided | Arp Reply<br>Agent | Info<br>Option | Admin<br>State |
|-------------|-------|-------------------|--------------------|----------------|----------------|
| sap:1/1/9:0 | No    | 0/0               | Yes                | Keep           | Down           |
| sdp:2:222   | No    | N/A               | N/A                | N/A            | N/A            |
| sdp:2:700   | No    | N/A               | N/A                | N/A            | N/A            |

-----  
 Number of Entries : 3  
 -----

-----  
 ARP host Summary, service 700  
 -----

| Sap         | Used | Provided | Admin State  |
|-------------|------|----------|--------------|
| sap:1/1/9:0 | 0    | 1        | outOfService |

-----  
 Number of SAPs : 1  
 -----

-----  
 Service Endpoints  
 -----

No Endpoints found.

=====

\*A:ALA-48#

## Show, Clear, Debug Commands

```
*A:SetupCLI# show service id 2001 all
=====
Service Detailed Information
=====
Service Id : 2001 Vpn Id : 0
Service Type : i-VPLS
Customer Id : 1
Last Status Change: 09/25/2007 21:12:01
Last Mgmt Change : 09/25/2007 21:45:59
Admin State : Up Oper State : Down
MTU : 1514 Def. Mesh VC Id : 2001
SAP Count : 1 SDP Bind Count : 0
Snd Flush on Fail : Disabled Host Conn Verify : Disabled
b-vpls Id : 2002 Oper ISID : 122
Snd Flush in bVpls: Disabled
Snd Flush in bVpls: All-from-me b-vpls-status : Up
 : All-but-mine

Split Horizon Group specifics

Service Destination Points(SDPs)

No Matching Entries

Service Access Points

SAP 1/1/12:2001.2001

Service Id : 2001
SAP : 1/1/12:2001.2001 Encap : qinq
Sub Type : regular
QinQ Dot1p : Default
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100

Admin State : Up Oper State : Down
Flags : PortOperDown
Last Status Change: 09/25/2007 21:12:01
Last Mgmt Change : 09/25/2007 21:45:59
Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0
Admin MTU : 1522 Oper MTU : 1522
Ingress qos-policy : 1 Egress qos-policy : 1
Shared Q plcy : n/a Multipoint shared : Disabled
Ingr IP Fltr-Id : n/a Egr IP Fltr-Id : n/a
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
tod-suite : None qinq-pbit-marking : both
Egr Agg Rate Limit : max
Q Frame-Based Acct : Disabled
Mac Learning : Enabled Discard Unkwn Srce: Disabled
Mac Aging : Enabled Mac Pinning : Disabled
BPDU Translation : Disabled
L2PT Termination : Disabled
Vlan-translation : None

Multi Svc Site : None
Acct. Pol : None Collect Stats : Disabled
Restr MacProt Src : Disabled Restr MacUnpr Dst : Disabled
Mac Move : Non Blockable Mac Move Block Lvl : Tertiary
Egr MCast Grp :

Stp Service Access Point specifics
```

```

Stp Admin State : Up
Core Connectivity : Down
Port Role : N/A
Port Number : 2049
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDU from : N/A
CIST Desig Bridge : N/A

Stp Oper State : Down
Port State : Unknown
Port Priority : 128
Auto Edge : Enabled
Oper Edge : N/A
BPDU Encap : Dot1d
Active Protocol : N/A
Designated Port : N/A

```

```

Forward transitions: 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
MST BPDUs rcvd : 0

Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0
MST BPDUs tx : 0

```

#### SAP MRP Information

```

Rx Pdus : 0
Dropped Pdus : 0
Rx New Event : 0
Rx In Event : 0
Rx Empty Event : 0
Tx New Event : 0
Tx In Event : 0
Tx Empty Event : 0

Tx Pdus : 0
Tx Pdus : 0
Rx Join-In Event : 0
Rx Join Empty Evt : 0
Rx Leave Event : 0
Tx Join-In Event : 0
Tx Join Empty Evt : 0
Tx Leave Event : 0

```

#### SAP MMRP Information

```

MAC Address Registered Declared

```

```

Number of MACs=0 Registered=0 Declared=0

```

#### Sap Statistics

```

Last Cleared Time : N/A
 Packets
Forwarding Engine Stats
Dropped : 0
Off. HiPrio : 0
Off. LowPrio : 0
Off. Uncolor : 0
 Octets

```

#### Queueing Stats(Ingress QoS Policy 1)

```

Dro. HiPrio : 0
Dro. LowPrio : 0
For. InProf : 0
For. OutProf : 0

```

#### Queueing Stats(Egress QoS Policy 1)

```

Dro. InProf : 0
Dro. OutProf : 0
For. InProf : 0
For. OutProf : 0

```

#### Sap per Queue stats

```

 Packets
Ingress Queue 1 (Unicast) (Priority)
 Octets

```

## Show, Clear, Debug Commands

```

Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Ingress Queue 11 (Multipoint) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0

VPLS Spanning Tree Information

VPLS oper state : Down Core Connectivity : Down
Stp Admin State : Down Stp Oper State : Down
Mode : Rstp Vcp Active Prot. : N/A
Bridge Id : 80:00:70:ec:ff:00:00:00 Bridge Instance Id: 0
Bridge Priority : 32768 Tx Hold Count : 6
Topology Change : Inactive Bridge Hello Time : 2
Last Top. Change : 0d 00:00:00 Bridge Max Age : 20
Top. Change Count : 0 Bridge Fwd Delay : 15
MST region revision: 0 Bridge max hops : 20
MST region name :
Root Bridge : N/A
Primary Bridge : N/A
Root Path Cost : 0 Root Forward Delay: 15
Rcvd Hello Time : 2 Root Max Age : 20
Root Priority : 32768 Root Port : N/A

Forwarding Database specifics

Service Id : 2001 Mac Move : Disabled
Primary Factor : 3 Secondary Factor : 2
Mac Move Rate : 2 Mac Move Timeout : 10
Table Size : 250 Total Count : 0
Learned Count : 0 Static Count : 0
OAM-learned Count : 0 DHCP-learned Count: 0
Host-learned Count : 0
Remote Age : 900 Local Age : 300
High WaterMark : 95% Low Watermark : 90%
Mac Learning : Enabl Discard Unknown : Dsabl
Mac Aging : Dsabl Relearn Only : False

IGMP Snooping Base info

Admin State : Down
Querier : No querier found

Sap/Sdp Oper MRtr Pim Send Max Num MVR Num
Id State Port Port Queries Groups From-VPLS Groups

sap:1/1/12:2001.2001 Down No No Disabled No Limit Local 0

```



## DHCP Summary, service 2001

| Sap/Sdp              | Snoop | Used/<br>Provided | Arp Reply<br>Agent | Info<br>Option | Admin<br>State |
|----------------------|-------|-------------------|--------------------|----------------|----------------|
| sap:1/1/12:2001.2001 | No    | 0/0               | No                 | Keep           | Down           |

Number of Entries : 1

## MRP Information

|                |        |                      |     |
|----------------|--------|----------------------|-----|
| Admin State    | : Down | Failed Register Cnt: | 0   |
| Max Attributes | : 2048 | Attribute Count      | : 0 |

\*A:SetupCLI#

\*A:SetupCLI# show service id 2002 all

## Service Detailed Information

|                     |                       |                  |            |
|---------------------|-----------------------|------------------|------------|
| Service Id          | : 2002                | Vpn Id           | : 0        |
| Service Type        | : b-VPLS              |                  |            |
| Customer Id         | : 1                   |                  |            |
| Last Status Change: | 09/25/2007 21:12:01   |                  |            |
| Last Mgmt Change    | : 09/25/2007 21:45:59 |                  |            |
| Admin State         | : Up                  | Oper State       | : Down     |
| MTU                 | : 1530                | Def. Mesh VC Id  | : 2002     |
| SAP Count           | : 2                   | SDP Bind Count   | : 2        |
| Snd Flush on Fail   | : Disabled            | Host Conn Verify | : Disabled |
| Oper Backbone Src   | : 00:f7:f7:f7:f7:f7   |                  |            |

## Related iVpls services for bVpls service 2002

| iVpls SvcId | Oper ISID | Admin | Oper |
|-------------|-----------|-------|------|
| 2001        | 122       | Up    | Down |

Number of Entries : 1

## Split Horizon Group specifics

## Service Destination Points (SDPs)

Sdp Id 2000:2001 - (101.101.101.101)

|                    |                                |                  |            |
|--------------------|--------------------------------|------------------|------------|
| SDP Id             | : 2000:2001                    | Type             | : Spoke    |
| VC Type            | : Ether                        | VC Tag           | : n/a      |
| Admin Path MTU     | : 1500                         | Oper Path MTU    | : 1500     |
| Far End            | : 101.101.101.101              | Delivery         | : MPLS     |
| Admin State        | : Down                         | Oper State       | : Down     |
| Acct. Pol          | : None                         | Collect Stats    | : Disabled |
| Ingress Label      | : 0                            | Egress Label     | : 0        |
| Ing mac Fltr       | : n/a                          | Egr mac Fltr     | : n/a      |
| Admin ControlWord  | : Not Preferred                | Oper ControlWord | : False    |
| Last Status Change | : 09/25/2007 21:12:01          | Signaling        | : TLDP     |
| Last Mgmt Change   | : 09/25/2007 21:45:59          | Force Vlan-Vc    | : Disabled |
| Endpoint           | : N/A                          | Precedence       | : 4        |
| Class Fwding State | : Down                         |                  |            |
| Flags              | : SdpOperDown SdpBindAdminDown |                  |            |

## Show, Clear, Debug Commands

```

NoIngVCLabel NoEgrVCLabel
PathMTUTooSmall
Peer Pw Bits : None
Peer Fault Ip : None
Max Nbr of MAC Addr: No Limit
Learned MAC Addr : 0
Total MAC Addr : 0
Static MAC Addr : 0

MAC Learning : Enabled
BPDU Translation : Disabled
L2PT Termination : Disabled
Ignore Standby Sig : False

Discard Unkwn Srce: Disabled

KeepAlive Information :
Admin State : Enabled
Hello Time : 600
Max Drop Count : 3
Oper State : No response
Hello Msg Len : 1500
Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0
E. Fwd. Pkts. : 0
I. Dro. Pkts. : 0
E. Fwd. Octets : 0

Associated LSP LIST :
No LSPs Associate
Class-based forwarding :

Class forwarding : disabled
Default LSP : Uknwn
Multicast LSP : None
=====
FC Mapping Table
=====
FC Name LSP Name

No FC Mappings

Stp Service Destination Point specifics

Mac Move : Blockable
Stp Admin State : Up
Core Connectivity : Down
Port Role : N/A
Port Number : 2050
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDU from : N/A
Designated Bridge : N/A
Blockable Level : Tertiary
Stp Oper State : Down
Port State : Discarding
Port Priority : 128
Auto Edge : Enabled
Oper Edge : N/A
BPDU Encap : Dot1d
Active Protocol : N/A
Designated Port Id : 0

Fwd Transitions : 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0

Sdp Id 2000:2001 MRP Information

Rx Pdus : 0
Dropped Pdus : 0
Rx New Event : 0
Rx In Event : 0
Rx Empty Event : 0
Tx New Event : 0
Tx Pdus : 0
Rx Join-In Event : 0
Rx Join Empty Evt : 0
Rx Leave Event : 0
Tx Join-In Event : 0

```

```

Tx In Event : 0
Tx Empty Event : 0
Tx Join Empty Evt : 0
Tx Leave Event : 0

SDP MMRP Information

MAC Address Registered Declared

Number of MACs=0 Registered=0 Declared=0

Sdp Id 2000:2002 - (101.101.101.101)

SDP Id : 2000:2002 Type : Mesh
VC Type : Ether VC Tag : n/a
Admin Path MTU : 1500 Oper Path MTU : 1500
Far End : 101.101.101.101 Delivery : MPLS

Admin State : Down Oper State : Down
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 2050 Egress Label : 2050
Ing mac Fltr : n/a Egr mac Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Last Status Change : 09/25/2007 21:12:01 Signaling : TLDP
Last Mgmt Change : 09/25/2007 21:45:58 Force Vlan-Vc : Disabled
Endpoint : N/A Precedence : 4
Class Fwding State : Down
Flags : SdpOperDown SdpBindAdminDown
 PathMTUTooSmall
Peer Pw Bits : None
Peer Fault Ip : None
Ignore Standby Sig : False

KeepAlive Information :
Admin State : Enabled Oper State : No response
Hello Time : 600 Hello Msg Len : 1500
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0

Associated LSP LIST :
No LSPs Associated
Class-based forwarding :

Class forwarding : disabled
Default LSP : Uknwn Multicast LSP : None
=====
FC Mapping Table
=====
FC Name LSP Name

No FC Mappings

Sdp Id 2000:2002 MRP Information

Rx Pdus : 0 Tx Pdus : 0
Dropped Pdus : 0
Rx New Event : 0 Rx Join-In Event : 0
Rx In Event : 0 Rx Join Empty Evt : 0
Rx Empty Event : 0 Rx Leave Event : 0
Tx New Event : 0 Tx Join-In Event : 0

```

## Show, Clear, Debug Commands

```

Tx In Event : 0
Tx Empty Event : 0
Tx Join Empty Evt : 0
Tx Leave Event : 0

SDP MMRP Information

MAC Address Registered Declared

Number of MACs=0 Registered=0 Declared=0

Number of SDPs : 2

Service Access Points

SAP 1/1/12:2002.2002

Service Id : 2002
SAP : 1/1/12:2002.2002 Encap : qinq
Sub Type : regular
QinQ Dot1p : Default
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100
PBB Ethertype : 0x88e7

Admin State : Down Oper State : Down
Flags : SapAdminDown
 PortOperDown PortMTUTooSmall
Last Status Change : 09/25/2007 21:12:01
Last Mgmt Change : 09/25/2007 21:45:58
Max Nbr of MAC Addr: No Limit
Learned MAC Addr : 0
Admin MTU : 1522
Ingress qos-policy : 1
Shared Q plcy : n/a
Ingr Mac Fltr-Id : n/a
tod-suite : None
Egr Agg Rate Limit : max
Q Frame-Based Acct : Disabled
Mac Learning : Enabled
Mac Aging : Enabled
BPDU Translation : Disabled
L2PT Termination : Disabled
Vlan-translation : None

Multi Svc Site : None
Acct. Pol : None
Restr MacProt Src : Disabled
Mac Move : Blockable
Egr MCast Grp :

Total MAC Addr : 0
Static MAC Addr : 0
Oper MTU : 1522
Egress qos-policy : 1
Multipoint shared : Disabled
Egr Mac Fltr-Id : n/a
qinq-pbit-marking : both

Discard Unkwn Srce: Disabled
Mac Pinning : Disabled

Collect Stats : Disabled
Restr MacUnpr Dst : Disabled
Mac Move Block Lvl: Tertiary

Stp Service Access Point specifics

Stp Admin State : Up
Core Connectivity : Down
Port Role : N/A
Port Number : 2049
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDU from : N/A
CIST Desig Bridge : N/A

Stp Oper State : Down
Port State : Unknown
Port Priority : 128
Auto Edge : Enabled
Oper Edge : N/A
BPDU Encap : Dot1d
Active Protocol : N/A
Designated Port : N/A

```

|                      |     |                |     |
|----------------------|-----|----------------|-----|
| Forward transitions: | 0   | Bad BPDUs rcvd | : 0 |
| Cfg BPDUs rcvd       | : 0 | Cfg BPDUs tx   | : 0 |
| TCN BPDUs rcvd       | : 0 | TCN BPDUs tx   | : 0 |
| RST BPDUs rcvd       | : 0 | RST BPDUs tx   | : 0 |
| MST BPDUs rcvd       | : 0 | MST BPDUs tx   | : 0 |

---

SAP MRP Information

---

|                |     |                   |     |
|----------------|-----|-------------------|-----|
| Rx Pdus        | : 0 | Tx Pdus           | : 0 |
| Dropped Pdus   | : 0 | Tx Pdus           | : 0 |
| Rx New Event   | : 0 | Rx Join-In Event  | : 0 |
| Rx In Event    | : 0 | Rx Join Empty Evt | : 0 |
| Rx Empty Event | : 0 | Rx Leave Event    | : 0 |
| Tx New Event   | : 0 | Tx Join-In Event  | : 0 |
| Tx In Event    | : 0 | Tx Join Empty Evt | : 0 |
| Tx Empty Event | : 0 | Tx Leave Event    | : 0 |

---

SAP MMRP Information

---

| MAC Address | Registered | Declared |
|-------------|------------|----------|
|-------------|------------|----------|

---

Number of MACs=0 Registered=0 Declared=0

---



---

Sap Statistics

---



---

Last Cleared Time : N/A

---

|                         | Packets | Octets |
|-------------------------|---------|--------|
| Forwarding Engine Stats |         |        |
| Dropped                 | : 0     | 0      |
| Off. HiPrio             | : 0     | 0      |
| Off. LowPrio            | : 0     | 0      |
| Off. Uncolor            | : 0     | 0      |

## Queueing Stats(Ingress QoS Policy 1)

|              |     |   |
|--------------|-----|---|
| Dro. HiPrio  | : 0 | 0 |
| Dro. LowPrio | : 0 | 0 |
| For. InProf  | : 0 | 0 |
| For. OutProf | : 0 | 0 |

## Queueing Stats(Egress QoS Policy 1)

|              |     |   |
|--------------|-----|---|
| Dro. InProf  | : 0 | 0 |
| Dro. OutProf | : 0 | 0 |
| For. InProf  | : 0 | 0 |
| For. OutProf | : 0 | 0 |

---

Sap per Queue stats

---

|                                          | Packets | Octets |
|------------------------------------------|---------|--------|
| Ingress Queue 1 (Unicast) (Priority)     |         |        |
| Off. HiPrio                              | : 0     | 0      |
| Off. LoPrio                              | : 0     | 0      |
| Dro. HiPrio                              | : 0     | 0      |
| Dro. LoPrio                              | : 0     | 0      |
| For. InProf                              | : 0     | 0      |
| For. OutProf                             | : 0     | 0      |
| Ingress Queue 11 (Multipoint) (Priority) |         |        |
| Off. HiPrio                              | : 0     | 0      |
| Off. LoPrio                              | : 0     | 0      |

## Show, Clear, Debug Commands

```

Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0

SAP 1/1/30:2002

Service Id : 2002
SAP : 1/1/30:2002 Encap : q-tag
Sub Type : regular
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100
PBB Ethertype : 0x88e7

Admin State : Down Oper State : Down
Flags : SapAdminDown
 PortOperDown PortMTUTooSmall
Last Status Change : 09/25/2007 21:12:01
Last Mgmt Change : 09/25/2007 21:45:58
Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0
Admin MTU : 1518 Oper MTU : 1518
Ingress qos-policy : 1 Egress qos-policy : 1
Shared Q plcy : n/a Multipoint shared : Disabled
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
tod-suite : None qinq-pbit-marking : both
Egr Agg Rate Limit : max
Q Frame-Based Acct : Disabled
Mac Learning : Enabled Discard Unkwn Srce: Disabled
Mac Aging : Enabled Mac Pinning : Disabled
BPDU Translation : Disabled
L2PT Termination : Disabled
Vlan-translation : None

Multi Svc Site : None
Acct. Pol : None Collect Stats : Disabled
Restr MacProt Src : Disabled Restr MacUnpr Dst : Disabled
Mac Move : Blockable Mac Move Block Lvl: Tertiary
Egr MCast Grp :

Stp Service Access Point specifics

Stp Admin State : Up Stp Oper State : Down
Core Connectivity : Down
Port Role : N/A
Port Number : 2048 Port State : Unknown
Port Path Cost : 10 Port Priority : 128
Admin Edge : Disabled Auto Edge : Enabled
Link Type : Pt-pt Oper Edge : N/A
Root Guard : Disabled BPDU Encap : Dot1d
Last BPDU from : N/A Active Protocol : N/A
CIST Desig Bridge : N/A Designated Port : N/A

Forward transitions: 0 Bad BPDUs rcvd : 0
Cfg BPDUs rcvd : 0 Cfg BPDUs tx : 0

```

|                |     |              |     |
|----------------|-----|--------------|-----|
| TCN BPDUs rcvd | : 0 | TCN BPDUs tx | : 0 |
| RST BPDUs rcvd | : 0 | RST BPDUs tx | : 0 |
| MST BPDUs rcvd | : 0 | MST BPDUs tx | : 0 |

-----  
SAP MRP Information

|                |     |                   |     |
|----------------|-----|-------------------|-----|
| Rx Pdus        | : 0 | Tx Pdus           | : 0 |
| Dropped Pdus   | : 0 | Tx Pdus           | : 0 |
| Rx New Event   | : 0 | Rx Join-In Event  | : 0 |
| Rx In Event    | : 0 | Rx Join Empty Evt | : 0 |
| Rx Empty Event | : 0 | Rx Leave Event    | : 0 |
| Tx New Event   | : 0 | Tx Join-In Event  | : 0 |
| Tx In Event    | : 0 | Tx Join Empty Evt | : 0 |
| Tx Empty Event | : 0 | Tx Leave Event    | : 0 |

-----  
SAP MMRP Information

| MAC Address | Registered | Declared |
|-------------|------------|----------|
|-------------|------------|----------|

-----  
Number of MACs=0 Registered=0 Declared=0-----  
Sap Statistics

|                         |         |        |
|-------------------------|---------|--------|
| Last Cleared Time       | : N/A   |        |
|                         | Packets | Octets |
| Forwarding Engine Stats |         |        |
| Dropped                 | : 0     | 0      |
| Off. HiPrio             | : 0     | 0      |
| Off. LowPrio            | : 0     | 0      |
| Off. Uncolor            | : 0     | 0      |

## Queueing Stats(Ingress QoS Policy 1)

|              |     |   |
|--------------|-----|---|
| Dro. HiPrio  | : 0 | 0 |
| Dro. LowPrio | : 0 | 0 |
| For. InProf  | : 0 | 0 |
| For. OutProf | : 0 | 0 |

## Queueing Stats(Egress QoS Policy 1)

|              |     |   |
|--------------|-----|---|
| Dro. InProf  | : 0 | 0 |
| Dro. OutProf | : 0 | 0 |
| For. InProf  | : 0 | 0 |
| For. OutProf | : 0 | 0 |

-----  
Sap per Queue stats

|                                      |         |        |
|--------------------------------------|---------|--------|
|                                      | Packets | Octets |
| Ingress Queue 1 (Unicast) (Priority) |         |        |
| Off. HiPrio                          | : 0     | 0      |
| Off. LoPrio                          | : 0     | 0      |
| Dro. HiPrio                          | : 0     | 0      |
| Dro. LoPrio                          | : 0     | 0      |
| For. InProf                          | : 0     | 0      |
| For. OutProf                         | : 0     | 0      |

## Ingress Queue 11 (Multipoint) (Priority)

|              |     |   |
|--------------|-----|---|
| Off. HiPrio  | : 0 | 0 |
| Off. LoPrio  | : 0 | 0 |
| Dro. HiPrio  | : 0 | 0 |
| Dro. LoPrio  | : 0 | 0 |
| For. InProf  | : 0 | 0 |
| For. OutProf | : 0 | 0 |

## Show, Clear, Debug Commands

```

Egress Queue 1
For. InProf : 0
For. OutProf : 0
Dro. InProf : 0
Dro. OutProf : 0

VPLS Spanning Tree Information

VPLS oper state : Down
Stp Admin State : Down
Mode : Rstp
Core Connectivity : Down
Stp Oper State : Down
Vcp Active Prot. : N/A

Bridge Id : 80:00:70:ec:ff:00:00:00
Bridge Priority : 32768
Topology Change : Inactive
Last Top. Change : 0d 00:00:00
Top. Change Count : 0
MST region revision: 0
MST region name :

Bridge Instance Id: 0
Tx Hold Count : 6
Bridge Hello Time : 2
Bridge Max Age : 20
Bridge Fwd Delay : 15
Bridge max hops : 20

Root Bridge : N/A
Primary Bridge : N/A

Root Path Cost : 0
Rcvd Hello Time : 2
Root Priority : 32768
Root Forward Delay: 15
Root Max Age : 20
Root Port : N/A

Forwarding Database specifics

Service Id : 2002
Primary Factor : 3
Mac Move Rate : 2
Table Size : 250
Learned Count : 0
OAM-learned Count : 0
Host-learned Count: 0
Remote Age : 900
High WaterMark : 95%
Mac Learning : Enabl
Mac Aging : Dsabl
Mac Move : Disabled
Secondary Factor : 2
Mac Move Timeout : 10
Total Count : 0
Static Count : 0
DHCP-learned Count: 0
Local Age : 300
Low Watermark : 90%
Discard Unknown : Dsabl
Relearn Only : False

IGMP Snooping Base info

Admin State : Down
Querier : No querier found

Sap/Sdp Oper MRtr Pim Send Max Num MVR Num
Id State Port Port Queries Groups From-VPLS Groups

sap:1/1/12:2002.2002 Down No No Disabled No Limit Local 0
sap:1/1/30:2002 Down No No Disabled No Limit Local 0
sdp:2000:2001 Down No No Disabled No Limit N/A 0
sdp:2000:2002 Down No No Disabled No Limit N/A 0

DHCP Summary, service 2002

Sap/Sdp Snoop Used/ Arp Reply Info Admin
 State Provided Agent Option State

sap:1/1/12:2002.2002 No 0/0 No Keep Down

```



```
sap:1/1/30:2002 No 0/0 No Keep Down
sdp:2000:2001 No N/A N/A N/A N/A
sdp:2000:2002 No N/A N/A N/A N/A
```

```

Number of Entries : 4

```

#### MRP Information

```

Admin State : Up Failed Register Cnt: 0
Max Attributes : 2048 Attribute Count : 2

```

```
*A:SetupCLI#
```

```
*A:alcag1-R6# show service id 5000 all | match post-lines 15 eth-cfm
eth-cfm Configuration Information
```

```

Md-index : 1 Direction : Up
Ma-index : 1 Admin : Enabled
MepId : 51 CCM-Enable : Enabled
LowestDefectPri : allDef HighestDefect : none
Defect Flags : None
Mac Address : 00:ae:ae:ae:ae:ae
CcmTx : 11548 CcmSequenceErr : 2
LbRxReply : 1 LbRxBadOrder : 0
LbRxBadMsdu : 0 LbTxReply : 2
LbNextSequence : 3 LtNextSequence : 3
LtRxUnexplained : 0

```

```
*A:alcmtul-R6#
```

```
*A:alcmtul-R6# show service id 5000 all | match post-lines 15 eth-cfm
eth-cfm Configuration Information
```

```

Md-index : 1 Direction : Up
Ma-index : 1 Admin : Enabled
MepId : 56 CCM-Enable : Enabled
LowestDefectPri : allDef HighestDefect : defMACstatus
Defect Flags : bDefMACstatus
Mac Address : 00:af:af:af:af:af
CcmTx : 815 CcmSequenceErr : 0
LbRxReply : 0 LbRxBadOrder : 0
LbRxBadMsdu : 0 LbTxReply : 0
LbNextSequence : 3 LtNextSequence : 1
LtRxUnexplained : 0

```

```
*A:alcmtul-R6#
```

## authentication

|                    |                                                                              |
|--------------------|------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication</b>                                                        |
| <b>Context</b>     | show>service>id                                                              |
| <b>Description</b> | This command enables the context to show session authentication information. |

## arp-host

|                    |                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-host</b> [wholesaler service-id] [sap sap-id   interface interface-name   ip-address ip-address[/mask]   mac ieee-address   {[port port-id] [no-inter-dest-id   inter-dest-id inter-dest-id]]} [detail]<br><b>arp-host statistics</b> [sap sap-id   interface interface-name]<br><b>arp-host summary</b> [interface interface-name] |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command displays ARP host related information.                                                                                                                                                                                                                                                                                        |

## Sample Output

```
*A:Dut-C# show service id 2 arp-host
=====
ARP host table, service 2
=====
IP Address Mac Address Sap Id Remaining MC
 Time Stdbby

128.128.1.2 00:80:00:00:00:01 2/1/5:2 00h04m41s
128.128.1.3 00:80:00:00:00:02 2/1/5:2 00h04m42s
128.128.1.4 00:80:00:00:00:03 2/1/5:2 00h04m43s
128.128.1.5 00:80:00:00:00:04 2/1/5:2 00h04m44s
128.128.1.6 00:80:00:00:00:05 2/1/5:2 00h04m45s
128.128.1.7 00:80:00:00:00:06 2/1/5:2 00h04m46s
128.128.1.8 00:80:00:00:00:07 2/1/5:2 00h04m47s
128.128.1.9 00:80:00:00:00:08 2/1/5:2 00h04m48s
128.128.1.10 00:80:00:00:00:09 2/1/5:2 00h04m49s
128.128.1.11 00:80:00:00:00:0a 2/1/5:2 00h04m50s

Number of ARP hosts : 10
=====
*A:Dut-C#

*A:Dut-C# show service id 2 arp-host ip-address 128.128.1.2 detail
=====
ARP hosts for service 2
=====
Service ID : 2
IP Address : 128.128.1.2
MAC Address : 00:80:00:00:00:01
SAP : 2/1/5:2
Remaining Time : 00h04m58s

Sub-Ident : "alu_1_2"
Sub-Profile-String : ""
SLA-Profile-String : ""
App-Profile-String : ""
ARP host ANCP-String : ""
ARP host Int Dest Id : ""
RADIUS-User-Name : "128.128.1.2"

Session Timeout (s) : 301
Start Time : 02/09/2009 16:35:07
Last Auth : 02/09/2009 16:36:34
```

```
Last Refresh : 02/09/2009 16:36:38
Persistence Key : N/A
```

```

Number of ARP hosts : 1
=====
```

```
*A:Dut-C#
```

```
*A:Dut-C# show service id 2 arp-host statistics
```

```
=====
ARP host statistics
=====
```

```
Num Active Hosts : 20
Received Triggers : 70
Ignored Triggers : 10
Ignored Triggers (overload) : 0
SHCV Checks Forced : 0
Hosts Created : 20
Hosts Updated : 40
Hosts Deleted : 0
Authentication Requests Sent : 40
=====
```

```
*A:Dut-C#
```

```
*A:Dut-C# show service id 2 arp-host summary
```

```
=====
ARP host Summary, service 2
=====
```

| Sap         | Used | Provided | Admin State |
|-------------|------|----------|-------------|
| sap:2/1/5:2 | 20   | 8000     | inService   |

```

Number of SAPs : 1
=====
```

```
*A:Dut-C#
```

## base

**Syntax** **base [msap]**

Context **show>service>id**  
**show>service>id>igmp-snooping**

**Description** This command displays basic information about the service ID including service type, description, SAPs and SDPs.

**Parameters** **msap** — Displays management SAPs.

**Output** **Show Service-ID Base** — The following table describes show service-id base output fields:

| Label            | Description                                                                                                                                                                 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id       | The service identifier.                                                                                                                                                     |
| Vpn Id           | Specifies the VPN ID assigned to the service.                                                                                                                               |
| Service Type     | Displays the type of service.                                                                                                                                               |
| Description      | Generic information about the service.                                                                                                                                      |
| Customer Id      | The customer identifier.                                                                                                                                                    |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this customer.                                                                                          |
| Adm              | The administrative state of the service.                                                                                                                                    |
| Oper             | The operational state of the service.                                                                                                                                       |
| Mtu              | The largest frame size (in octets) that the service can handle.                                                                                                             |
| Def. Mesh VC Id  | This object is only valid in services that accept mesh SDP bindings. It is used to validate the VC ID portion of each mesh SDP binding defined in the service.              |
| SAP Count        | The number of SAPs defined on the service.                                                                                                                                  |
| SDP Bind Count   | The number of SDPs bound to the service.                                                                                                                                    |
| Identifier       | Specifies the service access (SAP) and destination (SDP) points.                                                                                                            |
| Type             | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                           |
| AdmMTU           | Specifies the largest service frame size (in octets) that can be transmitted through this SDP to the far-end ESR, without requiring the packet to be fragmented.            |
| OprMTU           | Specifies the actual largest service frame size (in octets) that can be transmitted through this service to the far-end ESR, without requiring the packet to be fragmented. |

| Label | Description (Continued)        |
|-------|--------------------------------|
| Opr   | The operating state of the SAP |

### Sample Output

```
A:Sr-4# show service id 300 sap 1/1/1:300.* detail
=====
Service Access Points(SAP)
=====
Service Id : 300
SAP : 1/1/1:300.* Encap : qinq
QinQ Dot1p : Default
Admin State : Up Oper State : Up
Flags : None
Multi Svc Site : None
Last Status Change : 11/19/2007 20:42:34
Last Mgmt Change : 11/19/2007 20:42:25
Sub Type : regular
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100

Admin MTU : 1522 Oper MTU : 1522
Ingr IP Fltr-Id : n/a Egr IP Fltr-Id : n/a
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a Egr IPv6 Fltr-Id : n/a
tod-suite : None qinq-pbit-marking : both
Egr Agg Rate Limit : max Endpoint : N/A
Q Frame-Based Acct : Disabled
Vlan-translation : None

Acct. Pol : None Collect Stats : Disabled
Ingress qos-policy : 1 Egress qos-policy : 1
Shared Q plcy : n/a Multipoint shared : Disabled

Sap Statistics

Last Cleared Time : 11/19/2007 21:23:45

Packets Octets
Forwarding Engine Stats
Dropped : 0 0
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0

Queueing Stats(Ingress QoS Policy 1)
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

```

```

 Packets Octets
Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0
=====
*A:Sr-4#
*A:SetupCLI# show service id 2001 base
=====
Service Basic Information
=====
Service Id : 2001 Vpn Id : 0
Service Type : i-VPLS
Customer Id : 1
Last Status Change: 09/25/2007 21:12:01
Last Mgmt Change : 09/25/2007 21:45:59
Admin State : Up Oper State : Down
MTU : 1514 Def. Mesh VC Id : 2001
SAP Count : 1 SDP Bind Count : 0
Snd Flush on Fail : Disabled Host Conn Verify : Disabled
b-vpls Id : 2002 Oper ISID : 122
Snd Flush in bVpls: Disabled

Service Access & Destination Points

Identifier Type AdmMTU OprMTU Adm Opr

sap:1/1/12:2001.2001 qinq 1522 1522 Up Down

[<sap-id>] indicates a Managed SAP
=====
*A:SetupCLI#

*A:SetupCLI# show service id 2002 base
=====
Service Basic Information
=====
Service Id : 2002 Vpn Id : 0
Service Type : b-VPLS
Customer Id : 1
Last Status Change: 09/25/2007 21:12:01
Last Mgmt Change : 09/25/2007 21:45:59
Admin State : Up Oper State : Down
MTU : 1530 Def. Mesh VC Id : 2002
SAP Count : 2 SDP Bind Count : 2
Snd Flush on Fail : Disabled Host Conn Verify : Disabled
Oper Backbone Src : 00:f7:f7:f7:f7:f7

Related iVpls services for bVpls service 2002

iVpls SvcId Oper ISID Admin Oper

```

```

2001 122 Up Down

Number of Entries : 1

Service Access & Destination Points

Identifier Type AdmMTU OprMTU Adm Opr

sap:1/1/12:2002.2002 qinq 1522 1522 Down Down
sap:1/1/30:2002 q-tag 1518 1518 Down Down
sdp:2000:2001 S(101.101.101) n/a 1500 1500 Down Down
sdp:2000:2002 M(101.101.101) n/a 1500 1500 Down Down

[<sap-id>] indicates a Managed SAP
=====

```

A:ALA-48>config>service>vpls# show service id 700 base

```

=====
Service Basic Information
=====
Service Id : 700 Vpn Id : 0
Service Type : VPLS
Description : IMA VPLS
Customer Id : 7
Last Status Change: 11/21/2008 17:33:20
Last Mgmt Change : 11/21/2008 17:33:34
Admin State : Up Oper State : Down
MTU : 1514 Def. Mesh VC Id : 700
SAP Count : 1 SDP Bind Count : 2
Snd Flush on Fail : Disabled Host Conn Verify : Disabled
Propagate MacFlush: Disabled
Def. Gateway IP : None
Def. Gateway MAC : None

BGP Auto-discovery Information

Admin State : Down Vpls Id : None
Route Dist : None Prefix : 10.10.10.103
Rte-Target Import : None Rte-Target Export : None
Vsi-Import : None
Vsi-Export : None
PW-Template Id : None

Service Access & Destination Points

Identifier Type AdmMTU OprMTU Adm Opr

sap:1/1/9:0 q-tag 1518 1518 Up Down
sdp:2:222 S(10.10.10.104) n/a 0 0 Up Down
sdp:2:700 M(10.10.10.104) n/a 0 0 Up Down
=====
A:ALA-48>config>service>vpls#

```

epipe

|             |                                                                                                                                                                                                                                                                                           |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | epipe                                                                                                                                                                                                                                                                                     |
| Context     | show>service>id                                                                                                                                                                                                                                                                           |
| Description | This command displays Epipe services associated with the B-VPLS service. The command only applies when the service is a B-VPLS.                                                                                                                                                           |
| Output      | <pre>*A:term17&gt;show&gt;service&gt;id# epipe ===== Related Epipe services for bVpls service 2000 ===== Epipe SvcId      Oper ISID      Admin      Oper ----- 100              100           Down       Down ----- Number of Entries : 1 ----- *A:term17&gt;show&gt;service&gt;id#</pre> |



## fdb

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fdb</b> [ <b>sap</b> <i>sap-id</i> [ <b>expiry</b> ]]   [ <b>sdp</b> <i>sdp-id</i> [ <b>expiry</b> ]]   [ <b>mac</b> <i>ieee-address</i> [ <b>expiry</b> ]]   <b>endpoint</b> <i>endpoint</i>   [ <b>detail</b> ] [ <b>expiry</b> ] [ <b>pbb</b> ]                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | show>service>id<br>show>service>fdb-mac                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command displays FDB entries for a given MAC address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><b>sap</b> <i>sap-id</i> — Specifies the physical port identifier portion of the SAP. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>detail</b> — Displays detailed information.</p> <p><b>expiry</b> — Displays time until MAC is aged out.</p> <p><b>pbb</b> — Displays PBB related information. This keyword is only applicable to b-vpls or i-vpls services.</p> <p><i>endpoint-name</i> — Specifies an endpoint name up to 32 characters in length.</p> <p><b>Show FDB Information</b> — The following table describes service FDB output fields.</p> |

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ServID           | Displays the service ID.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| MAC              | Displays the associated MAC address.                                                                                                                                                                                                                                                                                                                                                                                                                |
| Mac Move         | Displays the administrative state of the MAC movement feature associated with this service.                                                                                                                                                                                                                                                                                                                                                         |
| Primary Factor   | Displays a factor for the primary ports defining how many MAC-relearn periods should be used to measure the MAC-relearn rate.                                                                                                                                                                                                                                                                                                                       |
| Secondary Factor | Displays a factor for the secondary ports defining how many MAC-relearn periods should be used to measure the MAC-relearn rate.                                                                                                                                                                                                                                                                                                                     |
| Mac Move Rate    | <p>Displays the maximum rate at which MAC's can be re-learned in this service, before the SAP where the moving MAC was last seen is automatically disabled in order to protect the system against undetected loops or duplicate MAC's.</p> <p>The rate is computed as the maximum number of re-learns allowed in a 5 second interval: for example, the default rate of 2 re-learns per second corresponds to 10 re-learns in a 5 second period.</p> |

| Label              | Description                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mac Move Timeout   | Displays the time in seconds to wait before a SAP that has been disabled after exceeding the maximum re-learn rate is re-enabled.<br>A value of zero indicates that the SAP will not be automatically re-enabled after being disabled. If after the SAP is re-enabled it is disabled again, the effective retry timeout is doubled in order to avoid thrashing. |
| Mac Move Retries   | Displays the number of times retries are performed for reenabling the SAP/SDP.                                                                                                                                                                                                                                                                                  |
| Table Size         | Specifies the maximum number of learned and static entries allowed in the FDB of this service.<br>The maximum value is 511999 when the the value of the chassis mode is <b>d</b> .<br>The maximum value is 196607 when the chassis mode is <b>c</b> .<br>In other cases, the maximum value is 131071.                                                           |
| Total Count        | Displays the total number of learned entries in the FDB of this service.                                                                                                                                                                                                                                                                                        |
| Learned Count      | Displays the current number of learned entries in the FDB of this service.                                                                                                                                                                                                                                                                                      |
| Static Count       | Displays the current number of static entries in the FDB of this service.                                                                                                                                                                                                                                                                                       |
| OAM-learned Count  | Displays the current number of OAM entries in the FDB of this service.                                                                                                                                                                                                                                                                                          |
| DHCP-learned Count | Displays the current number of DHCP-learned entries in the FDB of this service.                                                                                                                                                                                                                                                                                 |
| Host-learned Count | Displays the current number of host-learned entries in the FDB of this service.                                                                                                                                                                                                                                                                                 |
| Remote Age         | Displays the number of seconds used to age out FDB entries learned on an SDP. These entries correspond to MAC addresses learned on remote SAPs.                                                                                                                                                                                                                 |
| Local Age          | Displays the number of seconds used to age out FDB entries learned on local SAPs.                                                                                                                                                                                                                                                                               |
| High Watermark     | Displays the utilization of the FDB table of this service at which a table full alarm will be raised by the agent.                                                                                                                                                                                                                                              |
| Low Watermark      | Displays the utilization of the FDB table of this service at which a table full alarm will be cleared by the agent.                                                                                                                                                                                                                                             |
| Mac Learning       | Specifies whether the MAC learning process is enabled                                                                                                                                                                                                                                                                                                           |
| Discard Unknown    | Specifies whether frames received with an unknown destination MAC are discarded.                                                                                                                                                                                                                                                                                |
| Mac Aging          | Indicates whether the MAC aging process is enabled.                                                                                                                                                                                                                                                                                                             |

| Label             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relearn Only      | Displays, that when enabled, either the FDB table of this service is full, or that the maximum system-wide number of MA's supported by the agent has been reached, and thus MAC learning is temporary disabled, and only MAC re-learns can take place.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Mac Subnet Len    | Displays the number of bits to be considered when performing MAC-learning or MAC-switching.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Source-Identifier | The location where the MAC is defined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Type/Age          | <p>Type — Specifies the number of seconds used to age out TLS FDB entries learned on local SAPs.</p> <p>Age — Specifies the number of seconds used to age out TLS FDB entries learned on an SDP. These entries correspond to MAC addresses learned on remote SAPs.</p> <p>L — Learned - Dynamic entries created by the learning process.</p> <p>OAM — Entries created by the OAM process.</p> <p>H — Host, the entry added by the system for a static configured subscriber host.</p> <p>D or DHCP — DHCP-installed MAC. Learned addresses can be temporarily frozen by the DHCP snooping application for the duration of a DHCP lease.</p> <p>P — Indicates the MAC is protected" by the MAC protection feature.</p> <p>Static — Statically configured.</p> |
| Last Change       | Indicates the time of the most recent state changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### Sample Output

```

A:ALA-48>show>service>id# fdb mac
=====
Service Forwarding Database
=====
ServId MAC Source-Identifier Type/Age Last Change

6 00:aa:00:00:00:00 sap:lag-2 L/0 06/27/2006 15:04:31
6 00:aa:00:00:00:01 sap:lag-2 L/0 06/27/2006 15:04:31
6 00:aa:00:00:00:02 sap:lag-2 L/0 06/27/2006 15:04:31
6 00:aa:00:00:00:03 sap:lag-2 L/0 06/27/2006 15:04:31
6 00:aa:00:00:00:04 sap:lag-2 L/0 06/27/2006 15:04:31
10 12:12:12:12:12:12 sap:1/1/1:100 S 06/26/2006 10:03:29
=====
A:ALA-48>show>service>id#

```

## Show, Clear, Debug Commands

```
A:ALA-48# show service id 700 fdb [mac-protect]
=====
Forwarding Database, Service <service-id>
=====
ServId MAC Source-Identifier Type/Age Last Change

1 aa:aa:aa:aa:aa:aa sdp:100:1 P 11/02/2006 06:04:03

No. of MAC Entries: 1
=====
A:ALA-48#

A:term17>config>service# show service id 2000 fdb pbb
(BVPLS = 2000, IVPLS = 2100)
=====
Forwarding Database, bVpls Service 2000
=====
MAC Source-Identifier iVplsMACs Type/Age Last Change

00:f4:f4:f4:f4:f4 sdp:100:2000 10 L/0 09/25/2007 15:34:19
=====
A:term17>config>service#

*A:SetupCLI# show service id 2100 fdb pbb
=====
Forwarding Database, iVpls Service 2100
=====
MAC Source-Identifier B-Svc bVpls MAC Type/Age

76:55:ff:00:01:a4 b-sdp:100:2000 2000 00:f4:f4:f4:f4:ff L/0
76:55:ff:00:01:bb sap:1/1/1:2100 2000 N/A Static
=====
*A:SetupCLI#

A:term17>config>service# show service id 2100 fdb pbb
=====
Forwarding Database, iVpls Service 2100
=====
MAC Source-Identifier B-Svc bVpls MAC Type/Age

00:f4:f4:f4:00:00 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:01 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:02 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:03 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:04 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:05 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:06 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:07 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:08 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f4:f4:f4:00:09 b-sdp:100:2000 2000 00:f4:f4:f4:f4:f4 L/0
00:f7:f7:f7:00:00 sap:lag-1:2100 2000 N/A L/0
00:f7:f7:f7:00:01 sap:lag-1:2100 2000 N/A L/0
00:f7:f7:f7:00:02 sap:lag-1:2100 2000 N/A L/0
00:f7:f7:f7:00:03 sap:lag-1:2100 2000 N/A L/0
00:f7:f7:f7:00:04 sap:lag-1:2100 2000 N/A L/0
00:f7:f7:f7:00:06 sap:lag-1:2100 2000 N/A L/0
00:f7:f7:f7:00:07 sap:lag-1:2100 2000 N/A L/0
00:f7:f7:f7:00:08 sap:lag-1:2100 2000 N/A L/0
00:f7:f7:f7:00:09 sap:lag-1:2100 2000 N/A L/0
```

```
=====
A:term17>config>service#
```

```
*A:SetupCLI# show service id 2100 fdb pbb
```

```
=====
Forwarding Database, iVpls Service 2100
```

```
=====
MAC Source-Identifier B-Svc bVpls MAC Type/Age

76:55:ff:00:01:a4 b-sdp:100:2000 2000 00:f4:f4:f4:f4:ff L/0
76:55:ff:00:01:bb sap:1/1/1:2100 2000 N/A Static
=====
```

```
*A:SetupCLI#
```

```
*A:term17>config>service>epipe# show service id 2000 fdb detail pbb
```

```
=====
Forwarding Database, bVpls Service 2000
```

```
=====
MAC Source-Identifier iVplsMACs Epipes Type/Age

No Matching Entries
=====
```

```
*A:term17>config>service>epipe#
```

```
*A:term17>config>service>epipe# show service id 2100 fdb detail
```

```
=====
Forwarding Database, Service 2100
```

```
=====
ServId MAC Source-Identifier Type/Age Last Change

No Matching Entries
=====
```

```
*A:term17>config>service>epipe# show service id 2100 fdb detail pbb
```

```
=====
Forwarding Database, iVpls Service 2100
```

```
=====
MAC Source-Identifier B-Svc bVpls MAC Type/Age

No Matching Entries
=====
```

```
*A:term17>config>service>epipe#
```

## egress-multicast-group

|                    |                                                                       |
|--------------------|-----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress-multicast-group</b> [ <i>group-name</i> ]                   |
| <b>Context</b>     | show>service                                                          |
| <b>Description</b> | This command displays egress multicast group information.             |
| <b>Parameters</b>  | <i>group-name</i> — Specifies the name of the egress multicast group. |

### Sample Output

```
A:Dut-C# show service egress-multicast-group emg1
=====
Egress Multicast Group Entry
=====
Group : emg1

Chain Limit : 16 Encap Type : dot1q
Dot1q ether type : 0x8100 Filter-Id : n/a

Service Access Points
1/1/1:100
=====
A:Dut-C#
```

gsmp

|                    |                                         |
|--------------------|-----------------------------------------|
| <b>Syntax</b>      | <b>gsmp</b>                             |
| <b>Context</b>     | show>service>id                         |
| <b>Description</b> | This command displays GSMP information. |

neighbors

|                    |                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>neighbors group</b> [ <i>name</i> ] [ <i>ip-address</i> ]                                                                                                                                                                                                                     |
| <b>Context</b>     | show>service>id>gsmp                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command displays GSMP neighbor information.                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <b>group</b> — A GSMP group defines a set of GSMP neighbors which have the same properties.<br><i>name</i> — Specifies a GSMP group name is unique only within the scope of the service in which it is defined.<br><i>ip-address</i> — Specifies the ip-address of the neighbor. |

Sample Output

These commands show the configured neighbors per service, regardless of the fact there exists an open TCP connection with this neighbor. The admin state is shown because for a neighbor to be admin enabled, the service, gsmp node, group node and the neighbor node in this service must all be in 'no shutdown' state. Session gives the number of session (open TCP connections) for each configured neighbor.

```
A:active>show>service>id>gsmp# neighbors
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
dslam1 192.168.1.3 Enabled 0

```

```

Number of neighbors shown: 2
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# neighbors group dslam1
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
dslam1 192.168.1.3 Enabled 0

Number of neighbors shown: 2
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# neighbors group dslam1 192.168.1.2
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
=====
A:active>show>service>id>gsmp#

```

## sessions

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sessions</b> [ <i>group name</i> ] <b>neighbor</b> <i>ip-address</i> ] [ <i>port port-number</i> ] [ <i>association</i> ] [ <i>statistics</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | show>service>id>gsmp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command displays GSMP sessions information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <p><b>group</b> — A GSMP group defines a set of GSMP neighbors which have the same properties.</p> <p><i>name</i> — Specifies a GSMP group name within the scope of the service in which it is defined.</p> <p><i>ip-address</i> — Specifies the ip-address of the neighbor.</p> <p><i>port</i> — Specifies the neighbor TCP port number use for this ANCP session.</p> <p><b>Values</b>      0 — 65535</p> <p><b>association</b> — Displays to what object the ANCP-string is associated.</p> <p><b>statistics</b> — Displays statistics information about an ANCP session known to the system.</p> |
| <b>Description</b> | <b>Show Sessions Neighbor Output</b> — The following table describes show sessions neighbor output fields.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Label         | Description                                                     |
|---------------|-----------------------------------------------------------------|
| State         | The current state of the ANCP session.                          |
| Peer Instance | The instance number of the ANCP session at the neighbor's side. |

| Label            | Description (Continued)                                                                                                          |
|------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Sender Instance  | The instance number of the ANCP session at our side.                                                                             |
| Peer Port        | The port number of the ANCP session at the neighbor's side.                                                                      |
| Sender Port      | The port number of the ANCP session at the local side.                                                                           |
| Peer Name        | The MAC address of the ANCP session at the neighbor's side.                                                                      |
| Sender name      | The MAC address of the ANCP session at the local side.                                                                           |
| timeouts         | The number of adjacency protocol message timeouts.                                                                               |
| Max. Timeouts    | The maximum allowed of the above timeouts before closing.                                                                        |
| Peer Timer       | The timer value for the neighbor periodic adjacency protocol messages.                                                           |
| Sender Timer     | The timer value for the local periodic adjacency protocol messages.                                                              |
| Capabilities     | The negotiated capabilities for the Established ANCP session (DTD: dynamic topology discovery - OAM: operation and maintenance). |
| Conf Cap         | The configured local capabilities.                                                                                               |
| Priority Marking | The DSCP bits for the IP messages used in the ANCP session.                                                                      |
| Local Addr.      | The destination IP address for this ANCP session.                                                                                |
| Conf Local Addr. | The destination IP address accepted for ANCP connections.                                                                        |

### Sample Output

This show command gives information about the open TCP connections with DSLAMs.

```
A:active>show>service>id>gsmp# sessions
=====
GSMP sessions for service 999 (VPRN)
=====
Port Ngbr-IPAddr Gsmp-Group

40590 192.168.1.2 dslam1

Number of GSMP sessions : 1
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590
=====
GSMP sessions for service 999 (VPRN), neighbor 192.168.1.2, Port 40590
=====
State : Established
Peer Instance : 1 Sender Instance : a3cf58
Peer Port : 0 Sender Port : 0
```



```

Peer Name : 12:12:12:12:12:12 Sender Name : 00:00:00:00:00:00
Timeouts : 0 Max. Timeouts : 3
Peer Timer : 100 Sender Timer : 100
Capabilities : DTD OAM
Conf Capabilities : DTD OAM
Priority Marking : dscp nc2
Local Addr. : 192.168.1.4
Conf Local Addr. : N/A

```

```

=====
A:active>show>service>id>gsmp#

```

```

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 association

```

```

=====
ANCP-Strings

```

```

=====
ANCP-String Assoc. State

```

```

No ANCP-Strings found

```

```

=====
A:active>show>service>id>gsmp#

```

```

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 statistics

```

```

=====
GSMP session stats, service 999 neighbor 192.168.1.2, Port 40590

```

```

=====
Event Received Transmitted

Dropped 0 0
Syn 1 1
Syn Ack 1 1
Ack 14 14
Rst Ack 0 0
Port Up 0 0
Port Down 0 0
OAM Loopback 0 0

```

```

=====
A:active>show>service>id>gsmp#

```

Note: The association command gives an overview of each ANCP string received from this session.

```

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 association

```

```

=====
ANCP-Strings

```

```

=====
ANCP-String Assoc.
State

```

```

7330-ISAM-E47 atm 1/1/01/01:19425.64048 ANCP Up

```

```

Number of ANCP-Strings : 1

```

```

=====
A:active>show>service>id>gsmp#

```

host

|                    |                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host</b> [ <b>sap</b> <i>sap-id</i> ] [ <b>detail</b> ]<br><b>host summary</b>                                                                                                                                                     |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                       |
| <b>Description</b> | This command displays static host information configured on this service.                                                                                                                                                             |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.<br><br><b>summary</b> — Displays summary host information. |

host-connectivity-verify

|                    |                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host-connectivity-verify statistics</b> [ <b>sap</b> <i>sap-id</i> ]                                                                                                                                                                                        |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                |
| <b>Description</b> | Displays host connectivity check statistics.                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <b>statistics</b> — Displays host connectivity verification data.<br><br><b>sap</b> <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax. |
| <b>Output</b>      | <b>Show Service Id Host Connectivity Verify</b> — The following table describes show service-id host connectivity verification output fields:                                                                                                                  |

| Label          | Description                                            |
|----------------|--------------------------------------------------------|
| Svc Id         | The service identifier.                                |
| SapId/SdpId    | The SAP and SDP identifiers.                           |
| DestIp Address | The destination IP address.                            |
| Last Response  | The time when the last response was received.          |
| Time Expired   | Displays whether the interval value has expired.       |
| Oper State     | Displays the current operational state of the service. |

Sample Output

```
A:ALA-48>show>service>id# host-connectivity-verify statistics sap 1/1/9:0
=====
Host connectivity check statistics
=====
Svc SapId/ DestIp Last Time Oper
Id SdpId Address Response Expired State

```

```

1000 1/2/3:0143.144.145.1 Up
=====
A:ALA-48>show>service>id#

```

## i-vpls

**Syntax** **i-vpls**

**Context** **show>service>id**

**Description** Displays i-vpls services associated with the b-vpls service. This command only applies when the service is a b-vpls.

**Output**

```

*A:SetupCLI# show service id 2002 i-vpls
=====
Related iVpls services for bVpls service 2002
=====
iVpls SvcId Oper ISID Admin Oper

2001 122 Up Down

Number of Entries : 1

*A:term17>show>service>id# i-vpls
=====
Related iVpls services for bVpls service 2000
=====
iVpls SvcId Oper ISID Admin Oper

2100 2100 Up Up
2110 123 Up Up

Number of Entries : 2

=====

```

## isid-using

**Syntax** **isid-using [ISID]**

**Context** **show>service**

**Description** This command displays services using an ISID.

**Parameters** *ISID* — [0..16777215]

**Output**

```

*A:SetupCLI# show service isid-using
=====
Services
=====
SvcId ISID Type b-Vpls Adm Opr SvcMtu CustId

2001 122 i-VPLS 2002 Up Down 1514 1
2005 2005 i-mVP* 2004 Down Down 1500 1

```

```

Matching Services : 2

*A:SetupCLI#

A:term17# show service isid-using
=====
Services
=====
SvcId ISID Type b-Vpls Adm Opr SvcMtu CustId

2000 0 b-VPLS 0 Up Up 1530 1
2110 123 i-VPLS 2000 Up Up 1514 1
2299 0 b-VPLS 0 Down Down 1514 1

Matching Services : 3

A:term17#
```

labels

- Syntax** labels
- Context** show>service>id
- Description** This command displays the labels being used by the service.
- Output** **Show Service-ID Labels** — The following table describes show service-id labels output fields:

| Label  |                                                                                                    | Description |
|--------|----------------------------------------------------------------------------------------------------|-------------|
| Svc Id | The service identifier.                                                                            |             |
| Sdp Id | The SDP identifier.                                                                                |             |
| Type   | Indicates whether the SDP is spoke or mesh.                                                        |             |
| I. Lbl | The VC label used by the far-end device to send packets to this device in this service by the SDP. |             |
| E. Lbl | The VC label used by this device to send packets to the far-end device in this service by the SDP. |             |

```
*A:ALA-12# show service id 1 labels
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 40:1 Mesh 130081 131061
1 60:1 Mesh 131019 131016
1 100:1 Mesh 0 0

```

Number of Bound SDPs : 6

-----  
\*A:ALA-12#

## l2pt

|                    |                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>l2pt disabled</b><br><b>l2pt [detail]</b>                                                                                                                   |
| <b>Context</b>     | show>service>id                                                                                                                                                |
| <b>Description</b> | This command displays Layer 2 Protocol Tunnel (L2-PT) route information associated with this service.                                                          |
| <b>Parameters</b>  | <b>disabled</b> — Displays only entries with termination disabled. This helps identify configuration errors.<br><b>detail</b> — Displays detailed information. |
| <b>Output</b>      | <b>Show L2PT Fields</b> — The following table describes show L2PT output fields:                                                                               |

| Label                  | Description                                                                                                                                                                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service id             | Displays the 24 bit (0..16777215) service instance identifier for the service.                                                                                                                                                                                        |
| L2pt-term enabled      | Indicates if L2-PT-termination and/or Bpdu-translation is in use in this service by at least one SAP or spoke SDP binding. If in use, at least one of L2PT-termination or Bpdu-translation is enabled. When enabled it is not possible to enable STP on this service. |
| L2pt-term disabled     | Indicates that L2-PT-termination is disabled.                                                                                                                                                                                                                         |
| Bpdu-trans auto        | Specifies the number of L2-PT PDU's are translated before being sent out on a port or sap.                                                                                                                                                                            |
| Bpdu-trans disabled    | Indicates that Bpdu-translation is disabled.                                                                                                                                                                                                                          |
| SAPs                   | Displays the number of SAPs with L2PT or BPDU translation enabled or disabled.                                                                                                                                                                                        |
| SDPs                   | Displays the number of SDPs with L2PT or BPDU translation enabled or disabled.                                                                                                                                                                                        |
| Total                  | Displays the column totals of L2PT entities.                                                                                                                                                                                                                          |
| SapId                  | The ID of the access point where this SAP is defined.                                                                                                                                                                                                                 |
| L2pt-termination       | Indicates whether L2pt termination is enabled or disabled.                                                                                                                                                                                                            |
| Admin Bpdu-translation | Specifies whether Bpdu translation is administratively enabled or disabled.                                                                                                                                                                                           |
| Oper Bpdu-translation  | Specifies whether Bpdu translation is operationally enabled or disabled.                                                                                                                                                                                              |
| SdpId                  | Specifies the SAP ID.                                                                                                                                                                                                                                                 |

**Sample Output**

```
A:ALA-48>show>service>id# l2pt
=====
L2pt summary, Service id 700
=====
```

|       | L2pt-term<br>enabled | L2pt-term<br>disabled | Bpdu-trans<br>auto | Bpdu-trans<br>disabled | Bpdu-trans<br>pvst | Bpdu-trans<br>stp |
|-------|----------------------|-----------------------|--------------------|------------------------|--------------------|-------------------|
| SAP's | 0                    | 1                     | 0                  | 1                      | 0                  | 0                 |
| SDP's | 0                    | 1                     | 0                  | 1                      | 0                  | 0                 |
| Total | 0                    | 2                     | 0                  | 2                      | 0                  | 0                 |

```
=====
A:ALA-48>show>service>id#
```

```
A:ALA-48>show>service>id# l2pt disabled
=====
L2pt details, Service id 700
=====
Service Access Points

```

| SapId   | L2pt-<br>termination | Admin Bpdu-<br>translation | Oper Bpdu-<br>translation |
|---------|----------------------|----------------------------|---------------------------|
| 1/1/9:0 | disabled             | disabled                   | disabled                  |

```

Number of SAPs : 1

Service Destination Points

```

| SdpId | L2pt-<br>termination | Admin Bpdu-<br>translation | Oper Bpdu-<br>translation |
|-------|----------------------|----------------------------|---------------------------|
| 2:222 | disabled             | disabled                   | disabled                  |

```

Number of SDPs : 1
=====
L2pt summary, Service id 700
=====
```

|       | L2pt-term<br>enabled | L2pt-term<br>disabled | Bpdu-trans<br>auto | Bpdu-trans<br>disabled | Bpdu-trans<br>pvst | Bpdu-trans<br>stp |
|-------|----------------------|-----------------------|--------------------|------------------------|--------------------|-------------------|
| SAP's | 0                    | 1                     | 0                  | 1                      | 0                  | 0                 |
| SDP's | 0                    | 1                     | 0                  | 1                      | 0                  | 0                 |
| Total | 0                    | 2                     | 0                  | 2                      | 0                  | 0                 |

```
=====
A:ALA-48>show>service>id#
```

```
A:ALA-48>show>service>id# l2pt detail
=====
L2pt details, Service id 700
=====
Service Access Points

```

| SapId | L2pt-<br>termination | Admin Bpdu-<br>translation | Oper Bpdu-<br>translation |
|-------|----------------------|----------------------------|---------------------------|
|-------|----------------------|----------------------------|---------------------------|

## Show, Clear, Debug Commands

```

1/1/9:0 disabled disabled disabled

Number of SAPs : 1

Service Destination Points

SdpId L2pt-termination Admin Bpdu-translation Oper Bpdu-translation

2:222 disabled disabled disabled

Number of SDPs : 1
=====
L2pt summary, Service id 700
=====
 L2pt-term L2pt-term Bpdu-trans Bpdu-trans Bpdu-trans Bpdu-trans
 enabled disabled auto disabled pvst stp

SAP's 0 1 0 1 0 0
SDP's 0 1 0 1 0 0

Total 0 2 0 2 0 0
=====
A:ALA-48>show>service>id#

```

## mac-move

|                    |                                                                       |
|--------------------|-----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mac-move</b>                                                       |
| <b>Context</b>     | show>service>id                                                       |
| <b>Description</b> | This command displays MAC move related information about the service. |

### Sample Output

```

*A:ALA-2009>config>service>vpls>mac-move# show service id 500 mac-move
=====
Service Mac Move Information
=====
Service Id : 500 Mac Move : Enabled
Primary Factor : 4 Secondary Factor : 2
Mac Move Rate : 2 Mac Move Timeout : 10
Mac Move Retries : 3

SAP Mac Move Information: 2/1/3:501

Admin State : Up Oper State : Down
Flags : RelearnLimitExceeded
Time to come up : 1 seconds Retries Left : 1
Mac Move : Blockable Blockable Level : Tertiary

SAP Mac Move Information: 2/1/3:502

Admin State : Up Oper State : Up
Flags : None

```



```

Time to RetryReset: 267 seconds Retries Left : none
Mac Move : Blockable Blockable Level : Tertiary

SDP Mac Move Information: 21:501

Admin State : Up Oper State : Up
Flags : None
Time to RetryReset: never Retries Left : 3
Mac Move : Blockable Blockable Level : Secondary

SDP Mac Move Information: 21:502

Admin State : Up Oper State : Down
Flags : RelearnLimitExceeded
Time to come up : never Retries Left : none
Mac Move : Blockable Blockable Level : Tertiary
=====
*A:ALA-2009>config>service>vpls>mac-move#

```

## mac-protect

**Syntax** **mac-protect**

**Context** show>service>id

**Description** This command displays MAC protect-related information about the service.

**Output**

```

*A:ALA-48>show>service>id# mac-protect
=====
Protected MACs, Service 700
=====
ServId MAC Source-Identifier Type/Age Last Change

700 ff:ff:ff:ff:ff:ff not learned n/a n/a

No. of MAC Entries: 1
=====
*A:ALA-48>show>service>id# mac-protect

```

## mld-snooping

**Syntax** **mld-snooping**

**Context** show>service>id

**Description** This command displays MLD snooping information.

## all

**Syntax** **all**

**Context** show>service>id>mld-snooping

**Description** This command displays detailed information about MLD snooping.

## base

**Syntax** **base**

**Context** show>service>id>mld-snooping

**Description** This command displays basic MLD snooping information.

## mrouters

**Syntax** **mrouters [detail]**

**Context** show>service>id>mld-snooping

**Description** This command displays all multicast routers.

## mvr

|                    |                                                                |
|--------------------|----------------------------------------------------------------|
| <b>Syntax</b>      | <b>mvr</b>                                                     |
| <b>Context</b>     | show>service>id>mld-snooping                                   |
| <b>Description</b> | This command displays multicast VPLS registration information. |

## port-db

|                    |                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port-db sap <i>sap-id</i></b><br><b>port-db sap <i>sap-id</i> detail</b><br><b>port-db sap <i>sap-id</i> group <i>grp-ipv6-address</i></b><br><b>port-db sdp <i>sdp-id:vc-id</i> [detail]</b><br><b>port-db sdp <i>sdp-id:vc-id</i> group <i>grp-ipv6-address</i></b> |
| <b>Context</b>     | show>service>id>mld-snooping                                                                                                                                                                                                                                             |
| <b>Description</b> | This command displays MLD snooping information related to a specific SAP.                                                                                                                                                                                                |

## proxy-db

|                    |                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>proxy-db [detail]</b><br><b>proxy-db group <i>grp-ip-address</i></b>                                                                                                                                  |
| <b>Context</b>     | show>service>id>mld-snooping                                                                                                                                                                             |
| <b>Description</b> | This command displays proxy-reporting database entries.                                                                                                                                                  |
| <b>Parameters</b>  | <i>grp-ip-address</i> — Displays the IGMP snooping proxy reporting database for a specific multicast group address.<br><b>detail</b> — Displays detailed information about the proxy-reporting database, |

## querier

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>Syntax</b>      | <b>querier</b>                                               |
| <b>Context</b>     | show>service>id>mld-snooping                                 |
| <b>Description</b> | This command displays information about the current querier. |

## static

|                |                                                             |
|----------------|-------------------------------------------------------------|
| <b>Syntax</b>  | <b>static [sap <i>sap-id</i>   sdp <i>sdp-id:vc-id</i>]</b> |
| <b>Context</b> | show>service>id>mld-snooping                                |

**Description** This command displays MLD snooping static group membership data.

statistics

**Syntax** **statistics** [**sap** *sap-id* | **sdp** *sdp-id:vc-id*]  
**Context** show>service>id>mld-snooping  
**Description** This command displays MLD snooping statistics.

mrp-policy

**Syntax** **mrp-policy** [*mrp-policy*]  
**mrp-policy** *mrp-policy* [**association**]  
**mrp-policy** *mrp-policy* [**entry** *entry-id*]  
**Context** show>service>id  
**Description** This command displays information on an MRP policy.  
**Parameters** *mrp-policy* — Specifies the MRP policy name.

**Values** 32 chars max  
*entry-id* — Specifies the entry ID number.

**Values** 1..65535

**Output** \*A:PE-B# show service mrp-policy

```
=====
Mrp Policies
=====
Mrp-Policy Scope Applied Description

1 template Yes
2 template Yes

Total: 2
=====
```

\*A:PE-B# show service mrp-policy "1"

```
=====
Mrp Policy
=====
Policy Name : 1 Applied : Yes
Scope : template Def. Action : block
Entries : 1
Description : (Not Specified)

Mrp Policy Entries

Entry : 1 Match action : end-station
```

```
Description : (Not Specified)
isid : 10..11
```

```
=====
*A:PE-B#
```

## mmrp

- Syntax** `mmrp mac [ieee-address]`
- Context** `show>service>id`
- Description** This command displays information on MACs. If a MAC address is specified, information will be displayed relevant to the specific group. No parameter will display information on all group MACs on a server.
- Parameters** *ieee-address* — Hex string: xx:xx:xx:xx:xx:xx; or xx-xx-xx-xx-xx-xx

### Output

```
*A:PE-A# show service id 10 mmrp mac 01:1E:83:00:00:65
```

| SAP/SDP      | MAC Address       | Registered | Declared |
|--------------|-------------------|------------|----------|
| sap:1/1/4:10 | 01:1e:83:00:00:65 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:65 | No         | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:65 | Yes        | Yes      |

```
*A:PE-A#
```

```
*A:PE-A# show service id 10 mmrp mac
```

| SAP/SDP      | MAC Address       | Registered | Declared |
|--------------|-------------------|------------|----------|
| sap:1/1/4:10 | 01:1e:83:00:00:65 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:66 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:67 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:68 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:69 | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6a | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6b | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6c | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6d | No         | Yes      |
| sap:1/1/4:10 | 01:1e:83:00:00:6e | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:65 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:66 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:67 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:68 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:69 | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6a | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6b | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6c | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6d | No         | Yes      |
| sap:1/2/2:10 | 01:1e:83:00:00:6e | No         | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:65 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:66 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:67 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:68 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:69 | Yes        | Yes      |
| sap:2/2/5:10 | 01:1e:83:00:00:6a | Yes        | Yes      |

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|              |                   |     |     |
|--------------|-------------------|-----|-----|
| sap:2/2/5:10 | 01:1e:83:00:00:6b | Yes | Yes |
| sap:2/2/5:10 | 01:1e:83:00:00:6c | Yes | Yes |
| sap:2/2/5:10 | 01:1e:83:00:00:6d | Yes | Yes |
| sap:2/2/5:10 | 01:1e:83:00:00:6e | Yes | Yes |
| -----        |                   |     |     |
| *A:PE-A#     |                   |     |     |

mstp-configuration

|                    |                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mstp-configuration</b>                                                                                    |
| <b>Context</b>     | show>service>id                                                                                              |
| <b>Description</b> | This command displays the MSTP specific configuration data. This command is only valid on a management VPLS. |

retailers

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>retailers</b>                                                                                          |
| <b>Context</b>     | show>service>id                                                                                           |
| <b>Description</b> | This command displays the service ID of the retailer subscriber service to which this DHCP lease belongs. |

wholesalers

|                    |                                                       |
|--------------------|-------------------------------------------------------|
| <b>Syntax</b>      | <b>wholesalers</b>                                    |
| <b>Context</b>     | show>service>id                                       |
| <b>Description</b> | This command displays service wholesaler information. |

## sap

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> [ <i>filter</i> ]                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command displays information for the SAPs associated with the service.<br>If no optional parameters are specified, a summary of all associated SAPs is displayed.                                                                                                                                                                                                                                                                        |
| <b>Parameters</b>  | <b>sap</b> <i>sap-id</i> — The ID that displays SAPs for the service in the <i>slot/mda/port[.channel]</i> form. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.<br><b>detail</b> — Displays detailed information for the SAP.<br><i>filter</i> — Specifies a search term to narrow down the results.<br><b>Values</b> atm, base, detail, dhcp, mc-ring, mcac, mrp, qos, sap-stats, stats, stp, sub-mgmt |
| <b>Output</b>      | <b>Show Service-ID SAP</b> — The following table describes show service SAP fields:                                                                                                                                                                                                                                                                                                                                                           |

| Label              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id         | The service identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| SAP                | The SAP and qtag.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Encap              | The encapsulation type of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Ethertype          | Specifies an Ethernet type II Ethertype value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Admin State        | The administrative state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Oper State         | The operational state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Flags              | Specifies the conditions that affect the operating status of this SAP.<br>Display output includes: ServiceAdminDown, SapAdminDown, InterfaceAdminDown, PortOperDown, PortMTUTooSmall, L2OperDown, SapIngressQoSMismatch, SapEgressQoSMismatch, RelearnLimitExceeded, RxProtSrcMac, ParentIfAdminDown, NoSapIpipeCeIpAddr, TodResourceUnavail, TodMssResourceUnavail, SapParamMismatch, CemSapNoEcidOrMacAddr, StandByForMcRing, ServiceMTUTooSmall, SapIngressNamedPoolMismatch, SapEgressNamedPoolMismatch, NoSapEpipeRingNode. |
| Last Status Change | Specifies the time of the most recent operating status change to this SAP                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Last Mgmt Change   | Specifies the time of the most recent management-initiated change to this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Admin MTU          | The largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented.                                                                                                                                                                                                                                                                                                                                                                         |

| Label                               | Description (Continued)                                                                                                                                         |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oper MTU                            | The actual largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented. |
| Ingress qos-policy                  | The ingress QoS policy ID assigned to the SAP.                                                                                                                  |
| Egress qos-policy                   | The egress QoS policy ID assigned to the SAP.                                                                                                                   |
| Ingress Filter-Id                   | The ingress filter policy ID assigned to the SAP.                                                                                                               |
| Egress Filter-Id                    | The egress filter policy ID assigned to the SAP.                                                                                                                |
| Acct. Pol                           | The accounting policy ID assigned to the SAP.                                                                                                                   |
| Collect Stats                       | Specifies whether collect stats is enabled.                                                                                                                     |
| Forwarding Engine Stats             |                                                                                                                                                                 |
| Dropped                             | The number of packets and octets dropped due to SAP state, ingress MAC or IP filter, same segment discard, bad checksum, etc.                                   |
| Off. HiPrio                         | The number of high priority packets and octets, as determined by the SAP ingress QoS policy.                                                                    |
| Off. LowPrio                        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy.                                                                     |
| Off. Uncolor                        | The number of uncolored packets and octets, as determined by the SAP ingress QoS policy.                                                                        |
| Queueing Stats (Ingress QoS Policy) |                                                                                                                                                                 |
| Dro. HiPrio                         | The number of high priority packets and octets, as determined by the SAP ingress QoS policy, dropped due to: MBS exceeded, buffer pool limit exceeded, etc.     |
| Dro. LowPrio                        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy, dropped due to: MBS exceeded, buffer pool limit exceeded, etc.      |
| For. InProf                         | The number of in-profile packets and octets (rate below CIR) forwarded.                                                                                         |
| For. OutProf                        | The number of out-of-profile packets and octets discarded due to MBS exceeded, buffer pool limit exceeded, etc.                                                 |
| Queueing Stats (Egress QoS Policy)  |                                                                                                                                                                 |
| Dro. InProf                         | The number of in-profile packets and octets discarded due to MBS exceeded, buffer pool limit exceeded, etc.                                                     |
| Dro. OutProf                        | The number of out-of-profile packets and octets due to MBS exceeded, buffer pool limit exceeded, etc.                                                           |



| Label               | Description (Continued)                                                     |
|---------------------|-----------------------------------------------------------------------------|
| For. InProf         | The number of in-profile packets and octets (rate below CIR) forwarded.     |
| For. OutProf        | The number of out-of-profile packets and octets (rate above CIR) forwarded. |
| Ingress TD Profile  | The profile ID applied to the ingress SAP.                                  |
| Egress TD Profile   | The profile ID applied to the egress SAP.                                   |
| Alarm Cell Handling | The indication that OAM cells are being processed.                          |
| AAL-5 Encap         | The AAL-5 encapsulation type.                                               |

### Sample Output

```
A:ALA-48>show>service>id# sap 1/1/9:0
=====
Service Access Points(SAP)
=====
Service Id : 700
SAP : 1/1/9:0
Dot1Q Ethertype : 0x8100
Encap : q-tag
QinQ Ethertype : 0x8100

Admin State : Up
Flags : PortOperDown
Oper State : Down
Last Status Change : 02/17/2007 15:23:16
Last Mgmt Change : 02/17/2007 15:23:18
Max Nbr of MAC Addr: No Limit
Learned MAC Addr : 0
Static MAC Addr : 0
Admin MTU : 1518
Oper MTU : 1518
Ingress qos-policy : 100
Egress qos-policy : 1
Shared Q plcy : default
Multipoint shared : Enabled
Ingr IP Fltr-Id : n/a
Egr IP Fltr-Id : 10
Ingr Mac Fltr-Id : n/a
Egr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a
Egr IPv6 Fltr-Id : n/a
tod-suite : None
qinq-pbit-marking : both
ARP Reply Agent : Enabled
Host Conn Verify : Enabled
Mac Learning : Enabled
Discard Unkwn Srce: Disabled
Mac Aging : Enabled
Mac Pinning : Disabled
L2PT Termination : Disabled
BPDU Translation : Disabled

Multi Svc Site : None
I. Sched Pol : SLA1
E. Sched Pol : SLA1
Acct. Pol : None
Collect Stats : Disabled

Anti Spoofing : None
Nbr Static Hosts : 1
MCAC Policy Name :
MCAC Const Adm St : Enable
MCAC Max Unconst BW: no limit
MCAC Max Mand BW : no limit
MCAC Avail Mand BW: unlimited
MCAC Avail Opnl BW: unlimited

Ingress Queue Override

```

## Show, Clear, Debug Commands

```
Queue Id : 1 (no overrides)

Egress Queue Override

Queue Id : 1 (no overrides)

DHCP

Admin State : Down Lease Populate : 0
DHCP Snooping : Down Action : Keep

Proxy Admin State : Down
Proxy Lease Time : N/A
Emul. Server Addr : Not Configured

Subscriber Management

Admin State : Down MAC DA Hashing : False
Def Sub-Profile : None
Def SLA-Profile : None
Sub-Ident-Policy : None
Subscriber Limit : 1
Single-Sub-Parameters
 Prof Traffic Only : False
 Non-Sub-Traffic : N/A
=====
A:ALA-48>show>service>id#

A:ALA-48>show>service>id# sap 1/1/9:0 detail
=====
Service Access Points (SAP)
=====
Service Id : 700
SAP : 1/1/9:0 Encap : q-tag
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100

Admin State : Up Oper State : Down
Flags : PortOperDown
Last Status Change : 06/07/2006 12:30:02
Last Mgmt Change : 06/07/2006 12:30:03
Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0
Admin MTU : 1518 Oper MTU : 1518
Ingress qos-policy : 100 Egress qos-policy : 1
Shared Q plcy : default Multipoint shared : Disabled
Ingress Filter-Id : n/a Egress Filter-Id : n/a
tod-suite : None
ARP Reply Agent : Disabled
Mac Learning : Enabled Discard Unkwn Srce: Disabled
Mac Aging : Enabled Mac Pinning : Disabled
L2PT Termination : Disabled BPDU Translation : Disabled

Multi Svc Site : None
I. Sched Pol : SLA1
E. Sched Pol : SLA1
Acct. Pol : None Collect Stats : Disabled

Anti Spoofing : None Nbr Static Hosts : 0
Auth Policy : none
Egr MCast Grp :

```

## Mac Protection

```

restrict-protected-src : Disabled
restrict-unprotected-dest : Disabled

```

## Stp Service Access Point specifics

```

Mac Move : Blockable
Stp Admin State : Up
Core Connectivity : Down
Port Role : N/A
Port Number : 2048
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDU from : N/A
CIST Desig Bridge : N/A

Stp Oper State : Down
Port State : Discarding
Port Priority : 128
Auto Edge : Enabled
Oper Edge : N/A
BPDU Encap : Dot1d
Active Protocol : N/A
Designated Port : N/A

```

```

MCAC Policy Name :
MCAC Max Unconst BW: no limit
MCAC In use Mand BW: 0
MCAC In use Opnl BW: 0
Forward transitions: 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
MST BPDUs rcvd : 0

MCAC Const Adm St : Enable
MCAC Max Mand BW : Enable
MCAC Avail Mand BW: unlimited
MCAC Avail Opnl BW: unlimited
Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0
MST BPDUs tx : 0

```

## DHCP

```

Admin State : Down
DHCP Snooping : Down
Lease Populate : 0
Action : Keep

Proxy Admin State : Down
Proxy Lease Time : N/A
Emul. Server Addr : Not Configured

```

## Subscriber Management

```

Admin State : Down
Def Sub-Profile : None
Def SLA-Profile : None
Sub-Ident-Policy : None

MAC DA Hashing : False

Subscriber Limit : 1
Single-Sub-Parameters
 Prof Traffic Only : False
 Non-Sub-Traffic : N/A

```

## Sap Statistics

```

Packets
Forwarding Engine Stats
Dropped : 0
Off. HiPrio : 0
Off. LowPrio : 0
Off. Uncolor : 0

Octets
Queueing Stats(Ingress QoS Policy 100)
Dro. HiPrio : 0

```

## Show, Clear, Debug Commands

```
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

Packets Octets
Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
.....
Ingress Queue 23 (Multipoint) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 25 (Multipoint) (Priority)

A:ALA-48>show>service>id#

*A:PE-A# show service id 10 sap 2/2/5:10 mrp
=====
Service Access Points(SAP)
=====
Service Id : 10
SAP : 2/2/5:10 Encap : q-tag
Description : Default sap description for service id 10
Admin State : Up Oper State : Up
Flags : None
Multi Svc Site : None
Last Status Change : 01/16/2008 09:37:57
Last Mgmt Change : 01/16/2008 09:37:41

SAP MRP Information

Join Time : 0.2 secs Leave Time : 1.0 secs
Leave All Time : 10.0 secs Periodic Time : 1.0 secs
Periodic Enabled : false
Rx Pdus : 11 Tx Pdus : 12
Dropped Pdus : 0 Tx Pdus : 12
Rx New Event : 0 Rx Join-In Event : 150
Rx In Event : 10 Rx Join Empty Evt : 10
Rx Empty Event : 10 Rx Leave Event : 0
Tx New Event : 0 Tx Join-In Event : 140
Tx In Event : 0 Tx Join Empty Evt : 20
Tx Empty Event : 10 Tx Leave Event : 0

SAP MMRP Information
```

```

MAC Address Registered Declared

01:1e:83:00:00:65 Yes Yes
01:1e:83:00:00:66 Yes Yes
01:1e:83:00:00:67 Yes Yes
01:1e:83:00:00:68 Yes Yes
01:1e:83:00:00:69 Yes Yes
01:1e:83:00:00:6a Yes Yes
01:1e:83:00:00:6b Yes Yes
01:1e:83:00:00:6c Yes Yes
01:1e:83:00:00:6d Yes Yes
01:1e:83:00:00:6e Yes Yes

Number of MACs=10 Registered=10 Declared=10

*A:PE-A#

```

## sdp

- Syntax** **sdp** *sdp-id:vc-id* {**mrp**}  
**sdp** [*sdp-id* | **far-end** *ip-addr*] [**detail**]
- Context** show>service>id
- Description** This command displays information for the SDPs associated with the service. If no optional parameters are specified, a summary of all associated SDPs is displayed.
- Parameters** *sdp-id* — Displays only information for the specified SDP ID.
- Default** All SDPs
- Values** 1 — 17407
- far-end** *ip-addr* — Displays only SDPs matching with the specified far-end IP address.
- Default** SDPs with any far-end IP address.
- detail** — Displays detailed SDP information.
- Output** **Show Service-ID SDP** — The following table describes show service-id SDP output fields.

| Label               | Description                                                                   |
|---------------------|-------------------------------------------------------------------------------|
| Sdp Id              | The SDP identifier.                                                           |
| Type                | Indicates whether the SDP is spoke or mesh.                                   |
| Split Horizon Group | Indicates the name of the split horizon group that the SDP belongs to.        |
| VC Type             | Displays the VC type: ether, vlan, or vpls.                                   |
| VC Tag              | Displays the explicit dot1Q value used when encapsulating to the SDP far end. |

| Label          | Description (Continued)                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I. Lbl         | The VC label used by the far-end device to send packets to this device in this service by the SDP.                                                                           |
| Admin Path MTU | The operating path MTU of the SDP is equal to the admin path MTU (when one is set) or the dynamically computed tunnel MTU, when no admin path MTU is set (the default case.) |
| Oper Path MTU  | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.             |
| Far End        | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                    |
| Delivery       | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                 |
| Admin State    | The administrative state of this SDP.                                                                                                                                        |
| Oper State     | The current status of the SDP.                                                                                                                                               |
| Ingress Label  | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                             |
| Egress Label   | The label used by this device to send packets to the far-end device in this service by the SDP.                                                                              |
| Last Changed   | The date and time of the most recent change to the SDP.                                                                                                                      |
| Signaling      | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on this SDP.                                           |
| Admin State    | The administrative state of the Keepalive process.                                                                                                                           |
| Oper State     | The operational state of the Keepalive process.                                                                                                                              |
| Hello Time     | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                               |
| Max Drop Count | Specifies the maximum number of consecutive SDP Echo Request messages that can be unacknowledged before the keepalive protocol reports a fault.                              |
| Hello Msg Len  | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                               |
| Hold Down Time | Specifies the amount of time to wait before the Keepalive operating status is eligible to enter the alive state.                                                             |
| I. Fwd. Pkts.  | Specifies the number of forwarded ingress packets.                                                                                                                           |
| I. Dro. Pkts   | Specifies the number of dropped ingress packets.                                                                                                                             |
| E. Fwd. Pkts.  | Specifies the number of forwarded egress packets.                                                                                                                            |
| E. Fwd. Octets | Specifies the number of forwarded egress octets.                                                                                                                             |

| Label               | Description (Continued)                                                                                                                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Associated LSP List | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far end field.<br>If the SDP type is GRE, then the following message displays:<br>SDP delivery mechanism is not MPLS |

### Sample Output

```
A:Dut-A# show service id 1 sdp detail
=====
Services: Service Destination Points Details
=====
Sdp Id 1:1 -(10.20.1.2)

Description : Default sdp description
SDP Id : 1:1 Type : Spoke
VC Type : Ether VC Tag : n/a
Admin Path MTU : 0 Oper Path MTU : 9186
Far End : 10.20.1.2 Delivery : MPLS

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 2048 Egress Label : 2048
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Ing ipv6 Fltr : n/a Egr ipv6 Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Last Status Change : 05/31/2007 00:45:43 Signaling : None
Last Mgmt Change : 05/31/2007 00:45:43

Class Fwding State : Up
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None
Max Nbr of MAC Addr: No Limit Total MAC Addr : 0
Learned MAC Addr : 0 Static MAC Addr : 0

MAC Learning : Enabled Discard Unkwn Srce: Disabled
MAC Aging : Enabled
L2PT Termination : Disabled BPDU Translation : Disabled
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
I. Fwd. Octs. : 0 I. Dro. Octs. : 0
E. Fwd. Pkts. : 0 E. Fwd. Octets : 0
MCAC Policy Name :
MCAC Max Unconst BW: no limit MCAC Max Mand BW : no limit
MCAC In use Mand BW: 0 MCAC Avail Mand BW: unlimited
MCAC In use Opnl BW: 0 MCAC Avail Opnl BW: unlimited
```

## Show, Clear, Debug Commands

```
Associated LSP LIST :
Lsp Name : A_B_1
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_2
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_3
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_4
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_5
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_6
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_7
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_8
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_9
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_10
Admin State : Up
Oper State : Up
Time Since Last Tr*: 00h26m34s

Class-based forwarding :

Class forwarding : enabled
Default LSP : A_B_10
Multicast LSP : A_B_9
=====
FC Mapping Table
=====
FC Name LSP Name

af A_B_3
be A_B_1
ef A_B_6
h1 A_B_7
h2 A_B_5
l1 A_B_4
l2 A_B_2
nc A_B_8
=====
Stp Service Destination Point specifics
```



```

Mac Move : Blockable
Stp Admin State : Up
Core Connectivity : Down
Port Role : N/A
Port Number : 2049
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDU from : N/A
Designated Bridge : N/A

Stp Oper State : Down
Port State : Forwarding
Port Priority : 128
Auto Edge : Enabled
Oper Edge : N/A
BPDU Encap : Dot1d
Active Protocol : N/A
Designated Port Id: 0

Fwd Transitions : 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0

Number of SDPs : 1

* indicates that the corresponding row element may have been truncated.

A:Dut-A#

```

## site

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| <b>Syntax</b>      | <b>site [detail]</b><br><b>site <i>name</i></b>         |
| <b>Context</b>     | show>service>id                                         |
| <b>Description</b> | This command displays sites configures for the service. |
| <b>Parameters</b>  | <i>name</i> — Specifies the site name.                  |
| <b>Values</b>      | 32 chars max                                            |

## split-horizon-group

|                    |                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>split-horizon-group [<i>group-name</i>]</b>                                                                                                                                                                                                                                                                                              |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | <p>This command displays service split horizon groups.</p> <pre> *A:ALA-1# show service id 700 split-horizon-group ===== Service: Split Horizon Group ===== Name                               Description ----- DSL-group1                         Split horizon group for DSL ----- No. of Split Horizon Groups: 1 ===== *A:ALA-1# </pre> |

```
*A:ALA-1# show service id 700 split-horizon-group DSL-group1
=====
Service: Split Horizon Group
=====
Name Description

DSL-group1 Split horizon group for DSL

Associations

SAP 1/1/3:1
SDP 108:1
SDP 109:1

SAPs Associated : 1 SDPs Associated : 2
=====
*A:ALA-1#
```

## stp

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>stp</b> [ <b>detail</b> ]<br><b>stp mst-instance</b> <i>mst-inst-number</i>                                                                     |
| <b>Context</b>     | show>service>id                                                                                                                                    |
| <b>Description</b> | This command displays information for the spanning tree protocol instance for the service.                                                         |
| <b>Parameters</b>  | <b>detail</b> — Displays detailed information.<br><i>mst-inst-number</i> — Displays information about the specified MST.<br><b>Values</b> 1 — 4094 |
| <b>Output</b>      | <b>Show Service-ID STP Output</b> — The following table describes show service-id STP output fields:                                               |

| Label             | Description                                                                                                                                                                                |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RSTP Admin State  | Indicates the administrative state of the Rapid Spanning Tree Protocol instance associated with this service.                                                                              |
| Core Connectivity | Indicates the connectivity status to the core.                                                                                                                                             |
| RSTP Oper State   | Indicates the operational state of the Rapid Spanning Tree Protocol instance associated with this service. This field is applicable only when STP is enabled on the router.                |
| Bridge-id         | Specifies the MAC address used to identify this bridge in the network.                                                                                                                     |
| Hold Time         | Specifies the interval length during which no more than two Configuration BPDUs shall be transmitted by this bridge.                                                                       |
| Bridge fwd delay  | Specifies how fast a bridge changes its state when moving toward the forwarding state.                                                                                                     |
| Bridge Hello time | Specifies the amount of time between the transmission of Configuration BPDUs.                                                                                                              |
| Bridge max age    | Specifies the maximum age of Spanning Tree Protocol information learned from the network on any port before it is discarded. This is the actual value that this bridge is currently using. |
| Bridge priority   | Defines the priority of the Spanning Tree Protocol instance associated with this service.                                                                                                  |
| Topology change   | Specifies whether a topology change is currently in progress.                                                                                                                              |
| Last Top. change  | Specifies the time (in hundredths of a second) since the last time a topology change was detected by the Spanning Tree Protocol instance associated with this service.                     |
| Top. change count | Specifies the total number of topology changes detected by the Spanning Tree Protocol instance associated with this service since the management entity was last reset or initialized.     |

| Label                 | Description (Continued)                                                                                                                                                                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Root bridge-id        | Specifies the bridge identifier of the root of the spanning tree as determined by the Spanning Tree Protocol instance associated with this service. This value is used as the Root Identifier parameter in all Configuration BPDUs originated by this node. |
| Root path cost        | Specifies the cost of the path to the root bridge as seen from this bridge.                                                                                                                                                                                 |
| Root forward delay    | Specifies how fast the root changes its state when moving toward the forwarding state.                                                                                                                                                                      |
| Root hello time       | Specifies the amount of time between the transmission of configuration BPDUs.                                                                                                                                                                               |
| Root max age          | Specifies the maximum age of Spanning Tree Protocol information learned from the network on any port before it is discarded.                                                                                                                                |
| Root priority         | This object specifies the priority of the bridge that is currently selected as root-bridge for the network.                                                                                                                                                 |
| Root port             | Specifies the port number of the port which offers the lowest cost path from this bridge to the root bridge.                                                                                                                                                |
| SAP Identifier        | The ID of the access port where this SAP is defined.                                                                                                                                                                                                        |
| RSTP State            | The operational state of RSTP.                                                                                                                                                                                                                              |
| STP Port State        | Specifies the port identifier of the port on the designated bridge for this port's segment.                                                                                                                                                                 |
| BPDU encap            | Specifies the type of encapsulation used on BPDUs sent out and received on this SAP.                                                                                                                                                                        |
| Port Number           | Specifies the value of the port number field which is contained in the least significant 12 bits of the 16-bit port ID associated with this SAP.                                                                                                            |
| Priority              | Specifies the value of the port priority field which is contained in the most significant 4 bits of the 16-bit port ID associated with this SAP.                                                                                                            |
| Cost                  | Specifies the contribution of this port to the path cost of paths towards the spanning tree root which include this port.                                                                                                                                   |
| Fast Start            | Specifies whether Fast Start is enabled on this SAP.                                                                                                                                                                                                        |
| Designated Port       | Specifies the port identifier of the port on the designated bridge for this port's segment.                                                                                                                                                                 |
| Designated Bridge     | Specifies the bridge identifier of the bridge which this port considers to be the designated bridge for this port's segment.                                                                                                                                |
| Service Access Points |                                                                                                                                                                                                                                                             |
| Managed by Service    | Specifies the service ID of the management VPLS managing this SAP or spoke SDP.                                                                                                                                                                             |

| Label                | Description (Continued)                                                                   |
|----------------------|-------------------------------------------------------------------------------------------|
| Managed by SAP/spoke | Specifies the SAP ID or SDP ID inside the management VPLS managing this SAP or spoke SDP. |
| Prune state          | Specifies the STP state inherited from the management VPLS.                               |

### Sample Output

```
*A:ALA-12# show service id 11 stp
=====
Stp info, Service 11
=====
Bridge Id : 80:00.22:68:ff:00:00:00 Top. Change Count : 1
Root Bridge : 00:00.22:69:ff:00:00:00 Stp Oper State : Syncing Vcp
Primary Bridge : N/A Topology Change : Inactive
Mode : Mstp Last Top. Change : 0d 19:12:58
Vcp Active Prot. : N/A
Root Port : 2048 External RPC : 10
=====
MSTP specific info for CIST
=====
Regional Root : This Bridge Root Port : 2048
Internal RPC : 0 Remaining Hopcount: 20
=====
Stp port info for CIST
=====
Sap/Sdp Id Oper- Port- Port- Port- Oper- Link- Active
 State Role State Num Edge Type Prot.

1/1/1:0 Up Root Forward 2048 False Pt-pt Mstp
1/1/3:0 Up N/A Forward 2049 N/A Pt-pt N/A
1/1/4:* Up Designated Forward 2050 False Pt-pt Mstp
=====
MSTP specific info for MSTI 111
=====
Regional Root : 80:6f.1c:65:ff:00:00:00 Root Port : 2050
Internal RPC : 10 Remaining Hopcount: 19
=====
MSTP port info for MSTI 111
=====
Sap/Sdp Id Oper- Port- Port- Port- Same
 State Role State Num Region

1/1/1:0 Up Master Forward 2048 False
1/1/3:0 Up N/A Forward 2049 N/A
1/1/4:* Up Root Forward 2050 True
=====
*A:ALA-12#

*A:ALA-12# show service id stp detail
=====
Spanning Tree Information
=====
VPLS Spanning Tree Information
```

```

VPLS oper state : Up Core Connectivity : Down
Stp Admin State : Up Stp Oper State : Up
Mode : Mstp Vcp Active Prot. : N/A

Bridge Id : 80:00.22:68:ff:00:00:00 Bridge Instance Id: 0
Bridge Priority : 32768 Tx Hold Count : 6
Topology Change : Inactive Bridge Hello Time : 2
Last Top. Change : 0d 19:14:34 Bridge Max Age : 20
Top. Change Count : 1 Bridge Fwd Delay : 15
MST region revision : 0 Bridge max hops : 20
MST region name : abc

Root Bridge : 00:00.22:69:ff:00:00:00
Primary Bridge : N/A

Root Path Cost : 10 Root Forward Delay: 15
Rcvd Hello Time : 2 Root Max Age : 20
Root Priority : 0 Root Port : 2048

MSTP info for CIST :
Regional Root : This Bridge Root Port : 2048
Internal RPC : 0 Remaining Hopcount: 20
MSTP info for MSTI 111 :
Regional Root : 80:6f.1c:65:ff:00:00:00 Root Port : 2050
Internal RPC : 10 Remaining Hopcount: 19

Spanning Tree Virtual Core Port (VCP) Specifics

Mesh Sdp Id Sdp Sdp Bind Mesh Sdp HoldDown Awaiting
 Oper-state Oper-state Port-state Timer Agreement

3:11 Down Down Discard Inactive N/A
4:11 Down Down Discard Inactive N/A

Spanning Tree Sap/Spoke SDP Specifics

SAP Identifier : 1/1/1:0 Stp Admin State : Up
Port Role : Root Port State : Forwarding
Port Number : 2048 Port Priority : 128
Port Path Cost : 10 Auto Edge : Enabled
Admin Edge : Disabled Oper Edge : False
Link Type : Pt-pt BPDU Encap : Dot1d
Root Guard : Disabled Active Protocol : Mstp
Last BPDUs from : 00:00.22:69:ff:00:00:00 Inside Mst Region : False
CIST Desig Bridge : 00:00.22:69:ff:00:00:00 Designated Port : 34816
MSTI 111 Port Prio : 128 Port Path Cost : 10
MSTI 111 Desig Brid: This Bridge Designated Port : 34816
Forward transitions: 1 Bad BPDUs rcvd : 0
Cfg BPDUs rcvd : 0 Cfg BPDUs tx : 0
TCN BPDUs rcvd : 0 TCN BPDUs tx : 0
RST BPDUs rcvd : 0 RST BPDUs tx : 0
MST BPDUs rcvd : 34638 MST BPDUs tx : 3

SAP Identifier : 1/1/3:0 Stp Admin State : Down
Port Role : N/A Port State : Forwarding
Port Number : 2049 Port Priority : 128
Port Path Cost : 10 Auto Edge : Enabled
Admin Edge : Disabled Oper Edge : N/A
Link Type : Pt-pt BPDU Encap : Dot1d
Root Guard : Disabled Active Protocol : N/A

```

```

Last BPDUs from : N/A
CIST Desig Bridge : N/A
MSTI 111 Port Prio : 128
MSTI 111 Desig Brid: N/A
Forward transitions: 1
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
MST BPDUs rcvd : 0

Designated Port : 0
Port Path Cost : 10
Designated Port : 0
Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0
MST BPDUs tx : 0

SAP Identifier : 1/1/4:*
Port Role : Designated
Port Number : 2050
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDUs from : 50:00.1c:65:ff:00:00:00
CIST Desig Bridge : This Bridge
MSTI 111 Port Prio : 128
MSTI 111 Desig Brid: 80:6f.1c:65:ff:00:00:00
Forward transitions: 1
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
MST BPDUs rcvd : 34636

Stp Admin State : Up
Port State : Forwarding
Port Priority : 128
Auto Edge : Enabled
Oper Edge : False
BPDU Encap : Dot1d
Active Protocol : Mstp
Inside Mst Region : True
Designated Port : 34818
Port Path Cost : 10
Designated Port : 34819
Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0
MST BPDUs tx : 34640

=====
*A:ALA-12#
*A:SetupCLI# show service id 2001 stp
=====
Stp info, Service 2001
=====
Bridge Id : 80:00.70:ec:ff:00:00:00
Root Bridge : N/A
Primary Bridge : N/A
Mode : Rstp
Vcp Active Prot. : N/A
Root Port : N/A
Top. Change Count : 0
Stp Oper State : Down
Topology Change : Inactive
Last Top. Change : 0d 00:00:00
External RPC : 0

=====
Stp port info
=====
Sap/ PIP Id Oper- Port- Port- Port- Oper- Link- Active
 State Role State Num Edge Type Prot.

Backbone VPLS Down N/A Discard 2048 N/A N/A N/A
1/1/12:2001.2001 Down N/A Disabled 2049 N/A Pt-pt N/A

=====
*A:SetupCLI#

*A:SetupCLI# show service id 2001 stp detail
=====
Spanning Tree Information

VPLS Spanning Tree Information

VPLS oper state : Down
Stp Admin State : Down
Mode : Rstp
Core Connectivity : Down
Stp Oper State : Down
Vcp Active Prot. : N/A

Bridge Id : 80:00.70:ec:ff:00:00:00
Bridge Instance Id: 0

```

## Show, Clear, Debug Commands

```

Bridge Priority : 32768
Topology Change : Inactive
Last Top. Change : 0d 00:00:00
Top. Change Count : 0
MST region revision: 0
MST region name :

Tx Hold Count : 6
Bridge Hello Time : 2
Bridge Max Age : 20
Bridge Fwd Delay : 15
Bridge max hops : 20

Root Bridge : N/A
Primary Bridge : N/A

Root Path Cost : 0
Rcvd Hello Time : 2
Root Priority : 32768

Root Forward Delay : 15
Root Max Age : 20
Root Port : N/A

Spanning Tree Sap/Spoke SDP Specifics

SAP Identifier : 1/1/12:2001.2001
Port Role : N/A
Port Number : 2049
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDUs from : N/A
CIST Desig Bridge : N/A
Forward transitions : 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
MST BPDUs rcvd : 0

Stp Admin State : Up
Port State : Unknown
Port Priority : 128
Auto Edge : Enabled
Oper Edge : N/A
BPDU Encap : Dot1d
Active Protocol : N/A

Designated Port : N/A
Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0
MST BPDUs tx : 0

Spanning Tree PIP (Provider Internal Port) Specifics

Oper Status : Down
Port Num : 2048
Port Role : N/A
CIST Desig Bridge : N/A
b-Vpls STP state : Disabled
Forward transitions : 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
MST BPDUs rcvd : 0

mVPLS Prune State : N/A
Oper Protocol : N/A
Port State : Discarding
Designated Port : N/A

Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0
MST BPDUs tx : 0
=====
*A:SetupCLI#

```

## subscriber-hosts

|                    |                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subscriber-hosts</b> [ <b>sap</b> <i>sap-id</i> ] [ <b>ip</b> <i>ip-address[/mask]</i> ] [ <b>mac</b> <i>ieee-address</i> ] [ <b>sub-profile</b> <i>sub-profile-name</i> ] [ <b>sla-profile</b> <i>sla-profile-name</i> ] [ <b>detail</b> ] |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays subscriber host information.                                                                                                                                                                                             |
| <b>Parameters</b>  | <b>sap</b> <i>sap-id</i> — Displays the specified subscriber host SAP information. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.                                                                        |



**ip-address/mask** — The IP address of the IP interface. The *ip-address* portion of the **address** command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation.

**Values** Allowed values are IP addresses in the range 1.0.0.0 — 223.255.255.255 (with support of /31 subnets).  
mask: 1 — 32

**mac ieee-address** — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

**sub-profile sub-profile-name** — Specifies an existing subscriber profile name to be associated with the static subscriber host. The subscriber profile is configured in the **config>subscr-mgmt>sub-profile** context.

**sla-profile sla-profile-name** — Specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the **config>subscr-mgmt>sla-profile** context.

**detail** — Displays detailed information.

### Sample Output

```
A:ALA#-SR12# show service id 20 subscriber-hosts
=====
Subscriber Host table
=====
Sap Id IP Address MAC Address Origin(*) Subscriber

1/2/6:0 101.1.1.10 00:bb:bb:00:00:00 S/-/-
 Eval-20-static

Number of subscriber hosts : 1
=====
(*) S=Static Host, D=DHCP Lease, N=Non-Sub-Traffic
A:ALA#

A:ALA# show service id 10 subscriber-hosts
=====
Subscriber Host table
=====
Sap Id IP Address MAC Address Origin(*) Subscriber

1/2/5:0 100.1.1.10 00:aa:aa:00:00:01 -/D/-
 SUB-10-00aaaa000001

Number of subscriber hosts : 1
=====
(*) S=Static Host, D=DHCP Lease, N=Non-Sub-Traffic
A:ALA-SR12#
```

statistics

|                    |                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <i>policy name</i> ] [ <b>sap</b> <i>sap-id</i> ]                                                                                                                 |
| <b>Context</b>     | show>service>id>authentication                                                                                                                                                        |
| <b>Description</b> | This command displays session authentication statistics for this service.                                                                                                             |
| <b>Parameters</b>  | <b>sap</b> <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax. |

Sample Output

```
*A:ALA-1# show service id 11 authentication statistics
=====
Authentication statistics
=====
Interface / SAP Authentication Authentication
 Successful Failed

vpls-11-90.1.0.254 1582 3

Number of entries: 1
=====
*A:ALA-1#
```

## IGMP Snooping Show Commands

### igmp-snooping

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>igmp-snooping</b>                                                   |
| <b>Context</b>     | show>service>id                                                        |
| <b>Description</b> | This command enables the context to display IGMP snooping information. |

### all

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>all</b>                                                                                                |
| <b>Context</b>     | show>service>id>igmp-snooping                                                                             |
| <b>Description</b> | This command displays detailed information for all aspects of IGMP snooping on the VPLS service.          |
| <b>Output</b>      | <b>Show All Service-ID</b> — The following table describes the show all service-id command output fields: |

| Label          | Description                                                                                   |
|----------------|-----------------------------------------------------------------------------------------------|
| Admin State    | The administrative state of the IGMP instance.                                                |
| Querier        | Displays the address of the IGMP querier on the IP subnet to which the interface is attached. |
| Sap Id         | Displays the SAP IDs of the service ID.                                                       |
| Oper State     | Displays the operational state of the SAP IDs of the service ID.                              |
| Mrtr Port      | Specifies if the port is a multicast router port.                                             |
| Send Queries   | Specifies whether the send-queries command is enabled or disabled.                            |
| Max Num Groups | Specifies the maximum number of multicast groups that can be joined on this SAP.              |
| MVR From VPLS  | Specifies MVR from VPLS.                                                                      |
| Num Groups     | Specifies the actual number of multicast groups that can be joined on this SAP.               |

#### Sample Output

```
A:ALA-48>show>service>id>igmp-snooping>snooping# all
=====
IGMP Snooping info for service 750
```

```

=====
IGMP Snooping Base info

Admin State : Up
Querier : No querier found

Sap/Sdp Oper MRtr Send Max Num Num
Id State Port Queries Groups Groups

sap:1/1/7:0 Down No Disabled No Limit 0
sdp:1:22 Down No Disabled No Limit 0
sdp:8:750 Down No Disabled No Limit 0

IGMP Snooping Querier info

No querier found for this service.

IGMP Snooping Multicast Routers

MRouter Sap/Sdp Id Up Time Expires Version

Number of mrouter: 0

IGMP Snooping Proxy-reporting DB

Group Address Mode Type Up Time Expires Num Src

Number of groups: 0

IGMP Snooping SAP 1/1/7:0 Port-DB

Group Address Mode Type Up Time Expires Num Src

Number of groups: 0

IGMP Snooping SDP 1:22 Port-DB

Group Address Mode Type Up Time Expires Num Src

Number of groups: 0

IGMP Snooping SDP 8:750 Port-DB

Group Address Mode Type Up Time Expires Num Src

Number of groups: 0

IGMP Snooping Static Source Groups

IGMP Snooping Statistics

Message Type Received Transmitted Forwarded

General Queries 0 0 0
Group Queries 0 0 0
Group-Source Queries 0 0 0
V1 Reports 0 0 0
V2 Reports 0 0 0
V3 Reports 0 0 0
V2 Leaves 0 0 0
Unknown Type 0 N/A 0

```

```

Drop Statistics

Bad Length : 0
Bad IP Checksum : 0
Bad IGMP Checksum : 0
Bad Encoding : 0
No Router Alert : 0
Zero Source IP : 0

Send Query Cfg Drops : 0
Import Policy Drops : 0
Exceeded Max Num Groups : 0
=====
```

```
A:ALA-48>show>service>id>snooping#
```

## mfib

|                    |                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mfib</b> [ <b>brief</b>   <b>statistics</b> ] [ <b>ip</b>   <b>mac</b> ] <b>brief</b><br><b>mfib</b> [ <b>group</b> <i>grp-address</i>   * ][ <b>statistics</b> ]                                                                                                                                                   |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command displays the multicast FIB on the VPLS service.                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <b>brief</b> — Displays a brief output.<br><b>statistics</b> — Displays statistics on the multicast FIB.<br><b>ip</b> — Displays IP address information.<br><b>mac</b> — Displays MAC address information.<br><b>group</b> <i>grp grp-address</i> — Displays the multicast FIB for a specific multicast group address. |
| <b>Output</b>      | <b>Show Output</b> — The following table describes the command output fields:                                                                                                                                                                                                                                          |

| Label               | Description                                                                                                                                                                                        |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source Address      | IPv4 unicast source address.                                                                                                                                                                       |
| Group Address       | IPv4 multicast group address.                                                                                                                                                                      |
| SAP ID              | Indicates the SAP/SDP to which the corresponding multicast stream will be forwarded/blocked.                                                                                                       |
| Forwarding/Blocking | Indicates whether the corresponding multicast stream will be blocked/forwarded.                                                                                                                    |
| Number of Entries   | Specifies the number of entries in the MFIB.                                                                                                                                                       |
| Forwarded Packets   | Indicates the number of multicast packets forwarded for the corresponding source/group.                                                                                                            |
| Forwarded Octets    | Indicates the number of octets forwarded for the corresponding source/group.                                                                                                                       |
| Svc ID              | Indicates the service to which the corresponding multicast stream will be forwarded/blocked. Local means that the multicast stream will be forwarded/blocked to a SAP or SDP local to the service. |

## Sample Output

```
*A:ALA-SR12-D# show service id 10 mfib statistics
=====
IGMP Snooping MFIB for service 10
=====
Source Address Group Address Fwd Pkts Fwd Octets

1.1.1.1 225.0.0.1 291 9281
1.1.1.2 225.0.0.1 0 0

```

```

Number of entries: 2
=====
*A:ALA-SR12-D#

*A:PE-A# show service id 10 mfib
=====
Multicast FIB, Service 10
=====
Source Address Group Address Sap/Sdp Id Svc Id Fwd/Blk

* 01:1E:83:00:00:65 sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:66 sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:67 sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:68 sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:69 sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:6A sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:6B sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:6C sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:6D sap:2/2/5:10 Local Fwd
* 01:1E:83:00:00:6E sap:2/2/5:10 Local Fwd

Number of entries: 10
=====
*A:PE-A#

```

mrollers

|             |                                              |
|-------------|----------------------------------------------|
| Syntax      | mrollers [detail]                            |
| Context     | show>service>id>igmp-snooping                |
| Description | This command displays all multicast routers. |
| Parameters  | detail — Displays detailed information.      |

Sample Output

```
*A:ala-427# show service id 1 igmp-snooping mrollers
=====
IGMP Snooping Multicast Routers for service 1
=====
MRouter Sap/Sdp Id Up Time Expires Version

10.10.1.1 1/1/5:1 0d 00:00:26 14s 3
10.20.1.6 1/1/2:1 0d 00:10:16 2s 3

Number of mrollers: 2
=====
*A:ala-427#

*A:ala-427# show service id 1 igmp-snooping mrollers detail
=====
IGMP Snooping Multicast Routers for service 1
=====
MRouter 10.10.1.1

Sap Id : 1/1/5:1
Expires : 17s
Up Time : 0d 00:00:32
Version : 3

General Query Interval : 10s
Query Response Interval : 1.0s
Robust Count : 2

MRouter 10.20.1.6

Sap Id : 1/1/2:1
Expires : 3s
Up Time : 0d 00:10:22
Version : 3

General Query Interval : 2s
Query Response Interval : 1.0s
Robust Count : 2

Number of mrollers: 2
=====
*A:ala-427#
```



## mvr

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mvr</b>                                                                                                |
| <b>Context</b>     | show>service>id>igmp-snooping                                                                             |
| <b>Description</b> | This command displays Multicast VPLS Registration (MVR) information.                                      |
| <b>Output</b>      | <b>Show All Service-ID</b> — The following table describes the show all service-id command output fields: |

| Label           | Description                                                                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| MVR Admin State | Administrative state.                                                                                                                               |
| MVR Policy      | Policy name.                                                                                                                                        |
| Svc ID          | The service identifier.                                                                                                                             |
| Sap/Sdp Id      | Displays the SAP and SDP IDs of the service ID.                                                                                                     |
| Oper State      | Displays the operational state of the SAP and SDP IDs of the svcid.                                                                                 |
| Mrtr Port       | Specifies if the port is a multicast router port.                                                                                                   |
| From VPLS       | Specifies from which VPLS the multicast streams corresponding to the groups learned via this SAP will be copied. If local, it is from its own VPLS. |
| Num Groups      | Specifies the number of groups learned via this local SAP.                                                                                          |

## Sample Output

```
*A:ALA-1>show>service>id>snooping# mvr
=====
IGMP Snooping Multicast VPLS Registration info for service 10
=====
IGMP Snooping Admin State : Up
MVR Admin State : Up
MVR Policy : mvr-policy

Local SAPs/SDPs

Svc Id Sap/Sdp Oper From Num Local
 Id State VPLS Groups

100 sap:1/1/10:10 Up Local 100
100 sap:1/1/10:20 Up Local 100

MVR SAPs (from-vpls=10)

Svc Id Sap/Sdp Oper From Num MVR
 Id State VPLS Groups

20 sap:1/1/4:100 Up 10 100
30 sap:1/1/31:10.10 Up 10 100
=====
*A:ALA-1>show>service>id>snooping#
```

## port-db

**Syntax**     **port-db sap** *sap-id* [**detail**]  
**port-db sap** *sap-id* **group** *grp-address*  
**port-db sdp** *sdp-id:vc-id* [**detail**]  
**port-db sdp** *sdp-id:vc-id* **group** *grp-address*

**Context**     show>service>id>igmp-snooping

**Description**     This command displays information on the IGMP snooping port database for the VPLS service.

**Parameters**     **group** *grp-ip-address* — Displays the IGMP snooping port database for a specific multicast group address.

**sap** *sap-id* — Displays the IGMP snooping port database for a specific SAP. See [Common CLI Command Descriptions on page 1933](#) for command syntax.

**sdp** *sdp-id* — Displays only IGMP snooping entries associated with the specified mesh SDP or spoke SDP. For a spoke SDP, the VC ID must be specified, for a mesh SDP, the VC ID is optional.

**Values**     1 — 17407

*vc-id* — The virtual circuit ID on the SDP ID for which to display information.

**Default**     For mesh SDPs only, all VC IDs.

**Values**     1 — 4294967295

**group** *grp-address* — Displays IGMP snooping statistics matching the specified group address.

**source** *ip-address* — Displays IGMP snooping statistics matching one particular source within the multicast group.

**Output**     **Show Output** — The following table describes the show output fields:

| Label         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group Address | The IP multicast group address for which this entry contains information.                                                                                                                                                                                                                                                                                                                                                                                              |
| Mode          | Specifies the type of membership report(s) received on the interface for the group.<br>In the include mode, reception of packets sent to the specified multicast address is requested only from those IP source addresses listed in the source-list parameter of the IGMP membership report.<br>In exclude' mode, reception of packets sent to the given multicast address is requested from all IP source addresses except those listed in the source-list parameter. |
| Type          | Indicates how this group entry was learned.<br>If this group entry was learned by IGMP, the value is set to dynamic.<br>For statically configured groups, the value is set to static.                                                                                                                                                                                                                                                                                  |

| Label               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Compatibility mode  | Specifies the IGMP mode. This is used in order for routers to be compatible with older version routers. IGMPv3 hosts must operate in Version 1 and Version 2 compatibility modes. IGMPv3 hosts must keep state per local interface regarding the compatibility mode of each attached network. A host's compatibility mode is determined from the host compatibility mode variable which can be in one of three states: IGMPv1, IGMPv2 or IGMPv3. This variable is kept per interface and is dependent on the version of general queries heard on that interface as well as the older version querier present timers for the interface. |
| V1 host expires     | The time remaining until the local router will assume that there are no longer any IGMP Version 1 members on the IP subnet attached to this interface. Upon hearing any IGMPv1 membership report, this value is reset to the group membership timer. While this time remaining is non-zero, the local router ignores any IGMPv2 leave messages for this group that it receives on this interface.                                                                                                                                                                                                                                      |
| V2 host expires     | The time remaining until the local router will assume that there are no longer any IGMP Version 2 members on the IP subnet attached to this interface. Upon hearing any IGMPv2 membership report, this value is reset to the group membership timer. While this time remaining is non-zero, the local router ignores any IGMPv3 leave messages for this group that it receives on this interface.                                                                                                                                                                                                                                      |
| Source address      | The source address for which this entry contains information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Up Time             | The time since the source group entry was created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Expires             | The amount of time remaining before this entry will be aged out.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Number of sources   | Indicates the number of IGMP group and source specific queries received on this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Forwarding/Blocking | Indicates whether this entry is on the forward list or block list.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Number of groups    | Indicates the number of groups configured for this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

### Sample Output

```
*A:ALA-1>show>service>id>snooping# port-db sap 1/1/2
=====
IGMP Snooping SAP 1/1/2 Port-DB for service 10
=====
Group Address Mode Type Up Time Expires Num Sources

225.0.0.1 include dynamic 0d 00:04:44 0s 2
=====
*A:ALA-1>show>service>id>snooping#
```

## proxy-db

|                    |                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>proxy-db [detail]</b><br><b>proxy-db group grp-address</b>                                                             |
| <b>Context</b>     | show>service>id>igmp-snooping                                                                                             |
| <b>Description</b> | This command displays information on the IGMP snooping proxy reporting database for the VPLS service.                     |
| <b>Parameters</b>  | <b>group grp-ip-address</b> — Displays the IGMP snooping proxy reporting database for a specific multicast group address. |
| <b>Output</b>      | <b>Show Output</b> — The following table describes the show output fields:                                                |

| Label            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group Address    | The IP multicast group address for which this entry contains information.                                                                                                                                                                                                                                                                                                                                                                                                |
| Mode             | Specifies the type of membership report(s) received on the interface for the group. In the include mode, reception of packets sent to the specified multicast address is requested only from those IP source addresses listed in the source-list parameter of the IGMP membership report.<br><br>In “exclude” mode, reception of packets sent to the given multicast address is requested from all IP source addresses except those listed in the source-list parameter. |
| Up Time          | The total operational time in seconds.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Num Sources      | Indicates the number of IGMP group and source specific queries received on this interface.                                                                                                                                                                                                                                                                                                                                                                               |
| Number of groups | Number of IGMP groups.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Source Address   | The source address for which this entry contains information.                                                                                                                                                                                                                                                                                                                                                                                                            |

## Sample Output

```
*A:ALA-1>show>service>id>snooping# proxy-db
=====
IGMP Snooping Proxy-reporting DB for service 10
=====
Group Address Mode Up Time Num Sources

225.0.0.1 include 0d 00:05:40 2

Number of groups: 1
=====
*A:ALA-1>show>service>id>snooping#

*A:ALA-1>show>service>id>snooping# proxy-db detail
```

```

=====
IGMP Snooping Proxy-reporting DB for service 10

IGMP Group 225.0.0.1

Up Time : 0d 00:05:54 Mode : include

Source Address Up Time

1.1.1.1 0d 00:05:54
1.1.1.2 0d 00:05:54

Number of groups: 1
=====
*A:ALA-1>show>service>id>snooping#

```

## querier

|                    |                                                                            |
|--------------------|----------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>querier</b>                                                             |
| <b>Context</b>     | show>service>id>igmp-snooping                                              |
| <b>Description</b> | Displays information on the IGMP snooping queriers for the VPLS service.   |
| <b>Output</b>      | <b>Show Output</b> — The following table describes the show output fields: |

| Label                   | Description                                                                     |
|-------------------------|---------------------------------------------------------------------------------|
| SAP Id                  | Specifies the SAP ID of the service.                                            |
| IP address              | Specifies the IP address of the querier.                                        |
| Expires                 | The time left, in seconds, that the query will expire.                          |
| Up time                 | The length of time the query has been enabled.                                  |
| Version                 | The configured version of IGMP.                                                 |
| General Query Interval  | The frequency at which host-query packets are transmitted.                      |
| Query Response Interval | The time to wait to receive a response to the host-query message from the host. |
| Robust Count            | Specifies the value used to calculate several IGMP message intervals.           |

### Sample Output

```

*A:ALA-1>show>service>id>snooping# querier
=====
IGMP Snooping Querier info for service 10
=====
Sap Id : 1/1/1

```

## Show, Clear, Debug Commands

```
IP Address : 10.10.10.1
Expires : 6s
Up Time : 0d 00:56:50
Version : 3
```

```
General Query Interval : 5s
Query Response Interval : 2.0s
Robust Count : 2
```

```
=====
*A:ALA-1>show>service>id>snooping#
```

## static

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static</b> [ <b>sap</b> <i>sap-id</i>   <b>sdp</b> <i>sdp-id:vc-id</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | show>service>id>igmp-snooping                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b> | This command displays information on static IGMP snooping source groups for the VPLS service.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><b>sap</b> <i>sap-id</i> — Displays static IGMP snooping source groups for a specific SAP. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>sdp</b> <i>sdp-id</i> — Displays the IGMP snooping source groups for a specific spoke or mesh SDP.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID for which to display information.</p> <p><b>Default</b> For mesh SDPs only, all VC IDs.</p> <p><b>Values</b> 1 — 4294967295</p> |
| <b>Output</b>      | <b>Show Output</b> — The following table describes the show output fields:                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Label  | Description                                                          |
|--------|----------------------------------------------------------------------|
| Source | Displays the IP source address used in IGMP queries.                 |
| Group  | Displays the static IGMP snooping source groups for a specified SAP. |

## Sample Output

```
*A:ALA-1>show>service>id>snooping# static
=====
IGMP Snooping Static Source Groups for SAP 1/1/2

Source Group

* 225.0.0.2
* 225.0.0.3

Static (*,G)/(S,G) entries: 2

IGMP Snooping Static Source Groups for SDP 10:10

Source Group

1.1.1.1 225.0.0.10

Static (*,G)/(S,G) entries: 1
=====
*A:ALA-1>show>service>id>snooping#
```

statistics

- Syntax** **statistics** [**sap** *sap-id* | **sdp** *sdp-id:vc-id*]
- Context** show>service>id>igmp-snooping
- Description** This command displays IGMP snooping statistics for the VPLS service.
- Parameters**

**sap** *sap-id* — Displays IGMP snooping statistics for a specific SAP. See [Common CLI Command Descriptions on page 1933](#) for command syntax.

**sdp** *sdp-id* — Displays the IGMP snooping statistics for a specific spoke or mesh SDP.

**Values** 1 — 17407

*vc-id* — The virtual circuit ID on the SDP ID for which to display information.

**Default** For mesh SDPs only, all VC IDs.

**Values** 1 — 4294967295

Sample Output

```
*A:ALA-1>show>service>id>snooping# statistics
=====
IGMP Snooping Statistics for service 1
=====
Message Type Received Transmitted Forwarded

General Queries 4 0 4
Group Queries 0 0 0
Group-Source Queries 0 0 0
V1 Reports 0 0 0
V2 Reports 0 0 0
V3 Reports 0 0 0
V2 Leaves 0 0 0
Unknown Type 0 N/A 0

Drop Statistics

Bad Length : 0
Bad IP Checksum : 0
Bad IGMP Checksum : 0
Bad Encoding : 0
No Router Alert : 0
Zero Source IP : 0

Send Query Cfg Drops : 0
Import Policy Drops : 0
Exceeded Max Num Groups : 0

MVR From VPLS Cfg Drops : 0
MVR To SAP Cfg Drops : 0
=====
*A:ALA-1>show>service>id>snooping#
```



## egress-replication

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress-replication</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | show                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | This command enables the context to display egress flooding information for a VPLS service context on a given MDA. A VPLS service context supports both Layer 2 and Layer 3 flooding modes. The Layer 2 flooding mode is used for broadcast, Layer 2 multicast and unknown destination MAC addressed packets. All available interfaces (SAP, spoke SDP and mesh-SDP) that reside on an egress forwarding complex are included in the egress list except for SAPs that are defined in a residential split horizon group (Layer 2 flooding is not permitted on residential SAPs). The Layer 3 flooding mode is used for VPLS interfaces participating in IGMP snooping and is represented by an IP multicast [s,g] record. |

## vpls

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>vpls vpls-service-id mda card/slot</b><br><b>vpls vpls-service-id mda card/slot [igmp-record group ip-address {source ip-address   starg}]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | show>egress-replication                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | <p>The <b>vpls vpls-service-id mda slot/mda</b> command displays the flooding list used by the Layer 2 flooding mode for the VPLS service on the specified MDA. The Layer 2 flooding list is limited to SAPs, spoke SDP and mesh-SDP bindings that exist on the egress forwarding complex serviced by the specified MDA. For the 10G IOM, two MDAs share the same egress forwarding plane. In this case the Layer 2 flooding list will contain destinations for both MDAs (if entries exist). . The only VPLS interfaces that will not be included in the list are residential SAPs because Layer 2 replication is not permitted to a residential SAP. A packet processed by the egress Layer 2 flooding list may not be replicated to each destination. A packet will not be replicated to an interface on the Layer 2 flooding list because of the following:</p> <p>The ingress interface is the same as egress interface (source squelching rule)</p> <ul style="list-style-type: none"> <li>• The ingress interface split horizon group is the same as the egress interface (residential bridging rule).</li> <li>• The egress interface is down or blocking.</li> <li>• The packet matches a discard event while processing that destination interface.</li> <li>• An egress MTU violation occurs for the destination interface.</li> </ul> <p>Destination SAPs in the list may be displayed in a chain context representing common replication behavior. All SAPs in a single chain are processed a single time through the egress forwarding plane. If a discard decision is made for the first SAP in the chain, no replication processing is done for any of the chain members. If the forwarding plane decides to replicate the first SAP in the chain, it will replicate to all SAPs in the chain.</p> <p>The <b>vpls vpls-service-id mda card/slot igmp-record grp-address {source source-ip-address   starg}</b> command displays the IGMP record based flooding list for the <i>vpls-service-id</i> on the specified MDA. Unlike the Layer 2 flooding list for the VPLS context, an IGMP record list may contain interfaces from other VPLS contexts due to MVR (Multicast VPLS Registration) events on the individual VPLS interfaces. VPLS interfaces in other VPLS contexts become associated with the specified vpls-</p> |

service-id based on the MVR from-vpls definition. Another difference between the VPLS Layer 2 flooding list and IGMP lists is that many IGMP lists may exist (each associated with a different [s,g] record) and the lists may contain residential SAPs. The SAP chaining and replication behavior is similar to the VPLS Layer 2 flooding list.

IP multicast packets ingressing the vpls-service-id must match either a [\*g] or [s,g] record to be associated with the record's egress IP multicast IGMP flooding list. A [\*g] record will match any ingress IP multicast packet destined to the class D destination IP address represented by "g". An [s,g] record will match any ingress IP multicast packet with a source IP address matching "s" and a destination IP address matching "g". In the case that a packet could match both a [\*g] and [s,g] record, the [s,g] record takes precedence. Each [\*g] and [s,g] record has its own IGMP flooding list. The list will only appear on an egress forwarding plane (MDA) when a member of the list (VPLS interface) exists on the forwarding plane.

#### Parameters

*service-id* — Displays information about the specified service ID or service name.

##### Values

service-id: 1 — 214748364

svc-name: A string up to 64 characters in length.

*slot/mda* — Specifies a chassis and MDA slot.

*grp-ip-address* — Specifies a multicast group address.

*src-ip-address* — Specifies a source IP address.

**starg** — Specifies a (\*, G) record.

**mRouter** — Specifies the (\*,\*) record

**ipv6** — Displays IPv6 information.

*grp-ipv6-address* — ipv6-address - x:x:x:x:x:x:x (eight 16-bit pieces)

x:x:x:x:x:d.d.d.d

x - [0..FFFF]H

d - [0..255]D

multicast group IPv6 address

*src-ipv6-address* — ipv6-address - x:x:x:x:x:x:x (eight 16-bit pieces)

x:x:x:x:x:d.d.d.d

x - [0..FFFF]H

d - [0..255]D

## IGMP Commands

### group

|                    |                                                                                                                                                                                      |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>group</b> [ <i>grp-ip-address</i> ]                                                                                                                                               |
| <b>Context</b>     | show>router>igmp                                                                                                                                                                     |
| <b>Description</b> | This command displays the multicast group and (s, g) addresses. If no <i>grp-ip-address</i> parameters are specified then all IGMP group, (*, g) and (s, g) addresses are displayed. |
| <b>Parameters</b>  | <i>grp-ip-address</i> — Displays specific multicast group addresses.                                                                                                                 |
| <b>Output</b>      | <b>IGMP Group Output</b> — The following table describes the output fields for IGMP group information.                                                                               |

| Label       | Description                                                                                                 |
|-------------|-------------------------------------------------------------------------------------------------------------|
| IGMP Groups | Displays the IP multicast sources corresponding to the IP multicast groups which are statically configured. |
| Fwd List    | Displays the list of interfaces in the forward list.                                                        |
| Blk List    | Displays the list of interfaces in the block list.                                                          |

### Sample Output

```
A:NYC# show router igmp group
=====
IGMP Groups
=====
(*,224.24.24.24) Up Time : 0d 05:21:38
 Fwd List : nyc-vlc

(*,239.255.255.250) Up Time : 0d 05:21:38
 Fwd List : nyc-vlc

(*,G)/(S,G) Entries : 2
=====
A:NYC#

A:NYC# show router igmp group 224.24.24.24
=====
IGMP Groups
=====
(*,224.24.24.24) Up Time : 0d 05:23:23
 Fwd List : nyc-vlc

(*,G)/(S,G) Entries : 1
=====
A:NYC#
```

## ssm-translate

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ssm-translate</b>                                                               |
| <b>Context</b>     | show>router>igmp                                                                   |
| <b>Description</b> | This command displays IGMP SSM translate configuration information.                |
| <b>Output</b>      | <b>GMP Interface Output</b> — The following table provides IGMP field descriptions |

| Label                 | Description                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------|
| Group Range           | Displays the address ranges of the multicast groups for which this router can be an RP. |
| Source                | Displays the unicast address that sends data on an interface.                           |
| SSM Translate Entries | Displays the total number of SSM translate entries.                                     |

```
A:ALA-48>config>router>igmp# show router igmp ssm-translate
=====
IGMP SSM Translate Entries
=====
Group Range Source

<224.0.1.0 - 224.0.1.255> 1.1.1.1
<225.1.0.0 - 225.240.3.57> 2.2.2.2
<239.255.255.0 - 239.255.255.255> 3.3.3.3

SSM Translate Entries : 3
=====
A:ALA-48>config>router>igmp#
```

## interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> [ <i>ip-int-name</i>   <i>ip-address</i> ] [ <b>group</b> ] [ <i>grp-address</i> ] [ <b>detail</b> ]                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | show>router>igmp                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays IGMP interface information.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><i>ip-int-name</i> — Only displays the information associated with the specified IP interface name.</p> <p><i>ip-address</i> — Only displays the information associated with the specified IP address.</p> <p><b>group</b> <i>grp-address</i> — Only displays IP multicast group address for which this entry contains information.</p> <p><b>detail</b> — Displays detailed IP interface information along with the source group information learned on that interface.</p> |
| <b>Output</b>      | <b>IGMP Interface Output</b> — The following table provides IGMP field descriptions.                                                                                                                                                                                                                                                                                                                                                                                            |

| Label                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface                             | Specifies the interfaces that participates in the IGMP protocol.                                                                                                                                                                                                                                                                                                                                                                                                               |
| Adm<br>Admin Status                   | Displays the administrative state for the IGMP protocol on this interface.                                                                                                                                                                                                                                                                                                                                                                                                     |
| Oper<br>Oper Status                   | Displays the current operational state of IGMP protocol on the interface.                                                                                                                                                                                                                                                                                                                                                                                                      |
| Querier                               | Displays the address of the IGMP querier on the IP subnet to which the interface is attached.                                                                                                                                                                                                                                                                                                                                                                                  |
| Querier Up Time                       | Displays the time since the querier was last elected as querier.                                                                                                                                                                                                                                                                                                                                                                                                               |
| Querier Expiry<br>Timer               | Displays the time remaining before the querier ages out. If the querier is the local interface address, the value will be zero.                                                                                                                                                                                                                                                                                                                                                |
| Cfg/Opr Version<br>Admin/Oper version | Cfg – The configured version of IGMP running on this interface. For IGMP to function correctly, all routers on a LAN must be configured to run the same version of IGMP on that LAN.<br>Opr . The operational version of IGMP running on this interface. If the cfg value is 3 but all of the routers in the local subnet of this interface use IGMP version v1 or v2, the operational version will be v1 or v2.                                                               |
| Num Groups                            | The number of multicast groups which have been learned by the router on the interface.                                                                                                                                                                                                                                                                                                                                                                                         |
| Policy                                | Specifies the policy that is to be applied on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Group Address                         | Specifies the IP multicast group address for which this entry contains information.                                                                                                                                                                                                                                                                                                                                                                                            |
| Up Time                               | Specifies the time since this source group entry got created.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Last Reporter                         | Specifies the IP address of the source of the last membership report received for this IP Multicast group address on this interface. If no membership report has been received, this object has the value 0.0.0.0.                                                                                                                                                                                                                                                             |
| Mode                                  | The mode is based on the type of membership report(s) received on the interface for the group. In the 'include' mode, reception of packets sent to the specified multicast address is requested only from those IP source addresses listed in the source-list parameter of the IGMP membership report. In 'exclude' mode, reception of packets sent to the given multicast address is requested from all IP source addresses except those listed in the source-list parameter. |
| V1 Host Timer                         | The time remaining until the local router will assume that there are no longer any IGMP version 1 members on the IP subnet attached to this interface. Upon hearing any IGMPv1 Membership Report, this value is reset to the group membership timer. While this time remaining is non-zero, the local router ignores any IGMPv2 Leave messages for this group that it receives on this interface.                                                                              |

| Label         | Description (Continued)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| V2 Host Timer | The time remaining until the local router will assume that there are no longer any IGMP version 2 members on the IP subnet attached to this interface. Upon hearing any IGMPv2 Membership Report, this value is reset to the group membership timer. While this time remaining is non-zero, the local router ignores any IGMPv3 Leave messages for this group that it receives on this interface.                                                                                                                                                                                                     |
| Type          | Indicates how this group entry was learned. If this group entry was learned by IGMP, it will be set to 'dynamic'. For statically configured groups, the value will be set to 'static'.                                                                                                                                                                                                                                                                                                                                                                                                                |
| Compat Mode   | Used in order for routers to be compatible with older version routers. IGMPv3 hosts MUST operate in version 1 and version 2 compatibility modes. IGMPv3 hosts MUST keep state per local interface regarding the compatibility mode of each attached network. A host's compatibility mode is determined from the Host Compatibility Mode variable which can be in one of three states: IGMPv1, IGMPv2 or IGMPv3. This variable is kept per interface and is dependent on the version of General Queries heard on that interface as well as the Older Version Querier Present timers for the interface. |

### Sample Output

```
A:BA# show router igmp interface
=====
IGMP Interfaces
=====
Interface Adm Oper Querier Cfg/Opr Num Policy
 Version Groups

IGMP_to_CE Up Up 11.1.1.1 1/1 3 igmppol

Interfaces : 1
=====
A:BA#

A:BA# show router 100 igmp interface IGMP_to_CE
=====
IGMP Interface IGMP_to_CE
=====
Interface Adm Oper Querier Cfg/Opr Num Policy
 Version Groups

IGMP_to_CE Up Up 11.1.1.1 1/1 3 igmppol

Interfaces : 1
=====
A:BA#

A:BA# show router 100 igmp interface 11.1.1.1
=====
IGMP Interface 11.1.1.1
=====
```

```

Interface Adm Oper Querier Cfg/Opr Num Policy
 Version Groups

IGMP_to_CE Up Up 11.1.1.1 1/1 3 igmppol

Interfaces : 1
=====

```

A:BA#

A:BA# show router 100 igmp interface IGMP\_to\_CE group 227.1.1.1

```

=====
IGMP Interface IGMP_to_CE
=====
Interface Adm Oper Querier Cfg/Opr Num Policy
 Version Groups

IGMP_to_CE Up Up 11.1.1.1 1/1 3 igmppol

IGMP Group

Group Address : 227.1.1.1 Up Time : 0d 00:03:52
Interface : IGMP_to_CE Expires : never
Last Reporter : 0.0.0.0 Mode : exclude
V1 Host Timer : Not running Type : static
V2 Host Timer : Not running Compat Mode : IGMP Version 3

Interfaces : 1
=====

```

A:BA# show router 100 igmp interface IGMP\_to\_CE group 227.1.1.1 detail

```

=====
IGMP Interface IGMP_to_CE
=====
Interface : IGMP_to_CE
Admin Status : Up Oper Status : Up
Querier : 11.1.1.1 Querier Up Time : 0d 00:04:01
Querier Expiry Time: N/A Time for next query: 0d 00:13:42
Admin/Oper version : 1/1 Num Groups : 3
Policy : igmppol Subnet Check : Disabled
Max Groups Allowed : 16000 Max Groups Till Now: 3
MCAC Policy Name : MCAC Const Adm St : Enable
MCAC Max Unconst BW: no limit MCAC Max Mand BW : no limit
MCAC In use Mand BW: 0 MCAC Avail Mand BW : unlimited
MCAC In use Opnl BW: 0 MCAC Avail Opnl BW : unlimited

IGMP Group

Group Address : 227.1.1.1 Up Time : 0d 00:04:02
Interface : IGMP_to_CE Expires : never
Last Reporter : 0.0.0.0 Mode : exclude
V1 Host Timer : Not running Type : static
V2 Host Timer : Not running Compat Mode : IGMP Version 3

Interfaces : 1
=====
A:BA#

```

## static

- Syntax** **static** [*ip-int-name* | *ip-addr*]
- Context** show>router>igmp
- Description** This command displays static IGMP, (\*, g) (s, g) information.
- Parameters** *ip-int-name* — Only displays the information associated with the specified IP interface name.  
*ip-addr* — Only displays the information associated with the specified IP address.
- Output** **Static IGMP Output** — The following table provides static IGMP field descriptions

| Label     | Description                                                                                                                           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------|
| Source    | Displays entries which represents a source address from which receivers are interested/not interested in receiving multicast traffic. |
| Group     | Displays the IP multicast group address for which this entry contains information.                                                    |
| Interface | Displays the interface name.                                                                                                          |

**Sample Output**

```
A:BA# show router 100 igmp static
=====
IGMP Static Group Source
=====
Source Group Interface

11.11.11.11 226.136.22.3 IGMP_to_CE
* 227.1.1.1 IGMP_to_CE
22.22.22.22 239.255.255.255 IGMP_to_CE

Static (*,G) / (S,G) Entries : 3
=====
A:BA#
```

## statistics

- Syntax** **statistics** [*ip-int-name* | *ip-address*]
- Context** show>router>igmp
- Description** This command displays IGMP statistics information.
- Parameters** *ip-int-name* — Only displays the information associated with the specified IP interface name.  
*ip-addr* — Only displays the information associated with the specified IP address.



**Output**    **IGMP Statistics Output** — The following table provides statistical IGMP field descriptions

| Label                        | Description                                                                                                                                                                                                                                                                             |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IGMP Interface Statistics    | The section listing the IGMP statistics for a particular interface.                                                                                                                                                                                                                     |
| Message Type                 | <p>Queries — The number of IGMP general queries transmitted or received on this interface.</p> <p>Report — The total number of IGMP V1, V2, or V3 reports transmitted or received on this interface.</p> <p>Leaves — The total number of IGMP leaves transmitted on this interface.</p> |
| Received                     | Column that displays the total number of IGMP packets received on this interface.                                                                                                                                                                                                       |
| Transmitted                  | Column that displays the total number of IGMP packets transmitted from this interface.                                                                                                                                                                                                  |
| General Interface Statistics | The section listing the general IGMP statistics.                                                                                                                                                                                                                                        |
| Bad Length                   | Displays the total number of IGMP packets with bad length received on this interface.                                                                                                                                                                                                   |
| Bad Checksum                 | Displays the total number of IGMP packets with bad checksum received on this interface.                                                                                                                                                                                                 |
| Unknown Type                 | Displays the total number of IGMP packets with unknown type received on this interface.                                                                                                                                                                                                 |
| Bad Receive If               | Displays the total number of IGMP packets incorrectly received on this interface.                                                                                                                                                                                                       |
| Rx Non Local                 | Displays the total number of IGMP packets received from a non-local sender.                                                                                                                                                                                                             |
| Rx Wrong Version             | Displays the total number of IGMP packets with wrong versions received on this interface.                                                                                                                                                                                               |
| Policy Drops                 | Displays the number of times IGMP protocol instance matched the host IP address or group/source addresses in the import policy.                                                                                                                                                         |
| No Router Alert              | Displays the total number of IGMPv3 packets received on this interface which did not have the router alert flag set.                                                                                                                                                                    |

### Sample Output

```
A:BA# show router 100 igmp statistics
=====
IGMP Interface Statistics
=====
Message Type Received Transmitted

Queries 0 5
```

```
Report V1 0 0
Report V2 0 0
Report V3 0 0
Leaves 0 0

General Interface Statistics

Bad Length : 0
Bad Checksum : 0
Unknown Type : 0
Bad Receive If : 0
Rx Non Local : 0
Rx Wrong Version : 0
Policy Drops : 0
No Router Alert : 0
Rx Bad Encodings : 0
Rx Pkt Drops : 0

Source Group Statistics

(S,G) : 2
(*,G) : 1
=====
A:BA#
```

status

- Syntax** status
- Context** show>router>igmp
- Description** This command displays IGMP status information.  
If IGMP is not enabled, the following message appears:  
  
A:NYC# show router igmp status  
MINOR: CLI IGMP is not configured.  
A:NYC#
- Output** **IGMP Status Output** — The following table provides IGMP status field descriptions

| Label                      | Description                                                                                                                                                                    |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin State                | Displays the administrative status of IGMP.                                                                                                                                    |
| Oper State                 | Displays the current operating state of this IGMP protocol instance on this router.                                                                                            |
| Query Interval             | The frequency at which IGMP query packets are transmitted.                                                                                                                     |
| Last Member Query Interval | The maximum response time inserted into Group-Specific Queries sent in response to Leave Group messages, and is also the amount of time between Group-Specific Query messages. |
| Query Response Interval    | The maximum query response time advertised in IGMPv2 queries.                                                                                                                  |
| Robust Count               | Displays the number of times the router will retry a query.                                                                                                                    |

**Sample Output**

```

A:BA# show router 100 igmp status
=====
IGMP Status
=====
Admin State : Up
Oper State : Up
Query Interval : 1024
Last Member Query Interval : 1024
Query Response Interval : 1023
Robust Count : 10
=====
A:BA

```

**dhcp**

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                                             |
| <b>Context</b>     | show>service>id                                                                         |
| <b>Description</b> | This command enables the context to display DHCP information for the specified service. |

**lease-state**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-state</b> <i>[[sap sap-id]   [sdp sdp-id:vc-id]   [interface interface-name]   [ip-address ip-address]] [detail]</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | show>service>id>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b> | This command displays DHCP lease state related information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><b>sap</b> <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>sdp-id</b> — The SDP identifier.</p> <p><b>Values</b> 1 — 17407</p> <p><b>vc-id</b> — The virtual circuit ID on the SDP ID for which to display information.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>interface</b> <i>interface-name</i> — Displays information for the specified IP interface.</p> <p><b>ip-address</b> <i>ip-address</i> — Displays information associated with the specified IP address.</p> <p><b>detail</b> — Displays detailed information.</p> |

**Sample Output**

```

A:ALA-_Dut-A# show service id 13 dhcp lease-state
=====
DHCP lease state table, service 13
=====

```

## Show, Clear, Debug Commands

```

IP Address Mac Address Sap/Sdp Id Remaining Lease MC
 LifeTime Origin Stdbby

13.13.40.1 00:00:00:00:00:13 1/1/1:13 00h00m58s Radius

Number of lease states : 1
=====
A:ALA-_Dut-A#

A:ALA-_Dut-A# show service id 13 dhcp lease-state detail
=====
DHCP lease states for service 13
=====
Service ID : 13
IP Address : 13.13.40.1
Mac Address : 00:00:00:00:00:13
Interface : ies-13-13.13.1.1
SAP : 1/1/1:13
Remaining Lifetime : 00h00m58s
Persistence Key : N/A

Sub-Ident : "Belgacom"
Sub-Profile-String : "ADSL GO"
SLA-Profile-String : "BE-Video"
Lease ANCP-String : ""

Sub-Ident origin : Radius
Strings origin : Radius
Lease Info origin : Radius

Ip-Netmask : 255.255.0.0
Broadcast-Ip-Addr : 13.13.255.255
Default-Router : N/A
Primary-Dns : 13.13.254.254
Secondary-Dns : 13.13.254.253

ServerLeaseStart : 12/24/2006 23:44:07
ServerLastRenew : 12/24/2006 23:44:07
ServerLeaseEnd : 12/24/2006 23:45:07
Session-Timeout : 0d 00:01:00
DHCP Server Addr : N/A

Persistent Relay Agent Information
 Circuit Id : ancstb6_Dut-A|13|ies-13-13.13.1.1|0|13
 Remote Id : stringtest

Number of lease states : 1
=====
A:ALA-_Dut-A#

```

**Routed CO Output Example**

```

A:ALA-_Dut-A# show service id 13 dhcp lease-state
=====
DHCP lease state table, service 13
=====
IP Address Mac Address Sap/Sdp Id Remaining Lease MC
 LifeTime Origin Stdbby

13.13.40.1 00:00:00:00:00:13 1/1/1:13 00h00m58s Radius

Number of lease states : 1
=====
A:ALA-_Dut-A#

A:ALA-_Dut-A# show service id 13 dhcp lease-state detail
=====
DHCP lease states for service 13
=====
Service ID : 13
IP Address : 13.13.40.1
Mac Address : 00:00:00:00:00:13
Subscriber-interface : ies-13-13.13.1.1
Group-interface : intf-13
SAP : 1/1/1:13
Remaining Lifetime : 00h00m58s
Persistence Key : N/A

Sub-Ident : "Belgacom"
Sub-Profile-String : "ADSL GO"
SLA-Profile-String : "BE-Video"
Lease ANCP-String : ""

Sub-Ident origin : Radius
Strings origin : Radius
Lease Info origin : Radius

Ip-Netmask : 255.255.0.0
Broadcast-Ip-Addr : 13.13.255.255
Default-Router : N/A
Primary-Dns : 13.13.254.254
Secondary-Dns : 13.13.254.253

ServerLeaseStart : 12/24/2006 23:48:23
ServerLastRenew : 12/24/2006 23:48:23
ServerLeaseEnd : 12/24/2006 23:49:23
Session-Timeout : 0d 00:01:00
DHCP Server Addr : N/A

Persistent Relay Agent Information
 Circuit Id : ancstb6_Dut-A|13|intf-13|0|13
 Remote Id : stringtest

Number of lease states : 1
=====
A:ALA-_Dut-A#

```

**Wholesaler/Retailer Output Example**

## Show, Clear, Debug Commands

```
A:ALA-_Dut-A# show service id 2000 dhcp lease-state detail
=====
DHCP lease states for service 2000

Wholesaler 1000 Leases

Service ID : 1000
IP Address : 13.13.1.254
Mac Address : 00:00:00:00:00:13
Subscriber-interface : whole-sub
Group-interface : intf-13
Retailer : 2000
Retailer If : retail-sub
SAP : 1/1/1:13
Remaining Lifetime : 00h09m59s
Persistence Key : N/A

Sub-Ident : "Belgacom"
Sub-Profile-String : "ADSL GO"
SLA-Profile-String : "BE-Video"
Lease ANCP-String : ""

Sub-Ident origin : Retail DHCP
Strings origin : Retail DHCP
Lease Info origin : Retail DHCP

Ip-Netmask : 255.255.0.0
Broadcast-Ip-Addr : 13.13.255.255
Default-Router : N/A
Primary-Dns : N/A
Secondary-Dns : N/A

ServerLeaseStart : 12/25/2006 00:29:41
ServerLastRenew : 12/25/2006 00:29:41
ServerLeaseEnd : 12/25/2006 00:39:41
Session-Timeout : 0d 00:10:00
DHCP Server Addr : 10.232.237.2

Persistent Relay Agent Information
 Circuit Id : 1/1/1:13
 Remote Id : stringtest

Number of lease states : 1
=====
A:ALA-_Dut-A#
```

## statistics

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <b>sap</b> <i>sap-id</i><br><b>statistics</b> [ <b>sdp</b> <i>sdp-id:vc-id</i> ]<br><b>statistics</b> [ <b>interface</b> <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | show>service>id>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | Displays DHCP statistics information.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <b>sap</b> <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.<br><br><b>sdp-id</b> — The SDP identifier.<br><b>Values</b> 1 — 17407<br><br><b>vc-id</b> — The virtual circuit ID on the SDP ID for which to display information.<br><b>Values</b> 1 — 4294967295<br><br><b>interface</b> <i>interface-name</i> — Displays information for the specified IP interface. |

## summary

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>summary</b>                                                                                      |
| <b>Context</b>     | show>service>id>dhcp                                                                                |
| <b>Description</b> | Displays DHCP configuration summary information.                                                    |
| <b>Output</b>      | <b>Show DHCP Summary Output</b> — The following table describes the output fields for DHCP summary. |

| Label          | Description                                                                                                                                                                                                                                                                                                               |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface Name | Name of the router interface.                                                                                                                                                                                                                                                                                             |
| Arp Populate   | Specifies whether or not ARP populate is enabled.                                                                                                                                                                                                                                                                         |
| Used/Provided  | Used — The number of lease-states that are currently in use on a specific interface, that is, the number of clients on that interface got an IP address by DHCP. This value is always less than or equal to the 'Provided' field.<br><br>Provided — The lease-populate value that is configured for a specific interface. |
| Info Option    | Indicates whether Option 82 processing is enabled on the interface.                                                                                                                                                                                                                                                       |
| Admin State    | Indicates the administrative state.                                                                                                                                                                                                                                                                                       |

**Sample Output**

```
A:ALA-49# show service id 88 dhcp summary
```

## Show, Clear, Debug Commands

```
=====
DHCP Summary, service 88
=====
Interface Name Arp Used/ Info Admin
 SapId/Sdp Populate Provided Option State

Sector A No 0/0 Keep Up
 sap:7/1/1.2.2 0/0
grp-if No 0/1 Keep Down
 sap:2/2/2:0 0/1
 sap:2/2/2:0 0/1
test No 0/0 Keep Up
 sap:10/1/2:0 0/0

Interfaces: 3
=====
A:ALA-49#
```



---

## Show Multi-Chassis Endpoint Commands

### endpoint

|                    |                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>endpoint</b> [ <i>endpoint-name</i> ]                                                                   |
| <b>Context</b>     | show>service>id                                                                                            |
| <b>Description</b> | This command displays service endpoint information.                                                        |
| <b>Parameters</b>  | <i>endpoint-name</i> — Specifies an endpoint name created in the <b>config&gt;service&gt;vpls</b> context. |

### Sample Output

```
*A:Dut-B# show service id 1 endpoint
=====
Service 1 endpoints
=====
Endpoint name : mcep-t1
Description : (Not Specified)
Revert time : 0
Act Hold Delay : 0
Ignore Standby Signaling : false
Suppress Standby Signaling : false
Block On Mesh Fail : true
Multi-Chassis Endpoint : 1
MC Endpoint Peer Addr : 3.1.1.3
Psv Mode Active : No
Tx Active : 231:1
Tx Active Up Time : 0d 00:06:57
Revert Time Count Down : N/A
Tx Active Change Count : 5
Last Tx Active Change : 02/13/2009 22:08:33

Members

Spoke-sdp: 221:1 Prec:1 Oper Status: Up
Spoke-sdp: 231:1 Prec:2 Oper Status: Up
=====
*A:Dut-B#
```

multi-chassis

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>multi-chassis</b>                                                   |
| <b>Context</b>     | show>redundancy                                                        |
| <b>Description</b> | This command enables the context to display multi-chassis information. |

mc-endpoint

|                    |                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mc-endpoint statistics</b><br><b>mc-endpoint peer [ip-address] statistics</b><br><b>mc-endpoint endpoint [mcep-id] statistics</b><br><b>mc-endpoint peer [ip-address]</b>                                                                                     |
| <b>Context</b>     | show>redundancy>multi-chassis                                                                                                                                                                                                                                    |
| <b>Description</b> | This command displays multi-chassis endpoint information.                                                                                                                                                                                                        |
| <b>Parameters</b>  | <b>statistics</b> — Displays the global statistics for the MC endpoint.<br><b>peer ip-address</b> — Specifies the IP address of multi-chassis end-point peer.<br><b>endpoint mcep-id</b> — Specifies the multi-chassis endpoint.<br><b>Values</b> 1 — 4294967295 |

Sample Output

```
*A:Dut-B# show redundancy multi-chassis mc-endpoint statistics
=====
Multi-Chassis Endpoint Global Statistics
=====
Packets Rx : 533
Packets Rx Keepalive : 522
Packets Rx Config : 3
Packets Rx Peer Config : 1
Packets Rx State : 7
Packets Dropped Keep-Alive Task : 7
Packets Dropped Too Short : 0
Packets Dropped Verify Failed : 0
Packets Dropped Tlv Invalid Size : 0
Packets Dropped Out Of Seq : 0
Packets Dropped Unknown Tlv : 0
Packets Dropped Tlv Invalid MC-Endpoint Id : 0
Packets Dropped MD5 : 0
Packets Dropped Unknown Peer : 0
Packets Dropped MC Endpoint No Peer : 0
Packets Tx : 26099
Packets Tx Keepalive : 8221
Packets Tx Config : 2
Packets Tx Peer Config : 17872
Packets Tx State : 4
Packets Tx Failed : 0
=====
*A:Dut-B#
```

```

*A:Dut-B# show redundancy multi-chassis mc-endpoint peer 3.1.1.3 statistics
=====
Multi-Chassis MC-Endpoint Statistics
=====
Peer Addr : 3.1.1.3

Packets Rx : 597
Packets Rx Keepalive : 586
Packets Rx Config : 3
Packets Rx Peer Config : 1
Packets Rx State : 7
Packets Dropped State Disabled : 0
Packets Dropped Packets Too Short : 0
Packets Dropped Tlv Invalid Size : 0
Packets Dropped Tlv Invalid LagId : 0
Packets Dropped Out of Seq : 0
Packets Dropped Unknown Tlv : 0
Packets Dropped MD5 : 0
Packets Tx : 636
Packets Tx Keepalive : 600
Packets Tx Peer Config : 30
Packets Tx Failed : 0
Packets Dropped No Peer : 0
=====
*A:Dut-B#

*A:Dut-B# show redundancy multi-chassis mc-endpoint endpoint 1 statistics
=====
Multi-Chassis Endpoint Statistics
=====
MC-Endpoint Id 1
=====
Packets Rx Config : 3
Packets Rx State : 7
Packets Tx Config : 2
Packets Tx State : 4
Packets Tx Failed : 0
=====
Number of Entries 1
=====
*A:Dut-B#

*A:Dut-B# tools dump redundancy multi-chassis mc-endpoint peer 3.1.1.3
=====
MC Endpoint Peer Info
 peer addr : 3.1.1.3
 peer name : Dut-C
 peer name refs : 1
 src addr conf : Yes
 source addr : 2.1.1.2
 num of mcep : 1
 num of non-mcep : 0
 own sess num : 58ba0d39
 mc admin state : Up
 tlv own mc admin state : Up
 tlv peer mc admin state : Up
 reachable : Yes

 own sys priority : 50

```

## Show, Clear, Debug Commands

```
own sys id : 00:03:fa:72:c3:c0
peer sys priority : 21
peer sys id : 00:03:fa:c6:31:f8
master : No

conf boot timer : 300
boot timer active : No
conf ka intv : 10
conf hold on num of fail : 3
tlv own ka intv : 10
tlv peer ka intv : 10
ka timeout tmr active : Yes
ka timeout tmr intvl : 20
ka timeout tmr time left : 4
peer ka intv : 10
mc peer timed out : No

initial peer conf rx : Yes
peer-mc disabled : No
initial peer conf sync : Yes
peer conf sync : Yes

own passive mode : Disable
peer passive mode : No

retransmit pending : No
non-mcep retransmit pending : No
retransmit intvl : 5
last tx time : 1437130
last rx time : 1437156

own bfd : Enable
peer bfd : Enable
bfd vrtr if : 2
bfd handle : 1
bfd state : 3
bfd code : 0
=====
*A:Dut-B#

*A:Dut-B# tools dump service mc-endpoint 1
=====
MC Endpoint Info
mc-endpoint id : 1
endpoint : mcep-t1
service : 1
peer ref type : peer-name
peer : Dut-C
mc sel logic : peer selected active
selection master : No
retransmit pending : No
initial config sync : Yes
config sync : Yes
peer not mcep : No
peer acked non-mcep : No
config mismatch : No
initial state rx : Yes
initial state sync : Yes
state sync : Yes
can aggregate : Yes
```

```

sel peer active : No
peer sel active : Yes
passive mode active : No
own eligible force : No
own eligible double active : Yes
own eligible pw status bits : 0
own eligible precedence : 2
own eligible conf chg : No
own eligible revert wait : No
peer eligible force : No
peer eligible double active : Yes
peer eligible pw status bits : 0
peer eligible precedence : 3
peer eligible conf chg : No
peer eligible revert wait : No
=====
*A:Dut-B#

*A:Dut-B# tools perform service id 1 endpoint mcep-t1 force-switchover 221:1
*A:Dut-B>show#
*A:Dut-B# show service id 1 endpoint
=====
Service 1 endpoints
=====
Endpoint name : mcep-t1
Description : (Not Specified)
Revert time : 0
Act Hold Delay : 0
Ignore Standby Signaling : false
Suppress Standby Signaling : false
Block On Mesh Fail : true
Multi-Chassis Endpoint : 1
MC Endpoint Peer Addr : 3.1.1.3
Psv Mode Active : No
Tx Active : 221:1(forced)
Tx Active Up Time : 0d 00:00:17
Revert Time Count Down : N/A
Tx Active Change Count : 6
Last Tx Active Change : 02/14/2009 00:17:32

Members

Spoke-sdp: 221:1 Prec:1 Oper Status: Up
Spoke-sdp: 231:1 Prec:2 Oper Status: Up
=====
*A:Dut-B#

```

---

# VPLS Clear Commands

## id

|             |                                                                                                                                                                                                |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <code>id service-id</code>                                                                                                                                                                     |
| Context     | <code>clear&gt;service</code><br><code>clear&gt;service&gt;statistics</code>                                                                                                                   |
| Description | This command clears commands for a specific service.                                                                                                                                           |
| Parameters  | <i>service-id</i> — The ID that uniquely identifies a service.<br><br><b>Values</b> <code>service-id</code> : 1 — 214748364<br><code>svc-name</code> : A string up to 64 characters in length. |

## arp-host

|             |                                                                                                                                                                                                                                                                                                                                                            |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <code>arp-host</code><br><code>arp-host { mac <i>ieee-address</i>   sap <i>sap-id</i>   ip-address <i>ip-address</i>[/<i>mask</i>] }</code><br><code>arp-host [port <i>port-id</i>] [inter-dest-id <i>intermediate-destination-id</i>   no-inter-dest-id]</code><br><code>arp-host statistics [sap <i>sap-id</i>   interface <i>interface-name</i>]</code> |
| Context     | <code>clear&gt;service&gt;id</code>                                                                                                                                                                                                                                                                                                                        |
| Description | This command clears ARP host data.                                                                                                                                                                                                                                                                                                                         |

## authentication

|             |                                                                               |
|-------------|-------------------------------------------------------------------------------|
| Syntax      | <code>authentication</code>                                                   |
| Context     | <code>clear&gt;service&gt;id</code>                                           |
| Description | This command enables the context to clear session authentication information. |

## capture-sap

|             |                                                                  |
|-------------|------------------------------------------------------------------|
| Syntax      | <code>capture-sap sap-id [trigger]</code>                        |
| Context     | <code>clear&gt;service&gt;id</code>                              |
| Description | This command clears the statistics for a particular capture SAP. |

## cem

|                    |                                                      |
|--------------------|------------------------------------------------------|
| <b>Syntax</b>      | <b>cem</b>                                           |
| <b>Context</b>     | clear>service>id                                     |
| <b>Description</b> | This command clears CEM statistics for this service. |

## statistics

|                    |                                                          |
|--------------------|----------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b>                                        |
| <b>Context</b>     | clear>service>stats<br>clear>service>id>authentication   |
| <b>Description</b> | This command clears session statistics for this service. |

## fdb

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <b>Syntax</b>      | <b>fdb</b> { <b>all</b>   <b>mac</b> <i>ieee-address</i>   <b>sap</b> <i>sap-id</i> ]   <b>mesh-sdp</b> <i>sdp-id[:vc-id]</i>   <b>spoke-sdp</b> <i>sdp-id:vc-id</i> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |
| <b>Context</b>     | clear>service>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
| <b>Description</b> | This command clears FDB entries for the service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
| <b>Parameters</b>  | <p><b>all</b> — Clears all FDB entries.</p> <p><b>mac</b> <i>ieee-address</i> — Clears only FDB entries in the FDB table with the specified 48-bit MAC address. The MAC address can be expressed in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i>, <i>bb</i>, <i>cc</i>, <i>dd</i>, <i>ee</i> and <i>ff</i> are hexadecimal numbers.</p> <p><i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>mesh-sdp</b> — Clears only service FDB entries associated with the specified mesh SDP ID. For a mesh SDP, the VC ID is optional.</p> <p><b>spoke-sdp</b> — Clears only service FDB entries associated with the specified spoke SDP ID. For a spoke SDP, the VC ID must be specified.</p> <p><i>sdp-id</i> — The SDP ID for which to clear associated FDB entries.</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID for which to clear associated FDB entries.</p> |  |  |

|               |                |               |                |
|---------------|----------------|---------------|----------------|
| <b>Values</b> | sdp-id[:vc-id] | <i>sdp-id</i> | 1 — 17407      |
|               |                | <i>vc-id</i>  | 1 — 4294967295 |
|               | sdp-id:vc-id   | <i>sdp-id</i> | 1 — 17407      |
|               |                | <i>vc-id</i>  | 1 — 4294967295 |

## mld-snooping

|                    |                                                                      |
|--------------------|----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mld-snooping</b>                                                  |
| <b>Context</b>     | clear>service>id                                                     |
| <b>Description</b> | This command enables the context to clear MLD snooping-related data. |

## port-db

|                    |                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port-db sap</b> <i>sap-id</i> [ <b>group</b> <i>grp-ipv6-address</i> ]<br><b>port-db sap</b> <i>sap-id</i> <b>group</b> <i>grp-ipv6-address</i> <b>source</b> <i>src-ipv6-address</i><br><b>port-db sdp</b> <i>sdp-id:vc-id</i> [ <b>group</b> <i>grp-ipv6-address</i> ]<br><b>port-db sdp</b> <i>sdp-id:vc-id</i> <b>group</b> <i>grp-ipv6-address</i> <b>source</b> <i>src-ipv6-address</i> |
| <b>Context</b>     | clear>service>id>mld-snooping                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command clears MLD snooping port-db group data.                                                                                                                                                                                                                                                                                                                                             |

## querier

|                    |                                                       |
|--------------------|-------------------------------------------------------|
| <b>Syntax</b>      | <b>querier</b>                                        |
| <b>Context</b>     | clear>service>id>mld-snooping                         |
| <b>Description</b> | This command clears MLD snooping querier information. |

## statistics

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics all</b><br><b>statistics sap</b> <i>sap-id</i><br><b>statistics sdp</b> <i>sdp-id:vc-id</i> |
| <b>Context</b>     | clear>service>id>mld-snooping                                                                             |
| <b>Description</b> | This command clears MLD snooping statistics.                                                              |

## msap

|                    |                                             |
|--------------------|---------------------------------------------|
| <b>Syntax</b>      | <b>msap</b> <i>msap-id</i>                  |
| <b>Context</b>     | clear>service>id                            |
| <b>Description</b> | This command clears the managed SAP (MSAP). |
| <b>Parameters</b>  | <i>msap-id</i> — Specifies the MSAP ID.     |



|               |       |                                              |
|---------------|-------|----------------------------------------------|
| <b>Values</b> | dot1q | <i>port-id</i>   <i>lag-id</i> :qtag1        |
|               | qinq  | <i>port-id</i>   <i>lag-id</i> ::qtag1.qtag2 |
|               |       | qtag1    0 — 4094                            |
|               |       | qtag2    0 — 4094                            |

## mesh-sdp

|                    |                                                                                                                                                                                                                                                                                                                                      |               |           |                |                           |               |                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|----------------|---------------------------|---------------|----------------|
| <b>Syntax</b>      | <b>mesh-sdp</b> <i>sdp-id</i> [: <i>vc-id</i> ] <b>ingress-vc-label</b>                                                                                                                                                                                                                                                              |               |           |                |                           |               |                |
| <b>Context</b>     | clear>service>id                                                                                                                                                                                                                                                                                                                     |               |           |                |                           |               |                |
| <b>Description</b> | This command clears and resets the mesh SDP bindings for the service.                                                                                                                                                                                                                                                                |               |           |                |                           |               |                |
| <b>Parameters</b>  | <i>sdp-id</i> — The mesh SDP ID to be reset.<br><table> <tr> <td><b>Values</b></td><td>1 — 17407</td></tr> </table> <i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.<br><table> <tr> <td><b>Default</b></td><td>All VC IDs on the SDP ID.</td></tr> <tr> <td><b>Values</b></td><td>1 — 4294967295</td></tr> </table> | <b>Values</b> | 1 — 17407 | <b>Default</b> | All VC IDs on the SDP ID. | <b>Values</b> | 1 — 4294967295 |
| <b>Values</b>      | 1 — 17407                                                                                                                                                                                                                                                                                                                            |               |           |                |                           |               |                |
| <b>Default</b>     | All VC IDs on the SDP ID.                                                                                                                                                                                                                                                                                                            |               |           |                |                           |               |                |
| <b>Values</b>      | 1 — 4294967295                                                                                                                                                                                                                                                                                                                       |               |           |                |                           |               |                |

## spoke-sdp

|                    |                                                                                                                                                                                                                                                                   |               |           |               |                |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|---------------|----------------|
| <b>Syntax</b>      | <b>spoke-sdp</b> <i>sdp-id</i> : <i>vc-id</i> <b>ingress-vc-label</b>                                                                                                                                                                                             |               |           |               |                |
| <b>Context</b>     | clear>service>id                                                                                                                                                                                                                                                  |               |           |               |                |
| <b>Description</b> | This command clears and resets the spoke SDP bindings for the service.                                                                                                                                                                                            |               |           |               |                |
| <b>Parameters</b>  | <i>sdp-id</i> — The spoke SDP ID to be reset.<br><table> <tr> <td><b>Values</b></td><td>1 — 17407</td></tr> </table> <i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.<br><table> <tr> <td><b>Values</b></td><td>1 — 4294967295</td></tr> </table> | <b>Values</b> | 1 — 17407 | <b>Values</b> | 1 — 4294967295 |
| <b>Values</b>      | 1 — 17407                                                                                                                                                                                                                                                         |               |           |               |                |
| <b>Values</b>      | 1 — 4294967295                                                                                                                                                                                                                                                    |               |           |               |                |

## sap

|                    |                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> { <b>all</b>   <b>cem</b>   <b>counters</b>   <b>l2pt</b>   <b>stp</b>   <b>mrp</b> }                                                                                                                                                                                                                            |
| <b>Context</b>     | clear>service>statistics                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command clears statistics for the SAP bound to the service.                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <i>sap-id</i> — See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.<br><b>all</b> — Clears all queue statistics and STP statistics associated with the SAP.<br><b>cem</b> — Clears all CEM statistics associated with the SAP.<br><b>counters</b> — Clears all queue statistics associated with the SAP. |

**l2pt** — Clears all L2PT statistics associated with the SAP.

**stp** — Clears all STP statistics associated with the SAP.

**mrp** — Clears all MRP statistics associated with the SAP.

## sdp

|                    |                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp</b> <i>sdp-id</i> [ <b>keep-alive</b> ]                                                                                                                         |
| <b>Context</b>     | clear>service>statistics                                                                                                                                               |
| <b>Description</b> | This command clears keepalive statistics associated with the SDP ID.                                                                                                   |
| <b>Parameters</b>  | <i>sdp-id</i> — The SDP ID for which to clear statistics.<br><b>Values</b> 1 — 17407<br><b>keep-alive</b> — Clears the keep-alive history associated with this SDP ID. |

## counters

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>counters</b>                                                                |
| <b>Context</b>     | clear>service>statistics>id                                                    |
| <b>Description</b> | This command clears all traffic queue counters associated with the service ID. |

## l2pt

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <b>Syntax</b>      | <b>l2pt</b>                                               |
| <b>Context</b>     | clear>service>statistics>id                               |
| <b>Description</b> | This command clears the l2pt statistics for this service. |

## mesh-sdp

|                    |                                                                                                                                                                                                                                          |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mesh-sdp</b> <i>sdp-id[:vc-id]</i> { <b>all</b>   <b>counters</b>   <b>stp</b>   <b>mrp</b> }                                                                                                                                         |
| <b>Context</b>     | clear>service>statistics>id                                                                                                                                                                                                              |
| <b>Description</b> | This command clears the statistics for a particular mesh SDP bind.                                                                                                                                                                       |
| <b>Parameters</b>  | <i>sdp-id[:vc-id]</i> — sdp-id - [1..17407]<br>vc-id - [1..4294967295]<br><b>all</b> — Clears all queue statistics and STP statistics associated with the SDP.<br><b>counters</b> — Clears all queue statistics associated with the SDP. |

**stp** — Clears all STP statistics associated with the SDP.

**mrp** — Clears all MRP statistics associated with the SDP.

## mrp

|                    |                                                            |
|--------------------|------------------------------------------------------------|
| <b>Syntax</b>      | <b>mrp</b>                                                 |
| <b>Context</b>     | clear>service>statistics>id                                |
| <b>Description</b> | This command clears all MRP statistics for the service ID. |

## pip

|                    |                                                                            |
|--------------------|----------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>pip</b>                                                                 |
| <b>Context</b>     | clear>service>statistics>id                                                |
| <b>Description</b> | This command clears the Provider Internal Port statistics for this service |

## spoke-sdp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>spoke-sdp</b> <i>sdp-id[:vc-id]</i> { <b>all</b>   <b>counters</b>   <b>stp</b>   <b>l2pt</b>   <b>mrp</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | clear>service>statistics>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | This command clears statistics for the spoke SDP bound to the service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>sdp-id</i> — The spoke SDP ID for which to clear statistics.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>all</b> — Clears all queue statistics and STP statistics associated with the SDP.</p> <p><b>counters</b> — Clears all queue statistics associated with the SDP.</p> <p><b>stp</b> — Clears all STP statistics associated with the SDP.</p> <p><b>l2pt</b> — Clears all L2PT statistics associated with the SDP.</p> <p><b>mrp</b> — Clears all MRP statistics associated with the SDP.</p> |

## stp

|                |                             |
|----------------|-----------------------------|
| <b>Syntax</b>  | <b>stp</b>                  |
| <b>Context</b> | clear>service>statistics>id |

**Description** Clears all spanning tree statistics for the service ID.

## detected-protocols

**Syntax** **detected-protocols** {**all** | **sap** *sap-id* | **spoke-sdp** *sdp-id[:vc-id]*}

**Context** clear>service>id>stp

**Description** RSTP automatically falls back to STP mode when it receives an STP BPDU. The **clear detected-protocols** command forces the system to revert to the default RSTP mode on the SAP or spoke SDP.

**Parameters** **all** — Clears all detected protocol statistics.

*sap-id* — Clears the specified lease state SAP information. See [Common CLI Command Descriptions on page 1933](#) for command syntax.

*sdp-id* — The SDP ID to be cleared.

**Values** 1 — 17407

*vc-id* — The virtual circuit ID on the SDP ID to be cleared.

**Values** 1 — 4294967295

## lease-state

**Syntax** **lease-state** [**no-dhcp-release**]  
**lease-state ip-address** *ip-address* [**no-dhcp-release**]  
**lease-state mac** *ieee-address* **no-dhcp-release**  
**lease-state sap** *sap-id* [**no-dhcp-release**]  
**lease-state sdp** *sdp-id:vc-id* [**no-dhcp-release**]

**Context** clear>service>id>dhcp

**Description** This command clears DHCP lease state information.

**Parameters** **no-dhcp-release** — Specifies that the node will clear the state without sending the DHCP release message.

**ip-address** *ip-address* — Clears the DHCP IP address lease state information. The *ip-address* portion of the **address** command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).

**mac** *ieee-address* — Clears DHCP MAC address lease state information. The 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

**sap** *sap-id* — Clears DHCP SAP lease state information. See [Common CLI Command Descriptions on page 1933](#) for command syntax.

*sdp-id* — The SDP ID to be cleared.

**Values** 1 — 17407

*vc-id* — The virtual circuit ID on the SDP ID to be cleared.

**Values** 1 — 4294967295

## statistics

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <b>sap</b> <i>sap-id</i>   <b>sdp</b> [ <i>sdp-id</i> [: <i>vc-id</i> ]   <b>interface</b> [ <i>ip-address</i>   <i>ip-int-name</i> ]]]                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | clear>service>id>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | Clears DHCP statistics for this service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Parameters</b>  | <p><i>sap-id</i> — Clears the specified SAP statistics. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><i>sdp-id</i> — The SDP ID to be cleared.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID to be cleared.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>interface</b> <i>ip-int-name</i> — Clears the statistics for the IP interface with the specified name.</p> <p><b>interface</b> <i>ip-addr</i> — Clears the statistics for the IP interface with the specified IP address.</p> |

## statistics

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> { <b>all</b>   <b>sap</b> <i>sap-id</i>   <b>sdp</b> <i>sdp-id</i> [: <i>vc-id</i> ]}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | clear>service>id>igmp-snooping                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | Clears IGMP snooping statistics for the VPLS service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><b>sap</b> <i>sap-id</i> — Clears the IGMP snooping information on the specified SAP. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>sdp</b> <i>sdp-id</i> — Clears only IGMP snooping entries associated with the specified mesh SDP or spoke SDP. For a spoke SDP, the VC ID must be specified, for a mesh SDP, the VC ID is optional.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID for which to clear statistics.</p> <p><b>Default</b> For mesh SDPs only, all VC IDs.</p> <p><b>Values</b> 1 — 4294967295</p> |

## port-db

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>port-db</b> [ <b>sap</b> <i>sap-id</i> ] [ <b>group</b> <i>grp-address</i> [ <b>source</b> <i>ip-address</i> ] ]<br><b>port-db sdp</b> <i>sdp-id:vc-id</i> [ <b>group</b> <i>grp-address</i> [ <b>source</b> <i>ip-address</i> ]]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | clear>service>id>igmp-snooping                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command clears the information on the IGMP snooping port database for the VPLS service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><b>sap</b> <i>sap-id</i> — Clears IGMP snooping statistics matching the specified SAP ID and optional encapsulation value. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>sdp-id</b> — Clears only IGMP snooping entries associated with the specified mesh SDP or spoke SDP. For a spoke SDP, the VC ID must be specified, for a mesh SDP, the VC ID is optional.</p> <p><b>Values</b>      1 — 17407</p> <p><b>vc-id</b> — The virtual circuit ID on the SDP ID for which to clear information.</p> <p><b>Default</b>      For mesh SDPs only, all VC IDs.</p> <p><b>Values</b>      1 — 4294967295</p> <p><b>group</b> <i>grp-address</i> — Clears IGMP snooping statistics matching the specified group address.</p> <p><b>source</b> <i>ip-address</i> — Clears IGMP snooping statistics matching the specified particular source.</p> |

## querier

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>querier</b>                                                                          |
| <b>Context</b>     | clear>service>id>igmp-snooping                                                          |
| <b>Description</b> | This command clears the information on the IGMP snooping queriers for the VPLS service. |

## mfib

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mfib</b>                                                                        |
| <b>Context</b>     | clear>service>id>                                                                  |
| <b>Description</b> | This command enables the context to clear multicast FIB info for the VPLS service. |

## statistics

|                |                                                                                                                                                                        |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>  | <b>statistics</b> { <b>all</b>   <b>ip</b>   <b>mac</b> }<br><b>statistics group</b> <i>grp-address</i><br><b>statistics</b> [ <b>all</b>   <b>sap</b> <i>sap-id</i> ] |
| <b>Context</b> | clear>service>id>mfib                                                                                                                                                  |

|                    |                                                                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b> | This command clears multicast FIB statistics for the VPLS service.                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>grp-address</i> — Specifies an IGMP multicast group address that receives data on an interface.</p> <p><b>all</b> — Clears all statistics for the service ID.</p> <p><b>sap</b> <i>sap-id</i> — Clears statistics for the specified SAP ID.</p> |

## statistics

|                    |                                                                                                                                                                      |                |                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| <b>Syntax</b>      | <b>statistics { all   sap <i>sap-id</i>   sdp <i>sdp-id:vc-id</i> }</b>                                                                                              |                |                |
| <b>Context</b>     | clear>service>id>snooping                                                                                                                                            |                |                |
| <b>Description</b> | This command clears IGMP snooping statistics.                                                                                                                        |                |                |
| <b>Parameters</b>  | <b>all</b> — Clears all statistics for the service ID.<br><b>sap</b> <i>sap-id</i> — Clears statistics for the specified SAP ID.<br><b>sdp</b> <i>sdp-id:vc-id</i> — |                |                |
|                    | <b>Values</b>                                                                                                                                                        | <i>sdp-id:</i> | 1 — 17407      |
|                    |                                                                                                                                                                      | <i>vc-id:</i>  | 1 — 4294967295 |

## dhcp

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                        |
| <b>Context</b>     | clear>router                                                       |
| <b>Description</b> | This command enables the context to clear and reset DHCP entities. |

## statistics

|                    |                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics [interface <i>ip-int-name</i>   <i>ip-address</i>]</b>                                                                                                                                                                                               |
| <b>Context</b>     | clear>router>dhcp                                                                                                                                                                                                                                                  |
| <b>Description</b> | <p>Clears DHCP statistics.</p> <p><b>interface</b> <i>ip-int-name</i> — Clears the statistics for the IP interface with the specified name.</p> <p><b>interface</b> <i>ip-addr</i> — Clears the statistics for the IP interface with the specified IP address.</p> |

---

# VPLS Debug Commands

## id

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                                    |
| <b>Context</b>     | debug>service                                                                  |
| <b>Description</b> | This command debugs commands for a specific service.                           |
| <b>Parameters</b>  | <i>service-id</i> — The ID that uniquely identifies a service.                 |
| <b>Values</b>      | service-id: 1 — 214748364<br>svc-name: A string up to 64 characters in length. |

## arp-host

|                    |                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no]</b> arp-host                                                                                                      |
| <b>Context</b>     | debug>service>id                                                                                                          |
| <b>Description</b> | This command enables and configures ARP host debugging.<br>The <b>no</b> form of the command disables ARP host debugging. |

## igmp-snooping

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no]</b> igmp-snooping                                    |
| <b>Context</b>     | debug>service>id                                             |
| <b>Description</b> | This command enables and configures IGMP-snooping debugging. |

## detail-level

|                    |                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>detail-level</b> { <b>low</b>   <b>medium</b>   <b>high</b> }<br><b>no detail-level</b>                                                      |
| <b>Context</b>     | debug>service>id>igmp                                                                                                                           |
| <b>Description</b> | This command enables and configures the IGMP tracing detail level.<br>The <b>no</b> form of the command disables the IGMP tracing detail level. |



## mac

|                    |                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac</b> <i>ieee-address</i>                                                                                             |
| <b>Context</b>     | debug>service>id>igmp                                                                                                           |
| <b>Description</b> | This command shows IGMP packets for the specified MAC address.<br>The <b>no</b> form of the command disables the MAC debugging. |

## mode

|                    |                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode</b> { <b>dropped-only</b>   <b>ingr-and-dropped</b>   <b>egr-ingr-and-dropped</b> }<br><b>no mode</b>                                  |
| <b>Context</b>     | debug>service>id>igmp                                                                                                                          |
| <b>Description</b> | This command enables and configures the IGMP tracing mode.<br>The <b>no</b> form of the command disables the configures the IGMP tracing mode. |

## sap

|                    |                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap</b> <i>sap-id</i>                                                                                                |
| <b>Context</b>     | debug>service>id>igmp                                                                                                        |
| <b>Description</b> | This command shows IGMP packets for a specific SAP.<br>The <b>no</b> form of the command disables the debugging for the SAP. |

## sdp

|                    |                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sdp</b> <i>sdp-id:vc-id</i>                                                                                                                                                                                                                                                                                                                                            |
| <b>Context</b>     | debug>service>id>igmp                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command shows IGMP packets for a specific SDP.<br>The <b>no</b> form of the command disables the debugging for the SDP.                                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <p><i>sdp-id</i> — Displays only IGMP snooping entries associated with the specified mesh SDP or spoke SDP. For a spoke SDP, the VC ID must be specified, for a mesh SDP, the VC ID is optional.</p> <p><b>Values</b>      1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID for which to display information.</p> <p><b>Values</b>      1 — 4294967295</p> |

## mld-snooping

|                    |                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mld-snooping</b>                                                                                                         |
| <b>Context</b>     | debug>service>id                                                                                                                 |
| <b>Description</b> | This command enables and configures MLD-snooping debugging.<br>The <b>no</b> form of the command disables MLD-snooping debugging |

## detail-level

|                    |                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>detail-level {low   medium   high}</b><br><b>no detail-level</b>                                                                           |
| <b>Context</b>     | debug>service>id>mld                                                                                                                          |
| <b>Description</b> | This command enables and configures the MLD tracing detail level.<br>The <b>no</b> form of the command disables the MLD tracing detail level. |

## mac

|                    |                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac <i>ieee-address</i></b>                                                                                                     |
| <b>Context</b>     | debug>service>id>mld                                                                                                                    |
| <b>Description</b> | This command shows MLD packets for the specified MAC address.<br>The <b>no</b> form of the command disables disables the MAC debugging. |

## mode

|                    |                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mode {dropped-only   ingr-and-dropped   egr-ingr-and-dropped}</b><br><b>no mode</b>                                                       |
| <b>Context</b>     | debug>service>id>mld                                                                                                                         |
| <b>Description</b> | This command enables and configures the MLD tracing mode.<br>The <b>no</b> form of the command disables the configures the MLD tracing mode. |

## sap

|                    |                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap <i>sap-id</i></b>                                                                                               |
| <b>Context</b>     | debug>service>id>mld                                                                                                        |
| <b>Description</b> | This command shows MLD packets for a specific SAP.<br>The <b>no</b> form of the command disables the debugging for the SAP. |

## sdp

|                    |                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sdp <i>sdp-id:vc-id</i></b>                                                                                                                                                                                                                |
| <b>Context</b>     | debug>service>id>mld                                                                                                                                                                                                                               |
| <b>Description</b> | This command shows MLD packets for a specific SDP.<br>The <b>no</b> form of the command disables the debugging for the SDP.                                                                                                                        |
| <b>Parameters</b>  | <i>sdp-id</i> — Displays only MLD entries associated with the specified mesh SDP or spoke SDP.<br><b>Values</b> 1 — 17407<br><i>vc-id</i> — The virtual circuit ID on the SDP ID for which to display information.<br><b>Values</b> 1 — 4294967295 |

## mrp

|                    |                                                    |
|--------------------|----------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mrp</b>                                    |
| <b>Context</b>     | debug>service>id                                   |
| <b>Description</b> | This command enables and configures MRP debugging. |

## all-events

|                    |                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>all-events</b>                                                                                                                                                  |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                               |
| <b>Description</b> | This command enables MRP debugging for the applicant, leave all, periodic and registrant state machines and enables debugging of received and transmuted MRP PDUs. |

## applicant-sm

|                |                          |
|----------------|--------------------------|
| <b>Syntax</b>  | <b>[no] applicant-sm</b> |
| <b>Context</b> | debug>service>id>mrp     |

**Description** This command enables debugging of the applicant state machine.  
The **no** form of the command disables debugging of the applicant state machine.

## leave-all-sm

**Syntax** [no] **leave-all-sm**

**Context** debug>service>id>mrp

**Description** This command enables debugging of the leave all state machine.  
The **no** form of the command disables debugging of the leave all state machine.

## mmrp-mac

**Syntax** [no] **mmrp-mac** *ieee-address*

**Context** debug>service>id>mrp

**Description** This command filters debug events and only shows events related to the MAC address specified.  
The **no** form of the command removes the debug filter.

**Parameters** *ieee-address* — xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx (cannot be all zeroes)

## mrpdu

**Syntax** [no] **mrpdu**

**Context** debug>service>id>mrp

**Description** This command enables debugging of the MRP PDUs that are received or transmitted.  
The **no** form of the command disables debugging of MRP PDUs.

## periodic-sm

|                    |                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] periodic-sm</b>                                                                                                                              |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                 |
| <b>Description</b> | This command enables debugging of the periodic state machine.<br>The <b>no</b> form of the command disables debugging of the periodic state machine. |

## registrant-sm

|                    |                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] registrant-sm</b>                                                                                                                                |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                     |
| <b>Description</b> | This command enables debugging of the registrant state machine.<br>The <b>no</b> form of the command disables debugging of the registrant state machine. |

## sap

|                    |                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap sap-id</b>                                                                                                                         |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                           |
| <b>Description</b> | This command filters debug events and only shows events for the particular SAP.<br>The <b>no</b> form of the command removes the debug filter. |
| <b>Parameters</b>  | <i>sap-id</i> — See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.                                           |

## sdp

|                    |                                                                                                                                                                                                                                                                                                                                         |               |           |               |                |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|---------------|----------------|
| <b>Syntax</b>      | <b>[no] sdp sdp-id:vc-id</b>                                                                                                                                                                                                                                                                                                            |               |           |               |                |
| <b>Context</b>     | debug>service>id>mrp                                                                                                                                                                                                                                                                                                                    |               |           |               |                |
| <b>Description</b> | This command filters debug events and only shows events for the particular SDP.<br>The <b>no</b> form of the command removes the debug filter.                                                                                                                                                                                          |               |           |               |                |
| <b>Parameters</b>  | <i>sdp-id</i> — Displays only MLD entries associated with the specified mesh SDP or spoke SDP.<br><table> <tr> <td><b>Values</b></td><td>1 — 17407</td></tr> </table> <i>vc-id</i> — The virtual circuit ID on the SDP ID for which to display information.<br><table> <tr> <td><b>Values</b></td><td>1 — 4294967295</td></tr> </table> | <b>Values</b> | 1 — 17407 | <b>Values</b> | 1 — 4294967295 |
| <b>Values</b>      | 1 — 17407                                                                                                                                                                                                                                                                                                                               |               |           |               |                |
| <b>Values</b>      | 1 — 4294967295                                                                                                                                                                                                                                                                                                                          |               |           |               |                |

## event-type

|                    |                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] event-type {config-change   svc-oper-status-change   sap-oper-status-change   sdpbind-oper-status-change}</b>                                                                                                                                                                            |
| <b>Context</b>     | debug>service>id                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command enables a particular debugging event type.<br>The <b>no</b> form of the command disables the event type debugging.                                                                                                                                                                  |
| <b>Parameters</b>  | <b>config-change</b> — Debugs configuration change events.<br><b>svc-oper-status-change</b> — Debugs service operational status changes.<br><b>sap-oper-status-change</b> — Debugs SAP operational status changes.<br><b>sdpbind-oper-status-change</b> — Debugs SDP operational status changes. |

## host-connectivity-verify

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] host-connectivity-verify</b>                                                                                                               |
| <b>Context</b>     | debug>service>id                                                                                                                                   |
| <b>Description</b> | This command enables Subscriber Host Connectivity Verification (SHCV) debugging.<br>The <b>no</b> form of the command disables the SHCV debugging. |

## ip

|                    |                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ip <i>ip-address</i></b>                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular IP address.                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <i>ip-address</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets). |

## mac

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac</b> <i>ieee-address</i>                                                                                                                                                                                                                                                |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                                                                                                                                                                                                          |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular MAC address.                                                                                                                                                                        |
| <b>Parameters</b>  | <i>mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses. |

## sap

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap</b> <i>sap-id</i>                                                                                                                                              |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                                                                                                  |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular SAP.                                                                        |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax. |

## sap

|                    |                                                      |
|--------------------|------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap</b> <i>sap-id</i>                        |
| <b>Context</b>     | debug>service>id                                     |
| <b>Description</b> | This command enables debugging for a particular SAP. |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the SAP ID.                |

## stp

|                    |                                                     |
|--------------------|-----------------------------------------------------|
| <b>Syntax</b>      | <b>stp</b>                                          |
| <b>Context</b>     | debug>service>id                                    |
| <b>Description</b> | This command enables the context for debugging STP. |

## all-events

|                    |                                                    |
|--------------------|----------------------------------------------------|
| <b>Syntax</b>      | <b>all-events</b>                                  |
| <b>Context</b>     | debug>service>id>stp                               |
| <b>Description</b> | This command enables STP debugging for all events. |

## bpdu

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bpdu</b>                                                       |
| <b>Context</b>     | debug>service>id>stp                                                   |
| <b>Description</b> | This command enables STP debugging for received and transmitted BPDUs. |

## core-connectivity

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] core-connectivity</b>                             |
| <b>Context</b>     | debug>service>id>stp                                      |
| <b>Description</b> | This command enables STP debugging for core connectivity. |

## exception

|                    |                                                    |
|--------------------|----------------------------------------------------|
| <b>Syntax</b>      | <b>[no] exception</b>                              |
| <b>Context</b>     | debug>service>id>stp                               |
| <b>Description</b> | This command enables STP debugging for exceptions. |

## fsm-state-changes

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] fsm-state-changes</b>                             |
| <b>Context</b>     | debug>service>id>stp                                      |
| <b>Description</b> | This command enables STP debugging for FSM state changes. |



## fsm-timers

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] fsm-timers</b>                                    |
| <b>Context</b>     | debug>service>id>stp                                      |
| <b>Description</b> | This command enables STP debugging for FSM timer changes. |

## port-role

|                    |                                                               |
|--------------------|---------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] port-role</b>                                         |
| <b>Context</b>     | debug>service>id>stp                                          |
| <b>Description</b> | This command enables STP debugging for changes in port roles. |

## port-state

|                    |                                                     |
|--------------------|-----------------------------------------------------|
| <b>Syntax</b>      | <b>[no] port-state</b>                              |
| <b>Context</b>     | debug>service>id>stp                                |
| <b>Description</b> | This command enables STP debugging for port states. |

## sap

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap</b> <i>sap-id</i>                                                                                                                                              |
| <b>Context</b>     | debug>service>id>stp                                                                                                                                                       |
| <b>Description</b> | This command enables STP debugging for a specific SAP.                                                                                                                     |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax. |

## sdp

|                    |                                                        |
|--------------------|--------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sdp</b> <i>sdp-id:vc-id</i>                    |
| <b>Context</b>     | debug>service>stp                                      |
| <b>Description</b> | This command enables STP debugging for a specific SDP. |

## interface

|                    |                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] interface</b> [ <i>ip-int-name</i>   <i>ip-address</i> ]                                                                                                                                   |
| <b>Context</b>     | debug>router>igmp                                                                                                                                                                                  |
| <b>Description</b> | This command enables debugging on the IGMP interface.                                                                                                                                              |
| <b>Parameters</b>  | <i>ip-int-name</i> — Only displays the information associated with the specified IP interface name.<br><i>ip-address</i> — Only displays the information associated with the specified IP address. |

## mcs

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mcs</b> [ <i>ip-int-name</i> ]                                                              |
| <b>Context</b>     | debug>router>igmp                                                                                   |
| <b>Description</b> | This command enables debugging for IGMP MCS.                                                        |
| <b>Parameters</b>  | <i>ip-int-name</i> — Only displays the information associated with the specified IP interface name. |

## misc

|                    |                                                        |
|--------------------|--------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] misc</b>                                       |
| <b>Context</b>     | debug>router>igmp                                      |
| <b>Description</b> | This command enables debugging for IGMP miscellaneous. |

## packet

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] packet</b> [ <i>query</i>   <i>v1-report</i>   <i>v2-report</i>   <i>v3-report</i>   <i>v2-leave</i> ] [ <i>ip-int-name</i>   <i>ip-address</i> ]                                                                                                                          |
| <b>Context</b>     | debug>router>igmp                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command enables debugging for IGMP packets.                                                                                                                                                                                                                                   |
| <b>Parameters</b>  | <i>query v1/v2/v3-report, v2-leave</i> — Select the type of packet to debug.<br><i>ip-int-name</i> — Only displays the information associated with the specified IP interface name.<br><i>ip-address</i> — Only displays the information associated with the specified IP address. |

Show, Clear, Debug Commands

# IES Show Commands

## customer

|                    |                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>customer</b> [ <i>customer-id</i> ] [ <b>site</b> <i>customer-site-name</i> ]                                                                                                                                                                                                                                                   |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command displays service customer information.                                                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><i>customer-id</i> — Displays only information for the specified customer ID.</p> <p><b>Default</b> All customer IDs display</p> <p><b>Values</b> 1 — 2147483647</p> <p><b>site</b> <i>customer-site-name</i> — Specifies the customer site which is an anchor point for an ingress and egress virtual scheduler hierarchy.</p> |
| <b>Output</b>      | <b>Show Customer Command Output</b> — The following table describes show customer command output fields:                                                                                                                                                                                                                           |

| Label               | Description                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------|
| Customer-ID         | The ID that uniquely identifies a customer.                                                                               |
| Contact             | The name of the primary contact person.                                                                                   |
| Description         | Generic information about the customer.                                                                                   |
| Phone               | The phone/pager number to reach the primary contact person.                                                               |
| Total Customers     | The total number of customers configured.                                                                                 |
| Multi-service site  |                                                                                                                           |
| Site                | Multi-service site name. A multi-service customer site is a group of SAPs with common origination and termination points. |
| Description         | Information about a specific customer's multi-service site.                                                               |
| Assignment          | The port ID, MDA, or card number, where the SAP's that are members of this multi- service site are defined.               |
| I. Sched Pol        | The ingress QoS scheduler policy assigned to this multi-service site.                                                     |
| E. Sched Pol        | The egress QoS scheduler policy assigned to this multi-service site.                                                      |
| Service Association |                                                                                                                           |
| Service-ID          | The ID that uniquely identifies a service.                                                                                |
| SAP                 | Specifies the SAP assigned to the service.                                                                                |

### Sample Output

```
*A:ALA-12# show service customer
=====
Customers
=====
Customer-ID : 1
Contact : Manager
Description : Default customer
Phone : (123) 555-1212

Customer-ID : 2
Contact : Tech Support
Description : TiMetra Networks
Phone : (234) 555-1212

Customer-ID : 3
Contact : Fred
Description : TiMetra Networks
Phone : (345) 555-1212

Customer-ID : 6
Contact : Ethel
Description : Epipe Customer
Phone : (456) 555-1212

Customer-ID : 7
Contact : Lucy
Description : VPLS Customer
Phone : (567) 555-1212

Customer-ID : 8
Contact : Customer Service
Description : IES Customer
Phone : (678) 555-1212

Customer-ID : 274
Contact : Mssrs. Beaucoup
Description : ABC Company
Phone : 650 123-4567

Customer-ID : 94043
Contact : Test Engineer on Duty
Description : TEST Customer
Phone : (789) 555-1212

Total Customers : 8

*A:ALA-12#

*A:ALA-12# show service customer 274
=====
Customer 274
=====
Customer-ID : 274
Contact : Mssrs. Beaucoup
Description : ABC Company
Phone : 650 123-4567
```

```

Multi Service Site

Site : west
Description : (Not Specified)
=====
*A:ALA-12#

*A:ALA-12# show service customer 274 site west
=====
Customer 274
=====
Customer-ID : 274
Contact : Mssrs. Beaucoup
Description : ABC Company
Phone : 650 123-4567

Multi Service Site

Site : west
Description : (Not Specified)
Assignment : Card 5
I. Sched Pol: SLA1
E. Sched Pol: (Not Specified)

Service Association

No Service Association Found.
=====
*A:ALA-12#

```

## egress-label

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress-label</b> <i>egress-label1</i> [ <i>egress-label2</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>Display services using the range of egress labels.</p> <p>If only the mandatory <i>egress-label1</i> parameter is specified, only services using the specified label are displayed.</p> <p>If both <i>egress-label1</i> and <i>egress-label2</i> parameters are specified, the services using the range of labels X where <i>egress-label1</i> &lt;= X &lt;= <i>egress-label2</i> are displayed.</p> <p>Use the <b>show router ldp bindings</b> command to display dynamic labels.</p> |
| <b>Parameters</b>  | <p><i>egress-label1</i> — The starting egress label value for which to display services using the label range. If only <i>egress-label1</i> is specified, services only using <i>egress-label1</i> are displayed.</p> <p><b>Values</b>      0, 2049 — 131071</p> <p><i>egress-label2</i> — The ending egress label value for which to display services using the label range.</p> <p><b>Default</b>      The <i>egress-label1</i> value.</p> <p><b>Values</b>      2049 — 131071</p>      |

**Output**    **Show Service Egress Command Output** — The following table describes show service egress label output fields.

| Label                    | Description                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------|
| Svc Id                   | The value that identifies a service.                                                               |
| Sdp Id                   | The value that identifies a SDP.                                                                   |
| Type                     | Indicates whether the SDP binding is a spoke or a mesh.                                            |
| I. Lbl                   | The VC label used by the far-end device to send packets to this device in this service by the SDP. |
| E. Lbl                   | The VC label used by this device to send packets to the far-end device in this service by the SDP. |
| Number of bindings found | The total number of SDP bindings that exist within the specified egress label range.               |

### Sample Output

```
*A:ALA-12# show service egress-label 0 10000
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 100:1 Mesh 0 0
...
1 107:1 Mesh 0 0
1 108:1 Mesh 0 0
1 300:1 Mesh 0 0
1 301:1 Mesh 0 0
1 302:1 Mesh 0 0
1 400:1 Mesh 0 0
100 300:100 Spok 0 0
200 301:200 Spok 0 0
300 302:300 Spok 0 0
400 400:400 Spok 0 0

Number of Bindings Found : 21
=====
*A:ALA-12#
```

## ingress-label

**Syntax**    **ingress-label** *start-label* [*end-label*]

**Context**    show>service

**Description**    This command displays services using the range of ingress labels. If only the mandatory *start-label*



parameter is specified, only services using the specified label are displayed.

If both *start-label* and *end-label* parameters are specified, the services using the range of labels X where *start-label* <= X <= *end-label* are displayed.

Use the **show router vprn-service-id ldp bindings** command to display dynamic labels.

**Parameters** *start-label* — The starting ingress label value for which to display services using the label range. If only *start-label* is specified, services only using *start-label* are displayed.

**Values** 0, 2048 — 131071

*end-label* — The ending ingress label value for which to display services using the label range.

**Default** The *start-label* value.

**Values** 2049 — 131071

**Output** **Show Service Ingress-Label** — The following table describes show service ingress-label output fields:

| Label                    | Description                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------|
| Svc ID                   | The service identifier.                                                                                 |
| SDP Id                   | The SDP identifier.                                                                                     |
| Type                     | Indicates whether the SDP is spoke or mesh.                                                             |
| I.Lbl                    | The ingress label used by the far-end device to send packets to this device in this service by the SDP. |
| E.Lbl                    | The egress label used by this device to send packets to the far-end device in this service by the SDP.  |
| Number of Bindings Found | The number of SDP bindings within the label range specified.                                            |

### Sample Output

```
*A:ALA-12# show service ingress-label 0
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 50:1 Mesh 0 0
1 100:1 Mesh 0 0
1 101:1 Mesh 0 0
1 102:1 Mesh 0 0
1 103:1 Mesh 0 0
1 104:1 Mesh 0 0
1 105:1 Mesh 0 0
1 106:1 Mesh 0 0
1 107:1 Mesh 0 0
1 108:1 Mesh 0 0
1 300:1 Mesh 0 0
```

```
1 301:1 Mesh 0 0
1 302:1 Mesh 0 0
1 400:1 Mesh 0 0
1 500:2 Spok 131070 2001
1 501:1 Mesh 131069 2000
100 300:100 Spok 0 0
200 301:200 Spok 0 0
300 302:300 Spok 0 0
400 400:400 Spok 0 0

Number of Bindings Found : 23

*A:ALA-12#
```

sap-using

**Syntax**     **sap-using** [**sap** *sap-id*]  
              **sap-using interface** [*ip-address* | *ip-int-name*]  
              **sap-using** [**ingress** | **egress**] **atm-td-profile** *td-profile-id*  
              **sap-using** [**ingress** | **egress**] **filter** *filter-id*  
              **sap-using** [**ingress** | **egress**] **qos-policy** *qos-policy-id*  
              **sap-using authentication-policy** *policy-name*

**Context**     show>service

**Description**     Displays SAP information.  
  
If no optional parameters are specified, the command displays a summary of all defined SAPs. The optional parameters restrict output to only SAPs matching the specified properties.

**Parameters**     **sap** *sap-id* — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.

**ingress** — Specifies matching an ingress policy.

**egress** — Specifies matching an egress policy.

**qos-policy** *qos-policy-id* — The ingress or egress QoS Policy ID for which to display matching SAPs.

**Values**        1 — 65535

**atm-td-profile** *td-profile-id* — Displays SAPs using this traffic description.

**filter** *filter-id* — The ingress or egress filter policy ID for which to display matching SAPs.

**Values**        1 — 65535

**authentication** *policy-name* — The session authentication policy for which to display matching SAPs.

**interface** — Specifies matching SAPs with the specified IP interface.

*ip-addr* — The IP address of the interface for which to display matching SAPs.

**Values**        1.0.0.0 — 223.255.255.255

*ip-int-name* — The IP interface name for which to display matching SAPs.

**Output**    **Show Service SAP** — The following table describes show service SAP output fields:

| Label    | Description                                                     |
|----------|-----------------------------------------------------------------|
| Port ID  | The ID of the access port where the SAP is defined.             |
| Svc ID   | The value that identifies the service.                          |
| SapMTU   | The SAP MTU value.                                              |
| Igr.QoS  | The SAP ingress QoS policy number specified on the ingress SAP. |
| Ing.Fltr | The MAC or IP filter policy ID applied to the ingress SAP.      |
| E.QoS    | The SAP egress QoS policy number specified on the egress SAP.   |
| Egr.Fltr | The MAC or IP filter policy ID applied to the egress SAP.       |
| A.Pol    | The accounting policy ID assigned to the SAP.                   |
| Adm      | The administrative state of the SAP.                            |
| Opr      | The actual state of the SAP.                                    |

### Sample Output

```
*A:ALA-48# show service sap-using sap 2/1/10:0
=====
Service Access Points Using Port 2/1/10:0
=====
PortId SvcId Ing. Ing. Egr. Egr. Adm Opr
 QoS Fltr QoS Fltr

2/1/10:0 13 1 none 1 none Up Down

Number of SAPs : 1
=====
*A:ALA-48#
*A:ALA-12# show service sap-using egress atm-td-profile 2
=====
Service Access Point Using ATM Traffic Profile 2
=====
PortId SvcId I.QoS I.Fltr E.QoS E.Fltr A.Pol Adm Opr

5/1/1:0/11 511111 2 none 2 none none Up Up
5/1/1:0/12 511112 2 none 2 none none Up Up
5/1/1:0/13 511113 2 none 2 none none Up Up
5/1/1:0/14 511114 2 none 2 none none Up Up
5/1/1:0/15 511115 2 none 2 none none Up Up
5/1/1:0/16 511116 2 none 2 none none Up Up
5/1/1:0/17 511117 2 none 2 none none Up Up
5/1/1:0/18 511118 2 none 2 none none Up Up
5/1/1:0/19 511119 2 none 2 none none Up Up
5/1/1:0/20 511120 2 none 2 none none Up Up
5/1/1:0/21 511121 2 none 2 none none Up Up
5/1/1:0/22 511122 2 none 2 none none Up Up
5/1/1:0/23 511123 2 none 2 none none Up Up
```

## Show, Clear, Debug Commands

```
5/1/1:0/24 511124 2 none 2 none none Up Up
5/1/1:0/25 511125 2 none 2 none none Up Up
```

```
...
```

```
=====
*A:ALA-12#
```

## sdp

- Syntax** **sdp** [*sdp-id* | **far-end** *ip-address*] [**detail** | **keep-alive-history**]
- Context** show>service
- Description** This command displays SDP information. If no optional parameters are specified, a summary SDP output for all SDPs is displayed.
- Parameters** *sdp-id* — Specifies the SDP ID for which to display information.
- Default** All SDPs.
- Values** 1 — 17407
- far-end ip-address** — Displays only SDPs matching with the specified far-end IP address.
- Default** SDPs with any far-end IP address.
- detail** — Displays detailed SDP information.
- Default** SDP summary output.
- keep-alive-history** — Displays the last fifty SDP keepalive events for the SDP.
- Default** SDP summary output.
- Output** **Show Service SDP** — The following table describes show service SDP output fields:

| Label               | Description                                                                                                                                                                 |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDP Id              | The SDP identifier.                                                                                                                                                         |
| Adm MTU             | Specifies the desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Opr MTU             | Specifies the actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.  |
| IP address          | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                   |
| Adm<br>Admin State  | Specifies the administrative state of the SDP.                                                                                                                              |
| Opr<br>Oper State   | Specifies the operational state of the SDP.                                                                                                                                 |
| Deliver             | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                |
| Flags               | Specifies the conditions that affect the operating status of this SDP.                                                                                                      |
| Signal<br>Signaling | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                           |
| Last Status Change  | Specifies the time of the most recent operating status change to this SDP.                                                                                                  |

## Sample Output

```

*A:ALA-12# show service sdp
=====
Services: Service Destination Points
=====
SdpId Adm MTU Opr MTU IP address Adm Opr Deliver Signal

10 4462 4462 10.20.1.3 Up Dn NotReady MPLS TLDP
40 4462 1534 10.20.1.20 Up Up MPLS TLDP
60 4462 1514 10.20.1.21 Up Up GRE TLDP
100 4462 4462 180.0.0.2 Down Down GRE TLDP
500 4462 4462 10.20.1.50 Up Dn NotReady GRE TLDP

Number of SDPs : 5

*A:ALA-12#

*A:ALA-12# show service sdp 2 detail
=====
Service Destination Point (Sdp Id : 2) Details

Sdp Id 2 -(10.10.10.104)

Description : GRE-10.10.10.104
SDP Id : 2
Admin Path MTU : 0 Oper Path MTU : 0
Far End : 10.10.10.104 Delivery : GRE
Admin State : Up Oper State : Down
Flags : SignalingSessDown TransportTunnDown
Signaling : TLDP VLAN VC Etype : 0x8100
Last Status Change : 02/01/2007 09:11:39 Adv. MTU Over. : No
Last Mgmt Change : 02/01/2007 09:11:46

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Hello Timeout : 5 Unmatched Replies : 0
Max Drop Count : 3 Hold Down Time : 10
Tx Hello Msgs : 0 Rx Hello Msgs : 0

Associated LSP LIST :
SDP Delivery Mechanism is not MPLS
=====

*A:ALA-12#

*A:ALA-12# show service sdp 8
=====
Service Destination Point (Sdp Id : 8)
=====
SdpId Adm MTU Opr MTU IP address Adm Opr Deliver Signal

8 4462 4462 10.10.10.104 Up Dn NotReady MPLS TLDP

*A:ALA-12#

=====
Service Destination Point (Sdp Id : 8) Details
=====

```

```

Sdp Id 8 - (10.10.10.104)

Description : MPLS-10.10.10.104
SDP Id : 8
Admin Path MTU : 0 Oper Path MTU : 0
Far End : 10.10.10.104 Delivery : MPLS
Admin State : Up Oper State : Down
Flags : SignalingSessDown TransportTunnDown
Signaling : TLDP VLAN VC Etype : 0x8100
Last Status Change : 02/01/2007 09:11:39 Adv. MTU Over. : No
Last Mgmt Change : 02/01/2007 09:11:46
KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Hello Timeout : 5 Unmatched Replies : 0
Max Drop Count : 3 Hold Down Time : 10
Tx Hello Msgs : 0 Rx Hello Msgs : 0

Associated LSP LIST :
Lsp Name : to-104
Admin State : Up Oper State : Down
Time Since Last Tran*: 01d07h36m
=====
* indicates that the corresponding row element may have been truncated.
*A:ALA-12#

```

When network domains are configured, the SDP egress interface state can be verified by using the following command:

```

*A:Dut-T# show service sdp egressifs
=====
SDP Egress Ifs State Table
=====
SDP Id Network Domain State

100 net1 consistent

SDPs : 1
=====
*A:Dut-Tr#

```

## sdp-using

|                    |                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp-using</b> [ <i>sdp-id</i> [: <i>vc-id</i> ]   <b>far-end</b> <i>ip-address</i> ]                                                                                                                                          |
| <b>Context</b>     | show>service                                                                                                                                                                                                                     |
| <b>Description</b> | This command displays services using SDP or far-end address options.                                                                                                                                                             |
| <b>Parameters</b>  | <p><i>sdp-id</i> — Displays only services bound to the specified SDP ID.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — Displays information about the virtual circuit identifier.</p> <p><b>Values</b> 1 — 4294967295</p> |

**far-end ip-address** — Displays only services matching with the specified far-end IP address.

**Default** Services with any far-end IP address.

**Output** **Show Service SDP Using X** — The following table describes show service sdp-using output fields.

| Label      | Description                                                                                      |
|------------|--------------------------------------------------------------------------------------------------|
| Svc ID     | The service identifier.                                                                          |
| Sdp ID     | The SDP identifier.                                                                              |
| Type       | Type of SDP: spoke or mesh.                                                                      |
| Far End    | The far-end address of the SDP.                                                                  |
| Oper State | The operational state of the service.                                                            |
| I.Label    | The label used by the far-end device to send packets to this device in this service by this SDP. |
| E.Label    | The label used by this device to send packets to the far-end device in this service by this SDP. |

### Sample Output

```
*A:ALA-1# show service sdp-using 300
=====
Service Destination Point (Sdp Id : 300)
=====
SvcId SdpId Type Far End Opr State I.Label E.Label

1 300:1 Mesh 10.0.0.13 Up 131071 131071
2 300:2 Spok 10.0.0.13 Up 131070 131070
100 300:100 Mesh 10.0.0.13 Up 131069 131069
101 300:101 Mesh 10.0.0.13 Up 131068 131068
102 300:102 Mesh 10.0.0.13 Up 131067 131067

Number of SDPs : 5
=====
*A:ALA-1#
```



## service-using

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>service-using</b> [ <b>ies</b> ] [ <b>customer</b> <i>customer-id</i> ]                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command displays the services matching certain usage properties. If no optional parameters are specified, all services defined on the system are displayed.                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <p><b>ies</b> — Displays matching IES services.</p> <p><b>sdp</b> <i>sdp-id</i> — Displays only services bound to the specified SDP ID.</p> <p><b>Default</b> Services bound to any SDP ID.</p> <p><b>Values</b> 1 — 17407</p> <p><b>customer</b> <i>customer-id</i> — Displays services only associated with the specified customer ID.</p> <p><b>Default</b> Services associated with an customer.</p> <p><b>Values</b> 1 — 2147483647</p> |
| <b>Output</b>      | <b>Show Service Service-Using</b> — The following table describes show service service-using output fields:                                                                                                                                                                                                                                                                                                                                  |

| Label            | Description                                                                       |
|------------------|-----------------------------------------------------------------------------------|
| Service Id       | The value that identifies the service.                                            |
| Type             | Specifies the service type configured for the service ID.                         |
| Adm              | The administrative state of the service.                                          |
| Opr              | The operating state of the service.                                               |
| CustomerID       | The ID of the customer who owns this service.                                     |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this service. |

## Sample Output

```
A:ALA-48# show service service-using ies
=====
Services [ies]
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

88 IES Up Down 8 07/25/2006 15:46:28
89 IES Up Down 8 07/25/2006 15:46:28
104 IES Up Down 1 07/25/2006 15:46:28
200 IES Up Down 1 07/25/2006 15:46:28
214 IES Up Down 1 07/25/2006 15:46:28
321 IES Up Down 1 07/25/2006 15:46:28
322 IES Down Down 1 07/25/2006 15:46:28
1001 IES Up Down 1730 07/25/2006 15:46:28

Matching Services : 8
```

-----  
A:ALA-48#

## subscriber-using

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subscriber-using</b> [ <b>service-id</b> <i>service-id</i> ] [ <b>sap-id</b> <i>sap-id</i> ] [ <b>interface</b> <i>ip-int-name</i> ] [ <b>ip</b> <i>ip-address[/mask]</i> ] [ <b>mac</b> <i>ieee-address</i> ] [ <b>sub-profile</b> <i>sub-profile-name</i> ] [ <b>sla-profile</b> <i>sla-profile-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | show>service>subscriber-using                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command displays subscribers using certain options.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><b>service-id</b> <i>service-id</i> — Display subscriber information about the specified service ID.</p> <p><b>Values</b> 1 — 2147483648</p> <p><b>sap-id</b> <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.</p> <p><b>interface</b> <i>ip-int-name</i> — Display subscriber information about the specified interface.</p> <p><b>ip</b> <i>ip-address[/mask]</i> — Display subscriber information about the specified IP address.</p> <p><b>mac</b> <i>ieee-address</i> — Display subscriber information about the specified MAC address.</p> <p><b>sub-profile</b> <i>sub-profile-name</i> — Display subscriber information about the specified subscriber profile name.</p> <p><b>sla-profile</b> <i>sla-profile-name</i> — Display subscriber information about the specified SLA profile name.</p> |

## id

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i> { <b>all</b>   <b>arp</b>   <b>base</b>   <b>sap</b>   <b>sdp</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command displays information for a particular service-id.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <p><i>service-id</i> — The unique service identification number to identify the service in the service domain.</p> <p><b>all</b> — Display detailed information about the service.</p> <p><b>arp</b> — Display ARP entries for the service.</p> <p><b>arp-host</b> — Displays ARP host related information.</p> <p><b>base</b> — Display basic service information.</p> <p><b>interface</b> — Display service interfaces.</p> <p><b>sap</b> — Display SAPs associated to the service.</p> <p><b>sdp</b> — Display SDPs associated with the service.</p> |

all

|                    |                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>all</b>                                                                                                       |
| <b>Context</b>     | show>service>id                                                                                                  |
| <b>Description</b> | This command displays detailed information for all aspects of the service.                                       |
| <b>Output</b>      | <b>Show All Service-ID Output</b> — The following table describes the show all service-id command output fields: |

| Label                             | Description                                                                                                                                                      |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Detailed Information      |                                                                                                                                                                  |
| Service Id                        | The service identifier.                                                                                                                                          |
| VPN Id                            | The number which identifies the VPN.                                                                                                                             |
| Service Type                      | Specifies the type of service.                                                                                                                                   |
| SDP Id                            | The SDP identifier.                                                                                                                                              |
| Description                       | Generic information about the service.                                                                                                                           |
| Customer Id                       | The customer identifier.                                                                                                                                         |
| Last Mgmt Change                  | The date and time of the most recent management-initiated change to this customer.                                                                               |
| SAP Count                         | The number of SAPs specified for this service.                                                                                                                   |
| SDP Bind Count                    | The number of SDPs bound to this service.                                                                                                                        |
| Service Destination Points (SDPs) |                                                                                                                                                                  |
| SDP Id                            | The SDP identifier.                                                                                                                                              |
| Type                              | Indicates whether this Service SDP binding is a spoke or a mesh.                                                                                                 |
| Admin Path MTU                    | The largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.        |
| Oper Path MTU                     | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Delivery                          | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                     |
| Admin State                       | The administrative state of this SDP.                                                                                                                            |
| Oper State                        | The operational state of this SDP.                                                                                                                               |
| Ingress Label                     | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                 |

| Label                        | Description (Continued)                                                                                                                                                                                                                                                                |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Egress Label                 | The label used by this device to send packets to the far-end device in this service by this SDP.                                                                                                                                                                                       |
| Ingress Filter               | The ID of the ingress filter policy.                                                                                                                                                                                                                                                   |
| Egress Filter                | The ID of the egress filter policy.                                                                                                                                                                                                                                                    |
| Far End                      | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                                                                                                                              |
| Last Changed                 | The date and time of the most recent change to this customer.                                                                                                                                                                                                                          |
| Signaling                    | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on this SDP.                                                                                                                                                     |
| Admin State                  | Specifies the operating status of the service.                                                                                                                                                                                                                                         |
| Oper State                   | The current status of the service.                                                                                                                                                                                                                                                     |
| Hello Time                   | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                         |
| Hello Msg Len                | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                         |
| Max Drop Count               | Specifies the maximum number of consecutive SDP Echo Request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                        |
| Hold Down Time               | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                       |
| SDP Delivery Mechanism       | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far-end field.<br>If the SDP type is GRE, then the following message displays:<br>“SDP Delivery Mechanism is not MPLS” |
| Number of SDPs               | The total number SDPs applied to this service ID.                                                                                                                                                                                                                                      |
| <b>Service Access Points</b> |                                                                                                                                                                                                                                                                                        |
| Service Id                   | The service identifier.                                                                                                                                                                                                                                                                |
| Port Id                      | The ID of the access port where this SAP is defined.                                                                                                                                                                                                                                   |
| Description                  | Generic information about the SAP.                                                                                                                                                                                                                                                     |
| Encap                        | The value of the label used to identify this SAP on the access port.                                                                                                                                                                                                                   |
| Admin State                  | The desired state of the SAP.                                                                                                                                                                                                                                                          |
| Oper State                   | The operating state of the SAP.                                                                                                                                                                                                                                                        |
| Last Changed                 | The date and time of the last change.                                                                                                                                                                                                                                                  |

| Label                 | Description (Continued)                                                                                                                                          |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Admin MTU             | The largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.        |
| Oper MTU              | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Ingress qos-policy    | The SAP ingress QoS policy ID.                                                                                                                                   |
| Egress qos-policy     | The SAP egress QoS policy ID.                                                                                                                                    |
| Ingress Filter-Id     | The SAP ingress filter policy ID.                                                                                                                                |
| Egress Filter-Id      | The SAP egress filter policy ID.                                                                                                                                 |
| Multi Svc Site        | Indicates the multi-service site that the SAP is a member.                                                                                                       |
| Ingress sched-policy  | Indicates the ingress QoS scheduler for the SAP.                                                                                                                 |
| Egress sched-policy   | Indicates the egress QoS scheduler for the SAP.                                                                                                                  |
| Acct. Pol             | Indicates the accounting policy applied to the SAP.                                                                                                              |
| Collect Stats         | Specifies whether accounting statistics are collected on the SAP.                                                                                                |
| <b>SAP Statistics</b> |                                                                                                                                                                  |
| Dropped               | The number of packets or octets dropped.                                                                                                                         |
| Offered Hi Priority   | The number of high priority packets, as determined by the SAP ingress QoS policy.                                                                                |
| Offered Low Priority  | The number of low priority packets, as determined by the SAP ingress QoS policy.                                                                                 |
| Forwarded In Profile  | The number of in-profile packets or octets (rate below CIR) forwarded.                                                                                           |
| Forwarded Out Profile | The number of out-of-profile packets or octets (rate above CIR) forwarded.                                                                                       |
| <b>Queueing Stats</b> |                                                                                                                                                                  |
| Dropped In Profile    | The number of in-profile packets or octets discarded.                                                                                                            |
| Dropped Out Profile   | The number of out-of-profile packets or octets discarded.                                                                                                        |
| Forwarded In Profile  | The number of in-profile packets or octets (rate below CIR) forwarded.                                                                                           |
| Forwarded Out Profile | The number of out-of-profile packets or octets (rate above CIR) forwarded.                                                                                       |

| Label                                 | Description (Continued)                                                                                                                                     |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SAP per Queue stats</b>            |                                                                                                                                                             |
| Ingress Queue 1                       | The index of the ingress QoS queue of this SAP.                                                                                                             |
| High priority offered                 | The packets or octets count of the high priority traffic for the SAP.                                                                                       |
| High priority dropped                 | The number of high priority traffic packets/octets dropped.                                                                                                 |
| Low priority offered                  | The packets or octets count of the low priority traffic.                                                                                                    |
| Low priority dropped                  | The number of low priority traffic packets/octets dropped.                                                                                                  |
| In profile forwarded                  | The number of in-profile packets or octets (rate below CIR) forwarded.                                                                                      |
| Out profile forwarded                 | The number of out-of-profile octets (rate above CIR) forwarded.                                                                                             |
| Egress Queue 1                        | The index of the egress QoS queue of the SAP.                                                                                                               |
| In profile forwarded                  | The number of in-profile packets or octets (rate below CIR) forwarded.                                                                                      |
| <b>IPCP Address Extension Details</b> |                                                                                                                                                             |
| In profile dropped                    | The number of in-profile packets or octets dropped for the SAP.                                                                                             |
| Peer IP Addr                          | Specifies the remote IP address to be assigned to the far-end of the associated PPP/MLPPP link via IPCP extensions.                                         |
| Peer Pri DNS Addr                     | Specifies a unicast IPv4 address for the primary DNS server to be signaled to the far-end of the associate PPP/MLPPP link via IPCP extensions.              |
| Peer Sec DNS Addr                     | Specifies a unicast IPv4 address for the secondary DNS server to be signaled to the far-end of the associate PPP/MLPPP link via IPCP extensions. (optional) |

## arp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp</b> [ <i>ip-address</i> ]   [ <b>mac</b> <i>ieee-address</i> ]   [ <b>sap</b> <i>sap-id</i> ]   [ <b>interface</b> <i>ip-int-name</i> ] [ <b>sdp</b> <i>sdp-id:vc-id</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | Displays the ARP table for the IES instance. The ARP entries for a subscriber interface are displayed uniquely. Each MAC associated with the subscriber interface child group-interfaces are displayed with each subscriber interface ARP entry. They do not reflect actual ARP entries but are displayed along the interfaces ARP entry for easy lookup.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <p><i>ip-address</i> — Displays only ARP entries in the ARP table with the specified IP address.</p> <p><b>Default</b> All IP addresses.</p> <p><b>mac</b> <i>ieee-address</i> — Displays only ARP entries in the ARP table with the specified 48-bit MAC address. The MAC address can be expressed in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i>, <i>bb</i>, <i>cc</i>, <i>dd</i>, <i>ee</i> and <i>ff</i> are hexadecimal numbers.</p> <p><b>Default</b> All MAC addresses.</p> <p><b>sap</b> <i>sap-id</i> — Displays SAP information for the specified SAP ID. See Common CLI Command Descriptions on page 1933 for command syntax.</p> <p><i>port-id</i> — <b>interface</b> — Specifies matching service ARP entries associated with the IP interface.</p> <p><i>ip-address</i> — The IP address of the interface for which to display matching ARP entries.</p> <p><b>Values</b> 1.0.0.0 — 223.255.255.255</p> <p><i>ip-int-name</i> — The IP interface name for which to display matching ARPs.</p> <p><i>sdp-id</i> — The SDP identifier.</p> <p><i>vc-id</i> — The virtual circuit identifier.</p> <p><b>Values</b> 1 — 4294967295</p> |
| <b>Output</b>      | <b>Show Service-ID ARP</b> — The following table describes show service-id ARP output fields.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Label       | Description                                                                                                                                                                                                    |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IP Address  | The IP address.                                                                                                                                                                                                |
| MAC Address | The specified MAC address.                                                                                                                                                                                     |
| Type        | Static — FDB entries created by management.<br>Learned — Dynamic entries created by the learning process.<br>OAM — Entries created by the OAM process.<br>Other — Local entries for the IP interfaces created. |
| Expiry      | The age of the ARP entry.                                                                                                                                                                                      |
| Interface   | The interface applied to the service.                                                                                                                                                                          |
| SAP         | The SAP ID.                                                                                                                                                                                                    |

**Sample Output**

A:ALA-49# show service id 88 arp

## ARP Table

| IP Address | MAC Address       | Type    | Expiry    | Interface | SAP       |
|------------|-------------------|---------|-----------|-----------|-----------|
| 11.30.1.1  | 76:1e:ff:00:01:41 | Other   | 00h00m00s | ies30     | lag-1:30  |
| 11.31.1.1  | 76:1e:ff:00:01:41 | Other   | 00h00m00s | ies30     | lag-1:30  |
| 11.37.1.1  | 00:00:00:00:00:00 | Other   | 00h00m00s | foo2      | n/a       |
| 11.20.1.1  | 76:1e:ff:00:00:00 | Other   | 00h00m00s | s2        | subscrib* |
|            | 76:1e:ff:00:01:41 |         |           | g3        | lag-1     |
| 11.20.1.10 | 00:00:aa:aa:aa:dd | Managed | 00h00m00s | g3        | lag-1:11  |
| 11.20.1.11 | 00:00:aa:aa:aa:dd | Managed | 00h00m00s | g3        | lag-1:11  |
| 11.20.1.12 | 00:00:aa:aa:aa:dd | Managed | 00h00m00s | g3        | lag-1:11  |
| 11.38.1.1  | 76:1e:ff:00:00:00 | Other   | 00h00m00s | s3        | subscrib* |
|            | 76:21:04:01:00:01 |         |           | g5        | 4/1/1     |
|            | 76:21:04:01:00:01 |         |           | g7        | 4/1/1     |
| 11.39.1.1  | 76:1e:ff:00:00:00 | Other   | 00h00m00s | s3        | subscrib* |
|            | 76:21:04:01:00:01 |         |           | g5        | 41/1/1    |
|            | 76:21:04:01:00:01 |         |           | g7        | 4/1/1     |
| 11.38.1.2  | 76:22:07:01:00:01 | Managed | 00h00m00s | g7        | 4/1/1:25* |
| 11.38.10.1 | 76:22:07:01:00:01 | Managed | 00h00m00s | g7        | 4/1/1:25* |
| 11.38.99.1 | 76:22:07:01:00:01 | Managed | 00h00m00s | g7        | 4/1/1:25* |

\* indicates that the corresponding row element may have been truncated.

A:ALA-49#



## arp-host

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-host</b> [wholesaler service-id] [ <b>sap</b> sap-id   <b>interface</b> interface-name   <b>ip-address</b> ip-address[/mask]   <b>mac</b> ieee-address   {[ <b>port</b> port-id] [ <b>no-inter-dest-id</b>   <b>inter-dest-id</b> inter-dest-id]]] [ <b>detail</b> ]<br><b>arp-host statistics</b> [ <b>sap</b> sap-id   <b>interface</b> interface-name]<br><b>arp-host summary</b> [ <b>interface</b> interface-name] |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays ARP host related information.                                                                                                                                                                                                                                                                                                                                                                            |

## Sample Output

```
*A:Dut-C# show service id 2 arp-host
=====
ARP host table, service 2
=====
IP Address Mac Address Sap Id Remaining MC
 Time Stdbby

128.128.1.2 00:80:00:00:00:01 2/1/5:2 00h04m41s
128.128.1.3 00:80:00:00:00:02 2/1/5:2 00h04m42s
128.128.1.4 00:80:00:00:00:03 2/1/5:2 00h04m43s
128.128.1.5 00:80:00:00:00:04 2/1/5:2 00h04m44s
128.128.1.6 00:80:00:00:00:05 2/1/5:2 00h04m45s
128.128.1.7 00:80:00:00:00:06 2/1/5:2 00h04m46s
128.128.1.8 00:80:00:00:00:07 2/1/5:2 00h04m47s
128.128.1.9 00:80:00:00:00:08 2/1/5:2 00h04m48s
128.128.1.10 00:80:00:00:00:09 2/1/5:2 00h04m49s
128.128.1.11 00:80:00:00:00:0a 2/1/5:2 00h04m50s

Number of ARP hosts : 10
=====
*A:Dut-C#

*A:Dut-C# show service id 2 arp-host ip-address 128.128.1.2 detail
=====
ARP hosts for service 2
=====
Service ID : 2
IP Address : 128.128.1.2
MAC Address : 00:80:00:00:00:01
SAP : 2/1/5:2
Remaining Time : 00h04m58s

Sub-Ident : "alu_1_2"
Sub-Profile-String : ""
SLA-Profile-String : ""
App-Profile-String : ""
ARP host ANCP-String : ""
ARP host Int Dest Id : ""
RADIUS-User-Name : "128.128.1.2"

Session Timeout (s) : 301
Start Time : 02/09/2009 16:35:07
Last Auth : 02/09/2009 16:36:34
```

```
Last Refresh : 02/09/2009 16:36:38
Persistence Key : N/A

Number of ARP hosts : 1
=====
*A:Dut-C#

*A:Dut-C# show service id 2 arp-host statistics
=====
ARP host statistics
=====
Num Active Hosts : 20
Received Triggers : 70
Ignored Triggers : 10
Ignored Triggers (overload) : 0
SHCV Checks Forced : 0
Hosts Created : 20
Hosts Updated : 40
Hosts Deleted : 0
Authentication Requests Sent : 40
=====
*A:Dut-C#

*A:Dut-C# show service id 2 arp-host summary
=====
ARP host Summary, service 2
=====
Sap Used Provided Admin State

sap:2/1/5:2 20 8000 inService

Number of SAPs : 1

=====
*A:Dut-C#
```

statistics

- Syntax**     **statistics** [*policy name*] [*sap sap-id*]
- Context**    show>service>id>authentication
- Description** Displays session authentication statistics for this service.
- Parameters** **policy name** — Specifies the subscriber authentication policy statistics to display.  
**sap sap-id** — Specifies the SAP ID statistics to display. See Common CLI Command Descriptions on page 1933 for command syntax.

See Common CLI Command Descriptions on page 1933 for command syntax.

Sample Output

```
*A:ALA-1# show service id 11 authentication statistics
```

```

Authentication statistics

Interface / SAP Authentication Successful Authentication Failed

vpls-11-90.1.0.254 1582 3

Number of entries: 1
=====
*A:ALA-1#

```

## authentication

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication</b>                                                              |
| <b>Context</b>     | show>service>id                                                                    |
| <b>Description</b> | This command enables the context to display subscriber authentication information. |

## base

|                    |                                                                 |
|--------------------|-----------------------------------------------------------------|
| <b>Syntax</b>      | <b>base</b>                                                     |
| <b>Context</b>     | show>service>id                                                 |
| <b>Description</b> | This command displays basic information about this IES service. |

### Sample Output

```

*A:ALA-A# show service id 100 base

Service Basic Information

Service Id : 100 Vpn Id : 100
Service Type : IES
Description : Default Ies description for service id 100
Customer Id : 1
Last Status Change: 08/29/2006 17:44:28
Last Mgmt Change : 08/29/2006 17:44:28
Admin State : Up Oper State : Up
SAP Count : 2

Service Access & Destination Points

Identifier Type AdmMTU OprMTU Adm Opr

sap:1/1/3 null 1514 1514 Up Up
sap:1/1/4 null 1514 1514 Up Up
=====
*A:ALA-A#

```

dhcp

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                                             |
| <b>Context</b>     | show>service>id                                                                         |
| <b>Description</b> | This command enables the context to display DHCP information for the specified service. |

lease-state

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-state</b> <b>[[sap sap-id]   [sdp sdp-id:vc-id]   [interface interface-name]   [ip-address ip-address]] [detail]</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Context</b>     | show>service>id>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command displays DHCP lease state related information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <b>sap sap-id</b> — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.<br><b>sdp-id</b> — The SDP identifier.<br><b>Values</b> 1 — 17407<br><b>vc-id</b> — The virtual circuit ID on the SDP ID for which to display information.<br><b>Values</b> 1 — 4294967295<br><b>interface interface-name</b> — Displays information for the specified IP interface.<br><b>ip-address ip-address</b> — Displays information associated with the specified IP address.<br><b>detail</b> — Displays detailed information. |

Sample Output

```
A:ALA-_Dut-A# show service id 13 dhcp lease-state
=====
DHCP lease state table, service 13
=====
IP Address Mac Address Sap/Sdp Id Remaining Lease MC
LifeTime Origin Stdby

13.13.40.1 00:00:00:00:00:13 1/1/1:13 00h00m58s Radius

Number of lease states : 1
=====
A:ALA-_Dut-A#

A:ALA-_Dut-A# show service id 13 dhcp lease-state detail
=====
DHCP lease states for service 13
=====
Service ID : 13
IP Address : 13.13.40.1
Mac Address : 00:00:00:00:00:13
```

```

Interface : ies-13-13.13.1.1
SAP : 1/1/1:13
Remaining Lifetime : 00h00m58s
Persistence Key : N/A

Sub-Ident : "Belgacom"
Sub-Profile-String : "ADSL GO"
SLA-Profile-String : "BE-Video"
Lease ANCP-String : ""

Sub-Ident origin : Radius
Strings origin : Radius
Lease Info origin : Radius

Ip-Netmask : 255.255.0.0
Broadcast-Ip-Addr : 13.13.255.255
Default-Router : N/A
Primary-Dns : 13.13.254.254
Secondary-Dns : 13.13.254.253

ServerLeaseStart : 12/24/2006 23:44:07
ServerLastRenew : 12/24/2006 23:44:07
ServerLeaseEnd : 12/24/2006 23:45:07
Session-Timeout : 0d 00:01:00
DHCP Server Addr : N/A

Persistent Relay Agent Information
 Circuit Id : ancstb6_Dut-A|13|ies-13-13.13.1.1|0|13
 Remote Id : stringtest

```

```

Number of lease states : 1
=====

```

```

A:ALA-_Dut-A#

```

### Routed CO Output Example

```

A:ALA-_Dut-A# show service id 13 dhcp lease-state

```

```

=====
DHCP lease state table, service 13
=====

```

| IP Address | Mac Address       | Sap/Sdp Id | Remaining<br>LifeTime | Lease<br>Origin | MC<br>Stdby |
|------------|-------------------|------------|-----------------------|-----------------|-------------|
| 13.13.40.1 | 00:00:00:00:00:13 | 1/1/1:13   | 00h00m58s             | Radius          |             |

```

Number of lease states : 1
=====

```

```

A:ALA-_Dut-A#

```

```

A:ALA-_Dut-A# show service id 13 dhcp lease-state detail

```

```

=====
DHCP lease states for service 13
=====

```

```

Service ID : 13
IP Address : 13.13.40.1
Mac Address : 00:00:00:00:00:13
Subscriber-interface : ies-13-13.13.1.1
Group-interface : intf-13
SAP : 1/1/1:13

```

## Show, Clear, Debug Commands

```
Remaining Lifetime : 00h00m58s
Persistence Key : N/A

Sub-Ident : "Belgacom"
Sub-Profile-String : "ADSL GO"
SLA-Profile-String : "BE-Video"
Lease ANCP-String : ""

Sub-Ident origin : Radius
Strings origin : Radius
Lease Info origin : Radius

Ip-Netmask : 255.255.0.0
Broadcast-Ip-Addr : 13.13.255.255
Default-Router : N/A
Primary-Dns : 13.13.254.254
Secondary-Dns : 13.13.254.253

ServerLeaseStart : 12/24/2006 23:48:23
ServerLastRenew : 12/24/2006 23:48:23
ServerLeaseEnd : 12/24/2006 23:49:23
Session-Timeout : 0d 00:01:00
DHCP Server Addr : N/A

Persistent Relay Agent Information
 Circuit Id : ancstb6_Dut-A|13|intf-13|0|13
 Remote Id : stringtest
```

```

Number of lease states : 1
=====
```

```
A:ALA-_Dut-A#
```

### Wholesaler/Retailer Output Example

```
A:ALA-_Dut-A# show service id 2000 dhcp lease-state detail
```

```
=====
DHCP lease states for service 2000

```

```
Wholesaler 1000 Leases

```

```
Service ID : 1000
IP Address : 13.13.1.254
Mac Address : 00:00:00:00:00:13
Subscriber-interface : whole-sub
Group-interface : intf-13
Retailer : 2000
Retailer If : retail-sub
SAP : 1/1/1:13
Remaining Lifetime : 00h09m59s
Persistence Key : N/A
```

```
Sub-Ident : "Belgacom"
Sub-Profile-String : "ADSL GO"
SLA-Profile-String : "BE-Video"
Lease ANCP-String : ""
```

```
Sub-Ident origin : Retail DHCP
Strings origin : Retail DHCP
Lease Info origin : Retail DHCP
```

```
Ip-Netmask : 255.255.0.0
```

```
Broadcast-Ip-Addr : 13.13.255.255
Default-Router : N/A
Primary-Dns : N/A
Secondary-Dns : N/A
```

```
ServerLeaseStart : 12/25/2006 00:29:41
ServerLastRenew : 12/25/2006 00:29:41
ServerLeaseEnd : 12/25/2006 00:39:41
Session-Timeout : 0d 00:10:00
DHCP Server Addr : 10.232.237.2
```

```
Persistent Relay Agent Information
Circuit Id : 1/1/1:13
Remote Id : stringtest
```

```

Number of lease states : 1
```

```
=====
A:ALA-_Dut-A#
```

## statistics

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <b>sap</b> <i>sap-id</i><br><b>statistics</b> [ <b>sdp</b> <i>sdp-id:vc-id</i><br><b>statistics</b> [ <b>interface</b> <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | show>service>id>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | Displays DHCP statistics information.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Parameters</b>  | <b>sap</b> <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.<br><i>sdp-id</i> — The SDP identifier.<br><b>Values</b> 1 — 17407<br><i>vc-id</i> — The virtual circuit ID on the SDP ID for which to display information.<br><b>Values</b> 1 — 4294967295<br><b>interface</b> <i>interface-name</i> — Displays information for the specified IP interface. |

## summary

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>summary</b>                                                                                      |
| <b>Context</b>     | show>service>id>dhcp                                                                                |
| <b>Description</b> | Displays DHCP configuration summary information.                                                    |
| <b>Output</b>      | <b>Show DHCP Summary Output</b> — The following table describes the output fields for DHCP summary. |

| Label          | Description                                                                                                                                                                                                                                                                                                               |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface Name | Name of the router interface.                                                                                                                                                                                                                                                                                             |
| Arp Populate   | Specifies whether or not ARP populate is enabled.                                                                                                                                                                                                                                                                         |
| Used/Provided  | Used — The number of lease-states that are currently in use on a specific interface, that is, the number of clients on that interface got an IP address by DHCP. This value is always less than or equal to the 'Provided' field.<br><br>Provided — The lease-populate value that is configured for a specific interface. |
| Info Option    | Indicates whether Option 82 processing is enabled on the interface.                                                                                                                                                                                                                                                       |
| Admin State    | Indicates the administrative state.                                                                                                                                                                                                                                                                                       |

### Sample Output

```
A:ALA-49# show service id 88 dhcp summary
=====
DHCP Summary, service 88
=====
Interface Name Arp Used/ Info Admin
SapId/Sdp Populate Provided Option State

Sector A No 0/0 Keep Up
 sap:7/1/1.2.2 0/0
grp-if No 0/1 Keep Down
 sap:2/2/2:0 0/1
 sap:2/2/2:0 0/1
test No 0/0 Keep Up
 sap:10/1/2:0 0/0

Interfaces: 3
=====
A:ALA-49#
```

## gsmp

|                    |                                                               |
|--------------------|---------------------------------------------------------------|
| <b>Syntax</b>      | <b>gsmp</b>                                                   |
| <b>Context</b>     | show>service>id                                               |
| <b>Description</b> | This command enables the context to display GSMP information. |



## neighbors

|                    |                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>neighbors group</b> [ <i>name</i> ] [ <i>ip-address</i> ]                                                                                                                                                                                                                                    |
| <b>Context</b>     | show>service>id>gsmp                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command displays GSMP neighbor information.                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><b>group</b> — A GSMP group defines a set of GSMP neighbors which have the same properties.</p> <p><i>name</i> — Specifies a GSMP group name is unique only within the scope of the service in which it is defined.</p> <p><i>ip-address</i> — Specifies the ip-address of the neighbor.</p> |

### Sample Output

These commands show the configured neighbors per service, regardless of the fact there exists an open TCP connection with this neighbor. The admin state is shown because for a neighbor to be admin enabled, the service, gsmp node, group node and the neighbor node in this service must all be in 'no shutdown' state. Session gives the number of session (open TCP connections) for each configured neighbor.

```
A:active>show>service>id>gsmp# neighbors
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
dslam1 192.168.1.3 Enabled 0

Number of neighbors shown: 2
=====
A:active>show>service>id>gsmp#
```

```
A:active>show>service>id>gsmp# neighbors group dslam1
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
dslam1 192.168.1.3 Enabled 0

Number of neighbors shown: 2
=====
A:active>show>service>id>gsmp#
A:active>show>service>id>gsmp# neighbors group dslam1 192.168.1.2
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
=====
A:active>show>service>id>gsmp#
```

## sessions

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sessions</b> [ <b>group</b> <i>name</i> ] [ <b>neighbor</b> <i>ip-address</i> ] [ <b>port</b> <i>port-number</i> ] [ <b>association</b> ] [ <b>statistics</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | show>service>id>gsmp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays GSMP sessions information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><b>group</b> — A GSMP group defines a set of GSMP neighbors which have the same properties.</p> <p><i>name</i> — Specifies a GSMP group name is unique only within the scope of the service in which it is defined.</p> <p><i>ip-address</i> — Specifies the ip-address of the neighbor.</p> <p><i>port</i> — Specifies the neighbor TCP port number use for this ANCP session.</p> <p><b>Values</b>      0 — 65535</p> <p><b>association</b> — Displays to what object the ANCP-string is associated.</p> <p><b>statistics</b> — Displays statistics information about an ANCP session known to the system.</p> |

## Sample Output

This show command gives information about the open TCP connections with DSLAMs.

```
A:active>show>service>id>gsmp# sessions
=====
GSMP sessions for service 999 (VPRN)
=====
Port Ngbr-IPAddr Gsmp-Group

40590 192.168.1.2 dslam1

Number of GSMP sessions : 1
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590
=====
GSMP sessions for service 999 (VPRN), neighbor 192.168.1.2, Port 40590
=====
State : Established
Peer Instance : 1 Sender Instance : a3cf58
Peer Port : 0 Sender Port : 0
Peer Name : 12:12:12:12:12:12 Sender Name : 00:00:00:00:00:00
Timeouts : 0 Max. Timeouts : 3
Peer Timer : 100 Sender Timer : 100
Capabilities : DTD OAM
Conf Capabilities : DTD OAM
Priority Marking : dscp nc2
Local Addr. : 192.168.1.4
Conf Local Addr. : N/A
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 association
```

```
=====
ANCP-Strings
=====
ANCP-String Assoc. State

No ANCP-Strings found
=====
A:active>show>service>id>gsmp#
```

```
A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 statistics
=====
GSMP session stats, service 999 (VPRN), neighbor 192.168.1.2, Port 40590
=====
Event Received Transmitted

Dropped 0 0
Syn 1 1
Syn Ack 1 1
Ack 14 14
Rst Ack 0 0
Port Up 0 0
Port Down 0 0
OAM Loopback 0 0
=====
A:active>show>service>id>gsmp#
```

Note: The association command gives an overview of each ANCP string received from this session.

```
A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 association
=====
ANCP-Strings
=====
ANCP-String Assoc.
State

7330-ISAM-E47 atm 1/1/01/01:19425.64048 ANCP Up

Number of ANCP-Strings : 1
=====
A:active>show>service>id>gsmp#
```

## host

|                    |                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host</b>                                                                                                      |
| <b>Context</b>     | show>service>id                                                                                                  |
| <b>Description</b> | Displays static hosts configured for this IES service.                                                           |
| <b>Output</b>      | <b>Show All Service-ID Output</b> — The following table describes the show all service-id command output fields. |

| Label            | Description                                                                        |
|------------------|------------------------------------------------------------------------------------|
| Service Id       | The service identifier.                                                            |
| VPN Id           | The number which identifies the VPN.                                               |
| Service Type     | Specifies the type of service.                                                     |
| SDP Id           | The SDP identifier.                                                                |
| Description      | Generic information about the service.                                             |
| Customer Id      | The customer identifier.                                                           |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this customer. |
| SAP Count        | The number of SAPs specified for this service.                                     |

**Sample Output**

```
*A:ALA-48# show service id 88 host
=====
Static Hosts for service 88
=====
Sap IP Address Configured MAC Dynamic MAC
Subscriber Fwding state

1/2/4:50/5 143.144.145.1 N/A N/A
N/A Fwding

Number of static hosts : 1
=====
*A:ALA-48#
```

## host-connectivity-verify

|                    |                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>host-connectivity-verify statistics</b> [ <b>sap</b> <i>sap-id</i> ]                                                                                              |
| <b>Context</b>     | show>service>id                                                                                                                                                      |
| <b>Description</b> | Displays host connectivity check statistics.                                                                                                                         |
| <b>Parameters</b>  | <b>statistics</b> — Displays host connectivity verification data.<br><b>sap</b> <i>sap-id</i> — See Common CLI Command Descriptions on page 1933 for command syntax. |
| <b>Output</b>      | <b>Show Service Id Host Connectivity Verify</b> — The following table describes show service-id host connectivity verification output fields:                        |

| Label          | Description                                            |
|----------------|--------------------------------------------------------|
| Svc Id         | The service identifier.                                |
| SapId/SdpId    | The SAP and SDP identifiers.                           |
| DestIp Address | The destination IP address.                            |
| Last Response  | The time when the last response was received.          |
| Time Expired   | Displays whether the interval value has expired.       |
| Oper State     | Displays the current operational state of the service. |

### Sample Output

```
A:ALA-48>show>service>id# host-connectivity-verify statistics sap 1/1/9:0
=====
Host connectivity check statistics
=====
Svc SapId/ DestIp Last Time Oper
Id SdpId Address Response Expired State

1000 5/2/3:0 143.144.145.1 Up
=====
A:ALA-48>show>service>id#
```

## interface

|                    |                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> [ <i>ip-address</i>   <i>ip-int-name</i> ] [ <i>interface-type</i> ] [ <b>detail</b> ] [ <b>family</b> ]                                                                                 |
| <b>Context</b>     | show>service>id                                                                                                                                                                                           |
| <b>Description</b> | This command displays information for the IP interfaces associated with the IES service. If no optional parameters are specified, a summary of all IP interfaces associated to the service are displayed. |
| <b>Parameters</b>  | <i>ip-address</i> — The IP address of the interface for which to display information.                                                                                                                     |

**Values**

ipv4-address: a.b.c.d (host bits must be 0)  
 ipv6-address: x:x:x:x:x:x:x (eight 16-bit pieces)  
 x:x:x:x:x:d.d.d.d  
 x: [0 — FFFF]H  
 d: [0 — 255]

*ip-int-name* — Specifies the IP interface name for which to display information.

**Values** 32 characters maximum

**family** — Displays the router IP interface table to display.

**Values** **ipv4** — Displays only those peers that have the IPv4 family enabled.  
**ipv6** — Displays the peers that are IPv6-capable.

*interface-type* — Specifies to display either group or subscriber interfaces.

**Values** group, subscriber

**detail** — Displays detailed IP interface information.

**Default** IP interface summary output.

**Output** **Show Service-ID** — The following table describes show service-id output fields.

| Label           | Description                                                                                                                               |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| If Name         | The name used to refer to the IES interface.                                                                                              |
| Type            | Specifies the interface type.                                                                                                             |
| IP-Address      | Specifies the IP address/IP subnet/broadcast address of the interface.                                                                    |
| Adm             | The administrative state of the interface.                                                                                                |
| Opr             | The operational state of the interface.                                                                                                   |
| Admin State     | The administrative state of the interface.                                                                                                |
| Oper State      | The operational state of the interface.                                                                                                   |
| IP Addr/mask    | Specifies the IP address/IP subnet/broadcast address of the interface.                                                                    |
| If Index        | The index corresponding to this IES interface. The primary index is 1; all IES interfaces are defined in the base virtual router context. |
| If Type         | Specifies the interface type.                                                                                                             |
| SAP Id          | Specifies the SAP's port ID.                                                                                                              |
| SNTP B.Cast     | Specifies whether SNTP broadcast client mode is enabled or disabled.                                                                      |
| Arp Timeout     | Specifies the timeout for an ARP entry learned on the interface.                                                                          |
| MAC Address     | Specifies the 48-bit IEEE 802.3 MAC address.                                                                                              |
| ICMP Mask Reply | Specifies whether ICMP mask reply is enabled or disabled.                                                                                 |

| Label        | Description (Continued)                                                                   |
|--------------|-------------------------------------------------------------------------------------------|
| Cflowd       | Specifies whether Cflowd collection and analysis on the interface is enabled or disabled. |
| Redirects    | Specifies the rate for ICMP redirect messages.                                            |
| Unreachables | Specifies the rate for ICMP unreachable messages.                                         |
| TTL Expired  | Specifies the rate for ICMP TTL messages.                                                 |

### Sample Output

```
A:ALA-49# show service id 88 interface
=====
Interface Table
=====
Interface-Name Adm Opr (v4/v6) Type Port/SapId
IP-Address PfxState

Sector A Up Down/Down IES 1/1/1.2.2
- -
test Up Down/Down IES 1/1/2:0
 1.1.1.1/31 n/a
 1.1.1.1/31 n/a
 1.1.2.1/31 n/a
test27 Up Up/-- IES Sub subscriber
 192.168.10.21/24 n/a
grp-if Up Down/-- IES Grp 1/2/2
Interfaces : 4
=====
A:ALA-49#
```

## labels

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>labels</b>                                                                                       |
| <b>Context</b>     | show>service>id                                                                                     |
| <b>Description</b> | Displays the labels being used by the service.                                                      |
| <b>Output</b>      | <b>Show Service-ID Labels</b> — The following table describes show service-id labels output fields: |

| Label  | Description                                                                                        |
|--------|----------------------------------------------------------------------------------------------------|
| Svc Id | The service identifier.                                                                            |
| Sdp Id | The SDP identifier.                                                                                |
| Type   | Indicates whether the SDP is a spoke or a mesh.                                                    |
| I.Lbl  | The VC label used by the far-end device to send packets to this device in this service by the SDP. |

| Label | Description (Continued)                                                                            |
|-------|----------------------------------------------------------------------------------------------------|
| E.Lbl | The VC label used by this device to send packets to the far-end device in this service by the SDP. |

**Sample Output**

```
*A:ALA-12# show service id 1 labels
```

```
=====
Martini Service Labels
=====
```

| Svc Id | Sdp Id | Type | I.Lbl  | E.Lbl  |
|--------|--------|------|--------|--------|
| 1      | 10:1   | Mesh | 0      | 0      |
| 1      | 20:1   | Mesh | 0      | 0      |
| 1      | 30:1   | Mesh | 0      | 0      |
| 1      | 40:1   | Mesh | 130081 | 131061 |
| 1      | 60:1   | Mesh | 131019 | 131016 |
| 1      | 100:1  | Mesh | 0      | 0      |

```

Number of Bound SDPs : 6

```

```
*A:ALA-12#
```



## sap

|                    |                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> [ <b>detail</b> ]                                                                                                                                                                                                |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                           |
| <b>Description</b> | Displays information for the SAPs associated with the service.<br>If no optional parameters are specified, a summary of all associated SAPs is displayed.                                                                                 |
| <b>Parameters</b>  | <i>sap-id</i> — The ID that displays SAPs for the service in the <i>slot/mda/port[channel]</i> format. See Common CLI Command Descriptions on page 1933 for command syntax.<br><b>detail</b> — Displays detailed information for the SAP. |
| <b>Output</b>      | <b>Show Service-ID SAP</b> — The following table describes show service SAP fields:                                                                                                                                                       |

| Label              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id         | The service identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SAP                | The type of SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Encap              | The encapsulation type of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Ethertype          | Specifies an Ethernet type II Ethertype value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Admin State        | The administrative state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Oper State         | The operational state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Flags              | Specifies the conditions that affect the operating status of this SAP. Display output includes: ServiceAdminDown, SapAdminDown, InterfaceAdminDown, PortOperDown, PortMTUTooSmall, L2OperDown, SapIngressQoSMismatch, SapEgressQoSMismatch, RelearnLimitExceeded, RxProtSrcMac, ParentIfAdminDown, NoSapIpipeCelpAddr, TodResourceUnavail, TodMssResourceUnavail, SapParamMismatch, CemSapNoEcidOrMacAddr, StandByForMcRing, ServiceMTUTooSmall, SapIngressNamedPoolMismatch, SapEgressNamedPoolMismatch, NoSapEpipeRingNode. |
| Last Status Change | Specifies the time of the most recent operating status change to this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Last Mgmt Change   | Specifies the time of the most recent management-initiated change to this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Admin MTU          | The desired largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented.                                                                                                                                                                                                                                                                                                                                                              |
| Ingress qos-policy | The ingress QoS policy ID assigned to the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Egress qos-policy  | The egress QoS policy ID assigned to the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Ingress Filter-Id  | The ingress filter policy ID assigned to the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Label               | Description (Continued)                                                                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Egress Filter-Id    | The egress filter policy ID assigned to the SAP.                                                                                                                         |
| Acct. Pol           | The accounting policy ID assigned to the SAP.                                                                                                                            |
| Collect Stats       | Specifies whether statistics collection is enabled.                                                                                                                      |
| Dropped             | The number of packets and octets dropped due to SAP state, ingress MAC or IP filter, same segment discard, bad checksum, etc.                                            |
| Off. HiPrio         | The number of high priority packets and octets, as determined by the SAP ingress QoS policy.                                                                             |
| Off. LowPrio        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy.                                                                              |
| Off. Uncolor        | The number of uncolored packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                              |
| Dro. HiPrio         | The number of high priority packets and octets, as determined by the SAP ingress QoS policy, dropped by the Qchip due to: MBS exceeded, buffer pool limit exceeded, etc. |
| Dro. LowPrio        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy, dropped by the Qchip due to: MBS exceeded, buffer pool limit exceeded, etc.  |
| For. InProf         | The number of in-profile packets and octets (rate below CIR) forwarded by the ingress Qchip.                                                                             |
| For. OutProf        | The number of out-of-profile packets and octets (rate below CIR) forwarded by the ingress Qchip.                                                                         |
| Dro. InProf         | The number of in-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                          |
| Ingress TD Profile  | The profile ID applied to the ingress SAP.                                                                                                                               |
| Egress TD Profile   | The profile ID applied to the egress SAP.                                                                                                                                |
| Alarm Cell Handling | The OAM operational status of the VCL.                                                                                                                                   |
| AAL-5 Encap         | The AAL-5 encapsulation type.                                                                                                                                            |
| Mult Svc Site       | Specifies the customer's multi-service-site name.                                                                                                                        |
| I. Sched Pol        | The ingress scheduler policy applied to the customer's multi-service-site.                                                                                               |
| E. Sched Pol        | The egress scheduler policy applied to the customer's multi-service-site.                                                                                                |

**Sample Output**

```

A:ALA-49# show service id 88 sap 7/1/1.2.2
=====
Service Access Points(SAP)
=====
Service Id : 88
SAP : 1/1/1.2.2 Encap : bcpNull
Admin State : Up Oper State : Down
Flags : PortOperDown
 SapEgressQoSMismatch
Last Status Change : 06/06/2006 08:22:07
Last Mgmt Change : 06/06/2006 14:15:58
Admin MTU : 1518 Oper MTU : 1518
Ingress qos-policy : 2 Egress qos-policy : 1020
Shared Q plcy : default Multipoint shared : Enabled
Ingress Filter-Id : n/a Egress Filter-Id : n/a
tod-suite : None
Multi Svc Site : None
Acct. Pol : None Collect Stats : Disabled
Anti Spoofing : None Nbr Static Hosts : 0

Subscriber Management

Admin State : Down MAC DA Hashing : False
Def Sub-Profile : None
Def SLA-Profile : None
Sub-Ident-Policy : None
Subscriber Limit : 1
Single-Sub-Parameters
 Prof Traffic Only : False
 Non-Sub-Traffic : N/A
=====
A:ALA-49#

```

## sdp

- Syntax** `sdp [{sdp-id | far-end ip-address}] [detail]`
- Context** `show>service>id`
- Description** Displays information for the SDPs associated with the service.  
If no optional parameters are specified, a summary of all associated SDPs is displayed.
- Parameters** *sdp-id* — The SDP ID for which to display information.
- Values** 1 — 17407
- far-end ip-address* — When specified, displays SDP having the specified far-end IP address.
- detail** — Displays detailed information for the SDP.

### Sample Output

```

A:Dut-A# show service id 1 sdp detail
=====
Services: Service Destination Points Details
=====
Sdp Id 1:1 - (10.20.1.2)

```

```

Description : Default sdp description

SDP Id : 1:1
VC Type : Ether
Admin Path MTU : 0
Far End : 10.20.1.2

Type : Spoke
VC Tag : n/a
Oper Path MTU : 9186
Delivery : MPLS

Admin State : Up
Acct. Pol : None
Ingress Label : 2048
Ing mac Fltr : n/a
Ing ip Fltr : n/a
Ing ipv6 Fltr : n/a
Admin ControlWord : Not Preferred
Last Status Change : 05/31/2007 00:45:43
Last Mgmt Change : 05/31/2007 00:45:43
Class Fwding State : Up
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None
Max Nbr of MAC Addr: No Limit
Learned MAC Addr : 0

Oper State : Up
Collect Stats : Disabled
Egress Label : 2048
Egr mac Fltr : n/a
Egr ip Fltr : n/a
Egr ipv6 Fltr : n/a
Oper ControlWord : False
Signaling : None

Total MAC Addr : 0
Static MAC Addr : 0

MAC Learning : Enabled
MAC Aging : Enabled
L2PT Termination : Disabled
MAC Pinning : Disabled

Discard Unkwn Srce: Disabled
BPDU Translation : Disabled

KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Max Drop Count : 3

Oper State : Disabled
Hello Msg Len : 0
Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0
I. Fwd. Octs. : 0
E. Fwd. Pkts. : 0
MCAC Policy Name :
MCAC Max Unconst BW: no limit
MCAC In use Mand BW: 0
MCAC In use Opnl BW: 0

I. Dro. Pkts. : 0
I. Dro. Octs. : 0
E. Fwd. Octets : 0
MCAC Max Mand BW : no limit
MCAC Avail Mand BW: unlimited
MCAC Avail Opnl BW: unlimited

Associated LSP LIST :
Lsp Name : A_B_1
Admin State : Up
Time Since Last Tr*: 00h26m35s

Oper State : Up

Lsp Name : A_B_2
Admin State : Up
Time Since Last Tr*: 00h26m35s

Oper State : Up

Lsp Name : A_B_3
Admin State : Up
Time Since Last Tr*: 00h26m34s

Oper State : Up

Lsp Name : A_B_4
Admin State : Up
Time Since Last Tr*: 00h26m34s

Oper State : Up

```

```

Lsp Name : A_B_5
Admin State : Up
Time Since Last Tr*: 00h26m34s
Oper State : Up

Lsp Name : A_B_6
Admin State : Up
Time Since Last Tr*: 00h26m34s
Oper State : Up

Lsp Name : A_B_7
Admin State : Up
Time Since Last Tr*: 00h26m34s
Oper State : Up

Lsp Name : A_B_8
Admin State : Up
Time Since Last Tr*: 00h26m35s
Oper State : Up

Lsp Name : A_B_9
Admin State : Up
Time Since Last Tr*: 00h26m34s
Oper State : Up

Lsp Name : A_B_10
Admin State : Up
Time Since Last Tr*: 00h26m34s
Oper State : Up

Class-based forwarding :

Class forwarding : enabled
Default LSP : A_B_10
Multicast LSP : A_B_9
=====
FC Mapping Table
=====
FC Name LSP Name

af A_B_3
be A_B_1
ef A_B_6
h1 A_B_7
h2 A_B_5
l1 A_B_4
l2 A_B_2
nc A_B_8
=====
Stp Service Destination Point specifics

Mac Move : Blockable
Stp Admin State : Up
Core Connectivity : Down
Port Role : N/A
Port Number : 2049
Port Path Cost : 10
Admin Edge : Disabled
Link Type : Pt-pt
Root Guard : Disabled
Last BPDU from : N/A
Designated Bridge : N/A
Stp Oper State : Down
Port State : Forwarding
Port Priority : 128
Auto Edge : Enabled
Oper Edge : N/A
BPDU Encap : Dot1d
Active Protocol : N/A
Designated Port Id: 0

Fwd Transitions : 0
Cfg BPDUs rcvd : 0
TCN BPDUs rcvd : 0
RST BPDUs rcvd : 0
Bad BPDUs rcvd : 0
Cfg BPDUs tx : 0
TCN BPDUs tx : 0
RST BPDUs tx : 0

```

```

Number of SDPs : 1

* indicates that the corresponding row element may have been truncated.

A:Dut-A#

```

## subscriber-hosts

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subscriber-hosts</b> [ <b>sap</b> <i>sap-id</i> ] [ <b>ip</b> <i>ip-address</i> [/ <i>mask</i> ]] [ <b>mac</b> <i>ieee-address</i> ] [ <b>sub-profile</b> <i>sub-profile-name</i> ] [ <b>sla-profile</b> <i>sla-profile-name</i> ] [ <b>detail</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | Displays subscriber host information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Parameters</b>  | <p><b>sap</b> <i>sap-id</i> — Displays the specified subscriber host SAP information. See Common CLI Command Descriptions on page 1933 for command syntax.</p> <p><b>ip</b> <i>ip-address/mask</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation.</p> <p><b>Values</b>      Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).<br/>mask: 1 — 32</p> <p><b>ieee-address</b> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.</p> <p><b>sub-profile</b> <i>sub-profile-name</i> — Specifies an existing subscriber profile name to be associated with the static subscriber host. The subscriber profile is configured in the <b>config&gt;subscr-mgmt&gt;sub-profile</b> context.</p> <p><b>sla-profile</b> <i>sla-profile-name</i> — Specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the <b>config&gt;subscr-mgmt&gt;sla-profile</b> context.</p> <p><b>detail</b> — Displays detailed information.</p> |

## statistics

|                    |                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <i>ip-int-name</i>   <i>ip-address</i> ]                                                                                                                                                                                                        |
| <b>Context</b>     | show>router>dhcp                                                                                                                                                                                                                                                    |
| <b>Description</b> | Display statistics for DHCP relay and DHCP snooping. If no IP address or interface name is specified, then all configured interfaces are displayed. If an IP address or interface name is specified, then only data regarding the specified interface is displayed. |
| <b>Parameters</b>  | <i>ip-int-name</i>   <i>ip-address</i> — Displays statistics for the specified IP interface.                                                                                                                                                                        |

**Output**     **Show DHCP Statistics Output** — The following table describes the output fields for DHCP.i

| Label                      | Description                                                               |
|----------------------------|---------------------------------------------------------------------------|
| Received Packets           | The number of packets received from the DHCP clients.                     |
| Transmitted Packets        | The number of packets transmitted to the DHCP clients.                    |
| Received Malformed Packets | The number of malformed packets received from the DHCP clients.           |
| Received Untrusted Packets | The number of untrusted packets received from the DHCP clients.           |
| Client Packets Discarded   | The number of packets received from the DHCP clients that were discarded. |
| Client Packets Relayed     | The number of packets received from the DHCP clients that were forwarded. |
| Client Packets Snooped     | The number of packets received from the DHCP clients that were snooped.   |
| Server Packets Discarded   | The number of packets received from the DHCP server that were discarded.  |
| Server Packets Relayed     | The number of packets received from the DHCP server that were forwarded.  |
| Server Packets Snooped     | The number of packets received from the DHCP server that were snooped.    |

### Sample Output

```
*A:ALA-1# show router dhcp statistics
=====
DHCP Global Statistics
=====
Rx Packets : 0
Tx Packets : 0
Rx Malformed Packets : 0
Rx Untrusted Packets : 0
Client Packets Discarded : 0
Client Packets Relayed : 0
Client Packets Snooped : 0
Server Packets Discarded : 0
Server Packets Relayed : 0
Server Packets Snooped : 0
=====
*A:ALA-1#
```

## summary

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>summary</b>                                                                                      |
| <b>Context</b>     | show>router>dhcp                                                                                    |
| <b>Description</b> | Displays the status of the DHCP relay and DHCP snooping functions on each interface.                |
| <b>Output</b>      | <b>Show DHCP Summary Output</b> — The following table describes the output fields for DHCP summary. |

| Label          | Description                                                                                                                                                                                                                                                                 |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface Name | Name of the router interface.                                                                                                                                                                                                                                               |
| SapId/Sdp      | Specifies the associated SAP ID or SDP ID.                                                                                                                                                                                                                                  |
| Arp Populate   | Specifies whether or not ARP populate is enabled.                                                                                                                                                                                                                           |
| Used/Provided  | Used — The number of lease-states currently in use on a specific interface (the number of clients on that interface got an IP address by DHCP). This value is always less than or equal to the 'Provided' field.<br><br>Provided — The configured for a specific interface. |
| Info Option    | Indicates whether Option 82 processing is enabled on the interface.                                                                                                                                                                                                         |
| Admin State    | Indicates the administrative state.                                                                                                                                                                                                                                         |

## Sample Output

```
A:ALA-49# show router dhcp summary
=====
DHCP Summary (Router: Base)
=====
```

| Interface Name<br>SapId/Sdp | Arp<br>Populate | Used/<br>Provided | Info<br>Option | Admin<br>State |
|-----------------------------|-----------------|-------------------|----------------|----------------|
| Sector A                    | No              | 0/0               | Keep           | Up             |
| sap:7/1/1.2.2               |                 | 0/0               |                |                |
| grp-if                      | No              | 0/1               | Keep           | Down           |
| ies-test                    | No              | 0/0               | Keep           | Up             |
| sap:9/1/2:0/500             |                 | 0/0               |                |                |
| test                        | No              | 0/0               | Keep           | Up             |
| sap:10/1/2:0                |                 | 0/0               |                |                |
| test1                       | No              | 0/0               | Keep           | Up             |
| sap:7/1/1.1.2               |                 | 0/0               |                |                |
| test2                       | No              | 0/0               | Keep           | Up             |
| sap:7/1/1.2.1               |                 | 0/0               |                |                |
| testA                       | No              | 0/0               | Keep           | Up             |
| sap:7/1/3.1.1               |                 | 0/0               |                |                |
| testB                       | No              | 0/0               | Keep           | Up             |
| sap:7/1/5.1.1               |                 | 0/0               |                |                |
| to-HQ                       | No              | 0/0               | Keep           | Up             |
| sdp:spoke-2:1001            |                 | 0/0               |                |                |
| to-web                      | No              | 0/0               | Keep           | Up             |
| sap:2/1/10:50               |                 | 0/0               |                |                |

```

```



```

Interfaces: 9
=====
A:ALA-49#

```

## vrrp

|                    |                                                   |
|--------------------|---------------------------------------------------|
| <b>Syntax</b>      | <b>vrrp</b>                                       |
| <b>Context</b>     | show>router                                       |
| <b>Description</b> | This command displays information VRRP instances. |

## instance

|                    |                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>instance</b><br><b>instance interface</b> <i>interface-name</i> [ <b>vrid</b> <i>virtual-router-id</i> ]<br><b>instance interface</b> <i>interface-name</i> <b>vrid</b> <i>virtual-router-id</i> <i>ipv6</i> |
| <b>Context</b>     | show>router>vrrp                                                                                                                                                                                                |
| <b>Description</b> | This command displays statistics for the VRRP instance.                                                                                                                                                         |
| <b>Parameters</b>  | <i>interface-name</i> — Displays statistics for the specified interface.<br><i>virtual-router-id</i> — Displays statistics for the specified virtual router ID.                                                 |
| <b>Values</b>      | 1 — 255                                                                                                                                                                                                         |

## statistics

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b>                                       |
| <b>Context</b>     | show>router>vrrp                                        |
| <b>Description</b> | This command displays statistics for the VRRP instance. |

## retailers

|                    |                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>retailers</b>                                                                                          |
| <b>Context</b>     | show>service>id                                                                                           |
| <b>Description</b> | This command displays the service ID of the retailer subscriber service to which this DHCP lease belongs. |

## wholesalers

|                    |                                                       |
|--------------------|-------------------------------------------------------|
| <b>Syntax</b>      | <b>wholesalers</b>                                    |
| <b>Context</b>     | show>service>id                                       |
| <b>Description</b> | This command displays service wholesaler information. |

---

## IES Clear Commands

### dhcp

|                    |                                                            |
|--------------------|------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                |
| <b>Context</b>     | clear>router>dhcp<br>clear>service>id                      |
| <b>Description</b> | This command enables the context to clear DHCP parameters. |

### dhcp6

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp6</b>                                                 |
| <b>Context</b>     | clear>router>dhcp6<br>clear>service>id                       |
| <b>Description</b> | This command enables the context to clear DHCPv6 parameters. |

### statistics

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <i>ip-int-name</i>   <i>ip-address</i> ] |
| <b>Context</b>     | clear>router>dhcp                                            |
| <b>Description</b> | Clears DHCP statistics.                                      |

### id

|                    |                                                                           |
|--------------------|---------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                               |
| <b>Context</b>     | clear>service<br>clear>service>statistics                                 |
| <b>Description</b> | This command clears parameters for a specific service.                    |
| <b>Parameters</b>  | <i>service-id</i> — The ID that uniquely identifies the service to clear. |

## arp-host

|                    |                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-host</b><br><b>arp-host</b> { <b>mac</b> <i>ieee-address</i>   <b>sap</b> <i>sap-id</i>   <b>ip-address</b> <i>ip-address[/mask]</i> }<br><b>arp-host</b> [ <b>port</b> <i>port-id</i> ] [ <b>inter-dest-id</b> <i>intermediate-destination-id</i>   <b>no-inter-dest-id</b> ]<br><b>arp-host statistics</b> [ <b>sap</b> <i>sap-id</i>   <b>interface</b> <i>interface-name</i> ] |
| <b>Context</b>     | clear>service>id                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | This command clears ARP host data.                                                                                                                                                                                                                                                                                                                                                        |

## interface

|                    |                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> [ <i>ip-int-name</i>   <i>ip-addr</i> ] [ <b>icmp</b> ]                                                                                                                                                                    |
| <b>Context</b>     | clear>router                                                                                                                                                                                                                                |
| <b>Description</b> | This command clears IP interface statistics.<br><br>If no IP interface is specified either by IP interface name or IP address, the command will perform the clear operation on all IP interfaces.                                           |
| <b>Parameters</b>  | <i>ip-int-name</i>   <i>ip-addr</i> — The IP interface name or IP interface address.<br><br><b>Default</b> All IP interfaces.<br><br><b>icmp</b> — Specifies to reset the ICMP statistics for the IP interface(s) used for ICMP rate limit. |

## interface

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> <i>interface-name</i> [ <b>vrid</b> <i>virtual-router-id</i> ]<br><b>interface</b> <i>interface-name</i> <b>vrid</b> <i>virtual-router-id</i> <b>ipv6</b> |
| <b>Context</b>     | clear>router>vrrp                                                                                                                                                          |
| <b>Description</b> | This command clears and resets VRRP instances.                                                                                                                             |
| <b>Parameters</b>  | <i>interface-name</i> — [32 chars max]<br><i>virtual-router-id</i> — [1..255]                                                                                              |

## statistics

|                    |                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics interface</b> <i>interface-name</i> [ <b>vrid</b> <i>virtual-router-id</i> ]<br><b>statistics</b><br><b>statistics interface</b> <i>interface-name</i> <b>vrid</b> <i>virtual-router-id</i> <b>ipv6</b> |
| <b>Context</b>     | clear>router>vrrp                                                                                                                                                                                                     |
| <b>Description</b> | This command clears statistics for VRRP instances.                                                                                                                                                                    |
| <b>Parameters</b>  | <i>interface-name</i> — [32 chars max]<br><i>virtual-router-id</i> — [1..255]                                                                                                                                         |

## fdb

|                    |                                                                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>fdb</b> { <b>all</b>   <b>mac</b> <i>ieee-address</i>   <b>sap</b> <i>sap-id</i> ]   <b>mesh-sdp</b> <i>sdp-id[:vc-id]</i>   <b>spoke-sdp</b> <i>sdp-id:vc-id</i> } |
| <b>Context</b>     | clear>service>id                                                                                                                                                       |
| <b>Description</b> | This command clears FDB entries for the service.                                                                                                                       |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters</b> | <p><b>all</b> — Clears all FDB entries.</p> <p><b>mac <i>ieee-address</i></b> — Clears only FDB entries in the FDB table with the specified 48-bit MAC address. The MAC address can be expressed in the form <i>aa:bb:cc:dd:ee:ff</i> or <i>aa-bb-cc-dd-ee-ff</i> where <i>aa</i>, <i>bb</i>, <i>cc</i>, <i>dd</i>, <i>ee</i> and <i>ff</i> are hexadecimal numbers.</p> <p><b>sap <i>sap-id</i></b> — Clears the specified SAP information. See Common CLI Command Descriptions on page 1933 for command syntax.</p> <p><b>mesh-sdp</b> — Clears only service FDB entries associated with the specified mesh SDP ID. For a mesh SDP, the VC ID is optional.</p> <p><b>spoke-sdp</b> — Clears only service FDB entries associated with the specified spoke SDP ID. For a spoke SDP, the VC ID must be specified.</p> <p><b><i>sdp-id</i></b> — The SDP ID for which to clear associated FDB entries.</p> <p><b>Values</b> 1 — 17407</p> <p><b><i>vc-id</i></b> — The virtual circuit ID on the SDP ID for which to clear associated FDB entries.</p> <p><b>Default</b> For mesh SDPs only, all VC IDs.</p> <p><b>Values</b> 1 — 4294967295</p> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

site

|                    |                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>site <i>service-id</i></b>                                                                                                                 |
| <b>Context</b>     | clear>service>id                                                                                                                              |
| <b>Description</b> | This command clears site-specific information for the service.                                                                                |
| <b>Parameters</b>  | <p><b><i>service-id</i></b> — Specifies the service ID or service name up to 64 characters in length.</p> <p><b>Values</b> 1 — 2147483648</p> |

spoke-sdp

|                    |                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>spoke-sdp <i>sdp-id:vc-id ingress-vc-label</i></b>                                                                                                                                                         |
| <b>Context</b>     | clear>service>id                                                                                                                                                                                              |
| <b>Description</b> | Clears and resets the spoke SDP bindings for the service.                                                                                                                                                     |
| <b>Parameters</b>  | <p><b><i>sdp-id</i></b> — The spoke SDP ID to be reset.</p> <p><b>Values</b> 1 — 17407</p> <p><b><i>vc-id</i></b> — The virtual circuit ID on the SDP ID to be reset.</p> <p><b>Values</b> 1 — 4294967295</p> |

stp

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| <b>Syntax</b>      | <b>stp</b>                                              |
| <b>Context</b>     | clear>service>statistics>id                             |
| <b>Description</b> | Clears all spanning tree statistics for the service ID. |

## lease-state

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-state</b><br><b>lease-state ip-address</b> <i>ip-address</i><br><b>lease-state mac</b> <i>ieee-address</i><br><b>lease-state sap</b> <i>sap-id</i><br><b>lease-state sdp</b> <i>sdp-id:vc-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | clear>service>id>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | Clears DHCP lease state information for this service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><i>ip-address</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> <p><i>ieee-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.</p> <p><b>sap</b> <i>sap-id</i> — Clears the specified lease state SAP information. See Common CLI Command Descriptions on page 1933 for command syntax.</p> <p><i>sdp-id</i> — The specified SDP to be cleared.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID to be cleared.</p> <p><b>Values</b> 1 — 4294967295</p> |

## lease-state

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-state</b> [ <b>ip-address</b> <i>ipv6-address/prefix-length</i> ] [ <b>mac</b> <i>ieee-address</i> ]                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | clear>service>id>dhcp6                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command clears DHCPv6 lease state information for this service.                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <p><b>ip-address</b> <i>ipv6-address/prefix-length</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> |

|               |               |                                     |
|---------------|---------------|-------------------------------------|
| <b>Values</b> | ipv6-address  | x:x:x:x:x:x:x (eight 16-bit pieces) |
|               |               | x:x:x:x:x:x:d.d.d.d                 |
|               | prefix-length | x [0 — FFFF]H                       |
|               |               | d [0 — 255]D                        |
|               |               | 1 — 128                             |

**mac *ieee-address*** — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

statistics

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                       |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <i>ip-int-name</i>   <i>ipv6-address</i> ]                                                                                                                                                                                                                                                                                                                                                                             |                     |                       |
| <b>Context</b>     | clear>router>dhcp6                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |                       |
| <b>Description</b> | This command clears DHCP6 statistics.                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                       |
| <b>Parameters</b>  | <i>ip-int-name</i> — Specifies the IP interface name up to 32 characters inlength.                                                                                                                                                                                                                                                                                                                                                         |                     |                       |
|                    | <b>ip-address</b> <i>ipv6-address/prefix-length</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets). |                     |                       |
| <b>Values</b>      | ipv6-address                                                                                                                                                                                                                                                                                                                                                                                                                               | x:x:x:x:x:x:x       | (eight 16-bit pieces) |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                            | x:x:x:x:x:x:d.d.d.d |                       |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                            | x [0 — FFFF]H       |                       |
|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                            | d [0 — 255]D        |                       |
|                    | prefix-length                                                                                                                                                                                                                                                                                                                                                                                                                              | 1 — 128             |                       |

statistics

|                    |                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <b>sap</b> <i>sap-id</i>   <b>sdp</b> <i>sdp-id:vc-id</i>   <b>interface</b> <i>ip-address</i>   <i>ip-int-name</i> ]                                                            |
| <b>Context</b>     | clear>service>id>dhcp                                                                                                                                                                                |
| <b>Description</b> | This command clears DHCP statistics.                                                                                                                                                                 |
| <b>Parameters</b>  | <b>sap</b> <i>sap-id</i> — Clears the specified SAP information. See Common CLI Command Descriptions on page 1933 for command syntax.<br><b>sdp</b> <i>sdp-id</i> — The specified SDP to be cleared. |
| <b>Values</b>      | 1 — 17407                                                                                                                                                                                            |
|                    | <i>vc-id</i> — The virtual circuit ID on the SDP ID to be cleared.                                                                                                                                   |
| <b>Values</b>      | 1 — 4294967295                                                                                                                                                                                       |
|                    | <b>interface</b> <i>ip-address</i> — The interface IP address.                                                                                                                                       |



**ip-int-name** — The interface name.

---

## IES Debug Commands

### host-connectivity-verify

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] host-connectivity-verify</b>                                                                                                               |
| <b>Context</b>     | debug>service>id                                                                                                                                   |
| <b>Description</b> | This command enables Subscriber Host Connectivity Verification (SHCV) debugging.<br>The <b>no</b> form of the command disables the SHCV debugging. |

### ip

|                    |                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] ip <i>ip-address</i></b>                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular IP address.                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <i>ip-address</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets). |

### mac

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mac <i>ieee-address</i></b>                                                                                                                                                                                                                                                |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                                                                                                                                                                                                          |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular MAC address.                                                                                                                                                                        |
| <b>Parameters</b>  | <i>mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses. |

### sap

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap <i>sap-id</i></b>                                                                  |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                      |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular |

SAP.

**Parameters**     *sap-id* — Specifies the physical port identifier portion of the SAP definition. See Common CLI Command Descriptions on page 1933 for command syntax.

## packets

**Syntax**     **[no] packets**  
**[no] packets interface** *ip-int-name* [**vrid** *virtual-router-id*]  
**[no] packets interface** *ip-int-name* **vrid** *virtual-router-id* **ipv6**

**Context**     debug>router>vrrp

**Description**     This command enables or disables debugging for VRRP packets.

**Parameters**     *ip-int-name* — [32 chars max]  
*virtual-router-id* — [1..255]

## events

**Syntax**     **[no] events**  
**[no] events interface** *ip-int-name* [**vrid** *virtual-router-id*]  
**[no] events interface** *ip-int-name* **vrid** *virtual-router-id* **ipv6**

**Context**     debug>router>vrrp

**Description**     This command enables or disables debugging for VRRP events.

**Parameters**     *ip-int-name* — [32 chars max]  
*virtual-router-id* — [1..255]

## instance

**Syntax**     **instance interface** *interface-name* **vr-id** *virtual-router-id* [**ipv6**] [**interval** *seconds*] [**repeat** *repeat*] [**absolute**|**rate**]

**Context**     monitor>router>vrrp

**Description**     This command enables monitoring for statistics for VRRP instances.

Show, Clear, Debug Commands

## VPRN Show Commands

### egress-label

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress-label</b> <i>egress-label1</i> [ <i>egress-label2</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>Display services using the range of egress labels.</p> <p>If only the mandatory <i>egress-label1</i> parameter is specified, only services using the specified label are displayed.</p> <p>If both <i>egress-label1</i> and <i>egress-label2</i> parameters are specified, the services using the range of labels X where <i>egress-label1</i> &lt;= X &lt;= <i>egress-label2</i> are displayed.</p> <p>Use the <b>show router ldp bindings</b> command to display dynamic labels.</p> |
| <b>Parameters</b>  | <p><i>egress-label1</i> — The starting egress label value for which to display services using the label range. If only <i>egress-label1</i> is specified, services only using <i>egress-label1</i> are displayed.</p> <p><b>Values</b> 0, 2049 — 131071</p> <p><i>egress-label2</i> — The ending egress label value for which to display services using the label range.</p> <p><b>Default</b> The <i>egress-label1</i> value.</p> <p><b>Values</b> 2049 — 131071</p>                     |
| <b>Output</b>      | <b>Show Service Egress Command Output</b> — The following table describes show service egress label output fields.                                                                                                                                                                                                                                                                                                                                                                        |

| Label                    | Description                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------|
| Svc Id                   | The ID that identifies a service.                                                                  |
| Sdp Id                   | The ID that identifies an SDP.                                                                     |
| Type                     | Indicates whether the SDP binding is a spoke or a mesh.                                            |
| I. Lbl                   | The VC label used by the far-end device to send packets to this device in this service by the SDP. |
| E. Lbl                   | The VC label used by this device to send packets to the far-end device in this service by the SDP. |
| Number of bindings found | The total number of SDP bindings that exist within the specified egress label range.               |

**Sample Output**

```
*A:ALA-12# show service egress-label 0 10000
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 100:1 Mesh 0 0
...
1 107:1 Mesh 0 0
1 108:1 Mesh 0 0
1 300:1 Mesh 0 0
1 301:1 Mesh 0 0
1 302:1 Mesh 0 0
1 400:1 Mesh 0 0
1 500:2 Spok 131070 2001
1 501:1 Mesh 131069 2000
100 300:100 Spok 0 0
200 301:200 Spok 0 0
300 302:300 Spok 0 0
400 400:400 Spok 0 0

Number of Bindings Found : 23
=====
*A:ALA-12#
```

**ingress-label**

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>ingress-label</b> <i>start-label</i> [ <i>end-label</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | <p>Display services using the range of ingress labels.</p> <p>If only the mandatory <i>start-label</i> parameter is specified, only services using the specified label are displayed.</p> <p>If both <i>start-label</i> and <i>end-label</i> parameters are specified, the services using the range of labels X where <i>start-label</i> &lt;= X &lt;= <i>end-label</i> are displayed.</p> <p>Use the <b>show router vprn-service-id ldp bindings</b> command to display dynamic labels.</p> |
| <b>Parameters</b>  | <p><i>start-label</i> — The starting ingress label value for which to display services using the label range. If only <i>start-label</i> is specified, services only using <i>start-label</i> are displayed.</p> <p><b>Values</b> 0, 2048 — 131071</p> <p><i>end-label</i> — The ending ingress label value for which to display services using the label range.</p> <p><b>Default</b> The <i>start-label</i> value.</p> <p><b>Values</b> 2048 — 131071</p>                                  |
| <b>Output</b>      | <b>Show Service Ingress-Label</b> — The following table describes show service ingress-label output fields:                                                                                                                                                                                                                                                                                                                                                                                  |

| Label                    | Description                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------|
| Svc ID                   | The service identifier.                                                                                 |
| SDP Id                   | The SDP identifier.                                                                                     |
| Type                     | Indicates whether the SDP is a spoke or a mesh.                                                         |
| I.Lbl                    | The ingress label used by the far-end device to send packets to this device in this service by the SDP. |
| E.Lbl                    | The egress label used by this device to send packets to the far-end device in this service by the SDP.  |
| Number of Bindings Found | The number of SDP bindings within the label range specified.                                            |

### Sample Output

```

*A:ALA-12# show service ingress-label 0
=====
Martini Service Labels
=====
Svc Id Sdp Id Type I.Lbl E.Lbl

1 10:1 Mesh 0 0
1 20:1 Mesh 0 0
1 30:1 Mesh 0 0
1 50:1 Mesh 0 0
1 100:1 Mesh 0 0
1 101:1 Mesh 0 0
1 102:1 Mesh 0 0
1 103:1 Mesh 0 0
1 104:1 Mesh 0 0
1 105:1 Mesh 0 0
1 106:1 Mesh 0 0
1 107:1 Mesh 0 0
1 108:1 Mesh 0 0
1 300:1 Mesh 0 0
1 301:1 Mesh 0 0
1 302:1 Mesh 0 0
1 400:1 Mesh 0 0
100 300:100 Spok 0 0
200 301:200 Spok 0 0
300 302:300 Spok 0 0
400 400:400 Spok 0 0

Number of Bindings Found : 21

*A:ALA-12#

```

## sap-using

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap-using</b> [ <b>sap</b> <i>sap-id</i> ]<br><b>sap-using interface</b> [ <i>ip-address</i>   <i>ip-int-name</i> ]<br><b>sap-using</b> [ <b>ingress</b>   <b>egress</b> ] <b>atm-td-profile</b> <i>td-profile-id</i><br><b>sap-using</b> [ <b>ingress</b>   <b>egress</b> ] <b>filter</b> <i>filter-id</i><br><b>sap-using</b> [ <b>ingress</b>   <b>egress</b> ] <b>qos-policy</b> <i>qos-policy-id</i><br><b>sap-using authentication-policy</b> <i>policy-name</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b> | <p>This command displays SAP information.</p> <p>If no optional parameters are specified, the command displays a summary of all defined SAPs.</p> <p>The optional parameters restrict output to only SAPs matching the specified properties.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><b>sap-id</b> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>interface</b> — Specifies matching SAPs with the specified IP interface.</p> <p><i>ip-address</i> — The IP address of the interface for which to display matching SAPs.</p> <p><b>Values</b> 1.0.0.0 — 223.255.255.255</p> <p><i>ip-int-name</i> — The IP interface name for which to display matching SAPs.</p> <p><b>ingress</b> — Specifies matching an ingress policy.</p> <p><b>egress</b> — Specifies matching an egress policy.</p> <p><b>qos-policy</b> <i>qos-policy-id</i> — The ingress or egress QoS Policy ID for which to display matching SAPs.</p> <p><b>Values</b> 1 — 65535</p> <p><b>atm-td-profile</b> <i>td-profile-id</i> — Displays SAPs using this traffic description.</p> <p><b>filter</b> <i>filter-id</i> — The ingress or egress filter policy ID for which to display matching SAPs.</p> <p><b>Values</b> 1 — 65535</p> <p><b>authentication-policy</b> <i>policy name</i> — Specifies an existing authentication policy.</p> |
| <b>Output</b>      | <p><b>Show Service SAP</b> — The following table describes show service SAP output fields:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Label    | Description                                                     |
|----------|-----------------------------------------------------------------|
| Port ID  | The ID of the access port where the SAP is defined.             |
| Svc ID   | The service identifier.                                         |
| SapMTU   | The SAP MTU value.                                              |
| I.QoS    | The SAP ingress QoS policy number specified on the ingress SAP. |
| I.MAC/IP | The MAC or IP filter policy ID applied to the ingress SAP.      |
| E.QoS    | The SAP egress QoS policy number specified on the egress SAP.   |



| Label    | Description (Continued)                                  |
|----------|----------------------------------------------------------|
| E.Mac/IP | The MAC or IP filter policy ID applied to the egress SAP |
| A.Pol    | The accounting policy ID assigned to the SAP.            |
| Adm      | The desired state of the SAP.                            |
| Opr      | The actual state of the SAP.                             |

### Sample Output

```
*A:ALA-12# show service sap-using sap 1/1
=====
Service Access Points
=====
PortId SvcId SapMTU I.QoS I.Mac/IP E.QoS E.Mac/IP A.Pol Adm Opr

1/1/7:0 1 1518 10 8 10 none none Up Up
1/1/11:0 100 1514 1 none 1 none none Down Down
1/1/7:300 300 1518 10 none 10 none 1000 Up Up

Number of SAPs : 3

*A:ALA-12#

*A:ALA-12# show service sap-using egress atm-td-profile 2
=====
Service Access Point Using ATM Traffic Profile 2
=====
PortId SvcId I.QoS I.Fltr E.QoS E.Fltr A.Pol Adm Opr

5/1/1:0/11 511111 2 none 2 none none Up Up
5/1/1:0/12 511112 2 none 2 none none Up Up
5/1/1:0/13 511113 2 none 2 none none Up Up
5/1/1:0/14 511114 2 none 2 none none Up Up
5/1/1:0/15 511115 2 none 2 none none Up Up
5/1/1:0/16 511116 2 none 2 none none Up Up
5/1/1:0/17 511117 2 none 2 none none Up Up
5/1/1:0/18 511118 2 none 2 none none Up Up
5/1/1:0/19 511119 2 none 2 none none Up Up
5/1/1:0/20 511120 2 none 2 none none Up Up
5/1/1:0/21 511121 2 none 2 none none Up Up
5/1/1:0/22 511122 2 none 2 none none Up Up
5/1/1:0/23 511123 2 none 2 none none Up Up
5/1/1:0/24 511124 2 none 2 none none Up Up
5/1/1:0/25 511125 2 none 2 none none Up Up ...
=====
*A:ALA-12#
```

## sdp

|                    |                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp</b> [ <i>sdp-id</i>   <i>far-end ip-address</i> ] [ <i>detail</i>   <i>keep-alive-history</i> ] |
| <b>Context</b>     | show>service                                                                                           |
| <b>Description</b> | Displays SDP information.                                                                              |

If no optional parameters are specified, a summary SDP output for all SDPs is displayed.

**Parameters**

*sdp-id* — The SDP ID for which to display information.

**Default** All SDPs.

**Values** 1 — 17407

**far-end ip-address** — Displays only SDPs matching with the specified far-end IP address.

**Default** SDPs with any far-end IP address.

**detail** — Displays detailed SDP information.

**Default** SDP summary output.

**keep-alive-history** — Displays the last fifty SDP keepalive events for the SDP.

**Default** SDP summary output.

**Output**

**Show Service SDP** — The following table describes show service SDP output fields:

| Label               | Description                                                                                                                                                                |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDP Id              | The SDP identifier.                                                                                                                                                        |
| Adm MTU             | Specifies the largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.        |
| Opr MTU             | Specifies the actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| IP address          | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                  |
| Adm<br>Admin State  | Specifies the state of the SDP.                                                                                                                                            |
| Opr<br>Oper State   | Specifies the operating state of the SDP.                                                                                                                                  |
| Flags               | Specifies all the conditions that affect the operating status of this SDP.                                                                                                 |
| Signal<br>Signaling | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                          |
| Last Status Change  | Specifies the time of the most recent operating status change to this SDP.                                                                                                 |
| Last Mgmt Change    | Specifies the time of the most recent management-initiated change to this SDP.                                                                                             |
| Number of SDPs      | Specifies the total number of SDPs displayed according to the criteria specified.                                                                                          |
| Hello Time          | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                             |

| Label                  | Description (Continued)                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Deliver<br>Delivered   | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                                                                                                                         |
| Number of SDPs         | Specifies the total number of SDPs displayed according to the criteria specified.                                                                                                                                                                                                    |
| Hello Time             | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Msg Len          | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Timeout          | Specifies the number of seconds to wait for an SDP echo response message before declaring a timeout.                                                                                                                                                                                 |
| Unmatched Replies      | Specifies the number of SDP unmatched message replies.                                                                                                                                                                                                                               |
| Max Drop Count         | Specifies the maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                      |
| Hold Down Time         | Specifies the maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                      |
| TX Hello Msgs          | Specifies the number of SDP echo request messages transmitted since the keepalive was administratively enabled or the counter was cleared.                                                                                                                                           |
| Rx Hello Msgs          | Specifies the number of SDP echo request messages received since the keepalive was administratively enabled or the counter was cleared.                                                                                                                                              |
| Associated LSP<br>List | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far end field.<br>If the SDP type is GRE, then the following message displays:<br>SDP delivery mechanism is not MPLS |

### Sample Output

```
*A:ALA-12# show service sdp
=====
Services: Service Destination Points
=====
SdpId Adm MTU Opr MTU IP address Adm Opr Deliver Signal

10 4462 4462 10.20.1.3 Up Dn NotReady MPLS TLDP
40 4462 1534 10.20.1.20 Up Up MPLS TLDP
60 4462 1514 10.20.1.21 Up Up GRE TLDP
100 4462 4462 180.0.0.2 Down Down GRE TLDP
500 4462 4462 10.20.1.50 Up Dn NotReady GRE TLDP

Number of SDPs : 5
=====
*A:ALA-12#
```

\*A:ALA-12# show service sdp 2 detail

=====

Service Destination Point (Sdp Id : 2) Details

=====

-----

Sdp Id 2 -(10.10.10.104)

-----

Description : GRE-10.10.10.104

SDP Id : 2

Admin Path MTU : 0 Oper Path MTU : 0

Far End : 10.10.10.104 Delivery : GRE

Admin State : Up Oper State : Down

Flags : SignalingSessDown TransportTunnDown

Signaling : TLDP VLAN VC Etype : 0x8100

Last Status Change : 02/01/2007 09:11:39 Adv. MTU Over. : No

Last Mgmt Change : 02/01/2007 09:11:46

KeepAlive Information :

|                |            |                   |            |
|----------------|------------|-------------------|------------|
| Admin State    | : Disabled | Oper State        | : Disabled |
| Hello Time     | : 10       | Hello Msg Len     | : 0        |
| Hello Timeout  | : 5        | Unmatched Replies | : 0        |
| Max Drop Count | : 3        | Hold Down Time    | : 10       |
| Tx Hello Msgs  | : 0        | Rx Hello Msgs     | : 0        |

Associated LSP LIST :

SDP Delivery Mechanism is not MPLS

=====

\*A:ALA-12#

\*A:ALA-12# show service sdp 8

=====

Service Destination Point (Sdp Id : 8)

=====

| SdpId | Adm MTU | Opr MTU | IP address   | Adm | Opr | Deliver  | Signal    |
|-------|---------|---------|--------------|-----|-----|----------|-----------|
| 8     | 4462    | 4462    | 10.10.10.104 | Up  | Dn  | NotReady | MPLS TLDP |

=====

Service Destination Point (Sdp Id : 8) Details

-----

Sdp Id 8 -(10.10.10.104)

-----

Description : MPLS-10.10.10.104

SDP Id : 8

Admin Path MTU : 0 Oper Path MTU : 0

Far End : 10.10.10.104 Delivery : MPLS

Admin State : Up Oper State : Down

Flags : SignalingSessDown TransportTunnDown

Signaling : TLDP VLAN VC Etype : 0x8100

Last Status Change : 02/01/2007 09:11:39 Adv. MTU Over. : No

Last Mgmt Change : 02/01/2007 09:11:46

KeepAlive Information :

|                |            |                   |            |
|----------------|------------|-------------------|------------|
| Admin State    | : Disabled | Oper State        | : Disabled |
| Hello Time     | : 10       | Hello Msg Len     | : 0        |
| Hello Timeout  | : 5        | Unmatched Replies | : 0        |
| Max Drop Count | : 3        | Hold Down Time    | : 10       |
| Tx Hello Msgs  | : 0        | Rx Hello Msgs     | : 0        |

Associated LSP LIST :

Lsp Name : to-104

```

Admin State : Up Oper State : Down
Time Since Last Tran* : 01d07h36m
=====
* indicates that the corresponding row element may have been truncated.
*A:ALA-12#

```

## sdp-using

- Syntax** **sdp-using** [*sdp-id*[:*vc-id*] | **far-end** *ip-address*]
- Context** show>service
- Description** Display services using SDP or far-end address options.
- Parameters** *sdp-id* — Displays only services bound to the specified SDP ID.  
**Values** 1 — 17407  
*vc-id* — The virtual circuit identifier.  
**Values** 1 — 4294967295  
**far-end ip-address** — Displays only services matching with the specified far-end IP address.  
**Default** Services with any far-end IP address.
- Output** **Show Service SDP Using X** — The following table describes show service sdp-using output fields.

| Label         | Description                                                                                      |
|---------------|--------------------------------------------------------------------------------------------------|
| Svc ID        | The service identifier.                                                                          |
| Sdp ID        | The SDP identifier.                                                                              |
| Type          | Type of SDP: spoke or mesh.                                                                      |
| Far End       | The far end address of the SDP.                                                                  |
| Oper State    | The operational state of the service.                                                            |
| Ingress Label | The label used by the far-end device to send packets to this device in this service by this SDP. |
| Egress Label  | The label used by this device to send packets to the far-end device in this service by this SDP. |

### Sample Output

```

*A:ALA-1# show service sdp-using 300
=====
Service Destination Point (Sdp Id : 300)
=====
SvcId SdpId Type Far End Opr State I.Label E.Label

1 300:1 Mesh 10.0.0.13 Up 131071 131071
2 300:2 Spok 10.0.0.13 Up 131070 131070
100 300:100 Mesh 10.0.0.13 Up 131069 131069

```

```
101 300:101 Mesh 10.0.0.13 Up 131068 131068
102 300:102 Mesh 10.0.0.13 Up 131067 131067

Number of SDPs : 5

*A:ALA-1#

A:ALA-48# show service sdp-using
=====
SDP Using
=====
SvcId SdpId Type Far End Opr State I.Label E.Label

3 2:3 Spok 10.20.1.2 Up n/a n/a
103 3:103 Spok 10.20.1.3 Up 131067 131068
103 4:103 Spok 10.20.1.2 Up 131065 131069
105 3:105 Spok 10.20.1.3 Up 131066 131067

Number of SDPs : 4

A:ALA-48
```

service-using

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>service-using</b> [ <b>epipe</b> ] [ <b>ies</b> ] [ <b>vppls</b> ] [ <b>vprn</b> ] [ <b>mirror</b> ] [ <b>apipe</b> ] [ <b>fpipe</b> ] [ <b>ipipe</b> ] [ <b>sdp sdp-id</b> ] [ <b>customer customer-id</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Context     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Description | Displays the services matching certain usage properties.<br>If no optional parameters are specified, all services defined on the system are displayed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Parameters  | <b>epipe</b> — Displays matching Epipe services.<br><b>ies</b> — Displays matching IES instances.<br><b>vppls</b> — Displays matching VPLS instances.<br><b>vprn</b> — Displays matching VPRN services.<br><b>mirror</b> — Displays mirror services.<br><b>apipe</b> — Displays matching Apipe services.<br><b>fpipe</b> — Displays matching Fpipe services.<br><b>ipipe</b> — Displays matching Ipipe services.<br><b>sdp sdp-id</b> — Displays only services bound to the specified SDP ID.<br><b>Default</b> Services bound to any SDP ID.<br><b>Values</b> 1 — 17407<br><b>customer customer-id</b> — Displays services only associated with the specified customer ID.<br><b>Default</b> Services associated with an customer.<br><b>Values</b> 1 — 2147483647 |

**Output**    **Show Service Service-Using** — The following table describes show service service-using output fields:

| Label            | Description                                                                       |
|------------------|-----------------------------------------------------------------------------------|
| Service Id       | The service identifier.                                                           |
| Type             | Specifies the service type configured for the service ID.                         |
| Adm              | The desired state of the service.                                                 |
| Opr              | The operating state of the service.                                               |
| CustomerId       | The ID of the customer who owns this service.                                     |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this service. |

### Sample Output

```
*A:ALA-12# show service service-using customer 10
=====
Services
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

1 VPLS Up Up 10 09/05/2006 13:24:15
100 IES Up Up 10 09/05/2006 13:24:15
300 Epipe Up Up 10 09/05/2006 13:24:15
900 VPRN Up Up 2 11/04/2006 04:55:12

Matching Services : 4
=====
*A:ALA-12#

*A:ALA-12# show service service-using epipe
=====
Services [epipe]
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

6 Epipe Up Up 6 06/22/2006 23:05:58
7 Epipe Up Up 6 06/22/2006 23:05:58
8 Epipe Up Up 3 06/22/2006 23:05:58
103 Epipe Up Up 6 06/22/2006 23:05:58

Matching Services : 4
=====
*A:ALA-12#

A:del4# show service service-using
=====
Services
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

1 uVPLS Up Up 1 10/26/2006 15:44:57
2 Epipe Up Down 1 10/26/2006 15:44:57
```

```
10 mVPLS Down Down 1 10/26/2006 15:44:57
11 mVPLS Down Down 1 10/26/2006 15:44:57
100 mVPLS Up Up 1 10/26/2006 15:44:57
101 mVPLS Up Up 1 10/26/2006 15:44:57
102 mVPLS Up Up 1 10/26/2006 15:44:57
999 uVPLS Down Down 1 10/26/2006 16:14:33

Matching Services : 8

A:del4#
```

id

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>id</b> <i>service-id</i> { <b>all</b>   <b>arp</b>   <b>base</b>   <b>fdb</b>   <b>labels</b>   <b>mfib</b>   <b>sap</b>   <b>sdp</b>   <b>split-horizon-group</b>   <b>stp</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Context     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Description | This command displays information for a particular service-id.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Parameters  | <i>service-id</i> — The unique service identification number that identifies the service in the service domain.<br><br><b>all</b> — Display detailed information about the service.<br><b>arp</b> — Display ARP entries for the service.<br><b>base</b> — Display basic service information.<br><b>fdb</b> — Display FDB entries.<br><b>interface</b> — Display service interfaces.<br><b>labels</b> — Display labels being used by this service.<br><b>sap</b> — Display SAPs associated to the service.<br><b>sdp</b> — Display SDPs associated with the service.<br><b>split-horizon-group</b> — Display split horizon group information.<br><b>stp</b> — Display STP information. |

all

|             |                                                                                                                  |
|-------------|------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>all</b>                                                                                                       |
| Context     | show>service>id                                                                                                  |
| Description | Displays detailed information for all aspects of the service.                                                    |
| Output      | <b>Show All Service-ID Output</b> — The following table describes the show all service-id command output fields: |



| Label                               | Description                                                                                                              |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Service Detailed Information</b> |                                                                                                                          |
| Service Id                          | The service identifier.                                                                                                  |
| VPN Id                              | The number which identifies the VPN.                                                                                     |
| Customer Id                         | The customer identifier.                                                                                                 |
| Last Status Change                  | The date and time of the most recent change in the administrative or operating status of the service.                    |
| Last Mgmt Change                    | The date and time of the most recent management-initiated change to this customer.                                       |
| Admin State                         | The current administrative state.                                                                                        |
| Oper State                          | The current operational state.                                                                                           |
| Route Dist.                         | Displays the route distribution number.                                                                                  |
| AS Number                           | Displays the autonomous system number.                                                                                   |
| Router Id                           | Displays the router ID for this service.                                                                                 |
| ECMP                                | Displays equal cost multipath information.                                                                               |
| ECMP Max Routes                     | Displays the maximum number of routes that can be received from the neighbors in the group or for the specific neighbor. |
| Max Routes                          | Displays the maximum number of routes that can be used for path sharing.                                                 |
| Auto Bind                           | Specifies the automatic binding type for the SDP assigned to this service.                                               |
| Vrf Target                          | Specifies the VRF target applied to this service.                                                                        |
| Vrf Import                          | Specifies the VRF import policy applied to this service.                                                                 |
| Vrf Export                          | Specifies the VRF export policy applied to this service.                                                                 |
| SDP Id                              | The SDP identifier.                                                                                                      |
| Description                         | Generic information about the service.                                                                                   |
| SAP Count                           | The number of SAPs specified for this service.                                                                           |
| SDP Bind Count                      | The number of SDPs bound to this service.                                                                                |
| Split Horizon Group                 | Name of the split horizon group for this service.                                                                        |
| Description                         | Description of the split horizon group.                                                                                  |
| Last Changed                        | The date and time of the most recent management-initiated change to this split horizon group.                            |
| Service Destination Points (SDPs)   |                                                                                                                          |

| Label          | Description                                                                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDP Id         | The SDP identifier.                                                                                                                                               |
| Type           | Indicates whether this Service SDP binding is a spoke or a mesh.                                                                                                  |
| Admin Path MTU | The desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Oper Path MTU  | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.  |
| Delivery       | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                      |
| Admin State    | The administrative state of this SDP.                                                                                                                             |
| Oper State     | The operational state of this SDP.                                                                                                                                |
| Ingress Label  | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                  |
| Egress Label   | The label used by this device to send packets to the far-end device in this service by this SDP.                                                                  |
| Ingress Filter | The ID of the ingress filter policy.                                                                                                                              |
| Egress Filter  | The ID of the egress filter policy.                                                                                                                               |
| Far End        | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                         |
| Last Changed   | The date and time of the most recent change to this customer.                                                                                                     |
| Signaling      | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on this SDP.                                |
| Admin State    | Specifies the operating status of the keepalive protocol.                                                                                                         |
| Oper State     | The current status of the keepalive protocol.                                                                                                                     |
| Hello Time     | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                    |
| Hello Msg Len  | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                    |
| Max Drop Count | Specifies the maximum number of consecutive SDP Echo Request messages that can be unacknowledged before the keepalive protocol reports a fault.                   |
| Hold Down Time | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                  |

| Label                  | Description                                                                                                                                                                                                                                                                          |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDP Delivery Mechanism | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far end field.<br>If the SDP type is GRE, then the following message displays:<br>SDP delivery mechanism is not MPLS |
| Max Drop Count         | Specifies the maximum number of consecutive SDP Echo Request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                      |
| Number of SDPs         | The total number SDPs applied to this service ID.                                                                                                                                                                                                                                    |
| Service Access Points  |                                                                                                                                                                                                                                                                                      |
| Service Id             | The service identifier.                                                                                                                                                                                                                                                              |
| Port Id                | The ID of the access port where this SAP is defined.                                                                                                                                                                                                                                 |
| Description            | Generic information about the SAP.                                                                                                                                                                                                                                                   |
| Encap Value            | The value of the label used to identify this SAP on the access port.                                                                                                                                                                                                                 |
| Admin State            | The desired state of the SAP.                                                                                                                                                                                                                                                        |
| Oper State             | The operating state of the SAP.                                                                                                                                                                                                                                                      |
| Last Changed           | The date and time of the last change.                                                                                                                                                                                                                                                |
| Admin MTU              | The desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.                                                                                                                    |
| Oper MTU               | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.                                                                                                                     |
| Ingress qos-policy     | The SAP ingress QoS policy ID.                                                                                                                                                                                                                                                       |
| Egress qos-policy      | The SAP egress QoS policy ID.                                                                                                                                                                                                                                                        |
| Ingress Filter-Id      | The SAP ingress filter policy ID.                                                                                                                                                                                                                                                    |
| Egress Filter-Id       | The SAP egress filter policy ID.                                                                                                                                                                                                                                                     |
| Multi Svc Site         | Indicates the multi-service site that the SAP is a member.                                                                                                                                                                                                                           |
| Ingress sched-policy   | Indicates the ingress QoS scheduler for the SAP.                                                                                                                                                                                                                                     |
| Egress sched-policy    | Indicates the egress QoS scheduler for the SAP.                                                                                                                                                                                                                                      |
| Acct. Pol              | Indicates the accounting policy applied to the SAP.                                                                                                                                                                                                                                  |
| Collect Stats          | Specifies whether accounting statistics are collected on the SAP.                                                                                                                                                                                                                    |
| SAP Statistics         |                                                                                                                                                                                                                                                                                      |

| Label                      | Description                                                                       |
|----------------------------|-----------------------------------------------------------------------------------|
| Dropped                    | The number of packets or octets dropped.                                          |
| Offered Hi Priority        | The number of high priority packets, as determined by the SAP ingress QoS policy. |
| Offered Low Priority       | The number of low priority packets, as determined by the SAP ingress QoS policy.  |
| Forwarded In Profile       | The number of in-profile packets or octets (rate below CIR) forwarded.            |
| Forwarded Out Profile      | The number of out-of-profile packets or octets (rate above CIR) forwarded.        |
| <b>Queueing Stats</b>      |                                                                                   |
| Dropped In Profile         | The number of in-profile packets or octets discarded.                             |
| Dropped Out Profile        | The number of out-of-profile packets or octets discarded.                         |
| Forwarded In Profile       | The number of in-profile packets or octets (rate below CIR) forwarded.            |
| Forwarded Out Profile      | The number of out-of-profile packets or octets (rate above CIR) forwarded.        |
| <b>SAP per Queue stats</b> |                                                                                   |
| Ingress Queue 1            | The index of the ingress QoS queue of this SAP.                                   |
| High priority offered      | The packets or octets count of the high priority traffic for the SAP.             |
| High priority dropped      | The number of high priority traffic packets/octets dropped.                       |
| Low priority offered       | The packets or octets count of the low priority traffic.                          |
| Low priority dropped       | The number of low priority traffic packets/octets dropped.                        |
| In profile forwarded       | The number of in-profile packets or octets (rate below CIR) forwarded.            |
| Out profile forwarded      | The number of out-of-profile octets (rate above CIR) forwarded.                   |
| Egress Queue 1             | The index of the egress QoS queue of the SAP.                                     |
| In profile forwarded       | The number of in-profile packets or octets (rate below CIR) forwarded.            |
| In profile dropped         | The number of in-profile packets or octets dropped for the SAP.                   |
| Out profile forwarded      | The number of out-of-profile packets or octets (rate above CIR) forwarded.        |

| Label                                 | Description                                                                                                                                      |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Out profile dropped                   | The number of out-of-profile packets or octets discarded.                                                                                        |
| State                                 | Specifies whether DHCP relay is enabled on this SAP.                                                                                             |
| Info Option                           | Specifies whether Option 82 processing is enabled on this SAP.                                                                                   |
| Action                                | Specifies the Option 82 processing on this SAP or interface: keep, replace or drop.                                                              |
| Circuit ID                            | Specifies whether the If index is inserted in circuit ID sub-option of Option 82.                                                                |
| Remote ID                             | Specifies whether the far-end MAC address is inserted in Remote ID sub-option of Option 82.                                                      |
| <b>Service Access Points</b>          |                                                                                                                                                  |
| Managed by Service                    | Specifies the service-id of the management VPLS managing this SAP.                                                                               |
| Managed by SAP                        | Specifies the sap-id inside the management VPLS managing this SAP.                                                                               |
| Prune state                           | Specifies the STP state inherited from the management VPLS.                                                                                      |
| <b>Spoke SDPs</b>                     |                                                                                                                                                  |
| Managed by Service                    | Specifies the service-id of the management VPLS managing this spoke SDP.                                                                         |
| Managed by Spoke                      | Specifies the sap-id inside the management VPLS managing this spoke SDP.                                                                         |
| Prune state                           | Specifies the STP state inherited from the management VPLS.                                                                                      |
| <b>IPCP Address Extension Details</b> |                                                                                                                                                  |
| Peer IP Addr                          | Specifies the remote IP address to be assigned to the far-end of the associated PPP/MLPPP link via IPCP extensions.                              |
| Peer Pri DNS Addr                     | Specifies a unicast IPv4 address for the primary DNS server to be signaled to the far-end of the associate PPP/MLPPP link via IPCP extensions.   |
| Peer Sec DNS Addr                     | Specifies a unicast IPv4 address for the secondary DNS server to be signaled to the far-end of the associate PPP/MLPPP link via IPCP extensions. |

### Sample Output

```
A:ALA-48# show service id 1 all
=====
Service Detailed Information
=====
Service Id : 1 Vpn Id : 0
Service Type : VPRN
Customer Id : 1
Last Status Change: 06/18/2007 10:07:01
```

## Show, Clear, Debug Commands

```

Last Mgmt Change : 06/18/2007 10:07:01
Admin State : Up Oper State : Up

Route Dist. : 10001:1 VPRN Type : regular
AS Number : 10000 Router Id : 10.10.10.103
ECMP : Enabled ECMP Max Routes : 8
Max Routes : 80 Auto Bind : LDP
Vrf Target : target:10001:1
Vrf Import : vrfImpPolCust1
Vrf Export : vrfExpPolCust1

SAP Count : 2 SDP Bind Count : 3

Service Destination Points(SDPs)

Sdp Id 1:1 -(10.10.10.49)

Description : to-GRE-10.10.10.49
SDP Id : 1:1 Type : Spoke
VC Type : n/a VC Tag : n/a
Admin Path MTU : 0 Oper Path MTU : 0
Far End : 10.10.10.49 Delivery : GRE

Admin State : Up Oper State : Down
Acct. Pol : None Collect Stats : Disabled
Ingress Label : n/a Egress Label : n/a
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Ing ipv6 Fltr : n/a Egr ipv6 Fltr : n/a
Admin ControlWord : Not Preferred Oper ControlWord : False
Admin BW(Kbps) : 0 Oper BW(Kbps) : 0
Last Status Change : 06/18/2007 10:06:49 Signaling : n/a
Last Mgmt Change : 06/18/2007 10:07:01
Class Fwding State : Down
Flags : SdpOperDown
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : n/a I. Dro. Pkts. : n/a
I. Fwd. Octs. : n/a I. Dro. Octs. : n/a
E. Fwd. Pkts. : n/a E. Fwd. Octets : n/a

Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

Sdp Id 1:10 -(10.10.10.49)

Description : to-GRE-10.10.10.49
SDP Id : 1:10 Type : Spoke
VC Type : n/a VC Tag : n/a
Admin Path MTU : 0 Oper Path MTU : 0
Far End : 10.10.10.49 Delivery : GRE

```

```

Admin State : Up
Acct. Pol : None
Ingress Label : 0
Ing mac Fltr : n/a
Ing ip Fltr : n/a
Ing ipv6 Fltr : n/a
Admin ControlWord : Not Preferred
Admin BW(Kbps) : 0
Last Status Change : 06/18/2007 10:06:49
Last Mgmt Change : 06/18/2007 10:07:01
Class Fwding State : Down
Flags : SdpOperDown
 NoIngVCLabel NoEgrVCLabel

Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None

KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Max Drop Count : 3

Oper State : Down
Collect Stats : Disabled
Egress Label : 0
Egr mac Fltr : n/a
Egr ip Fltr : n/a
Egr ipv6 Fltr : n/a
Oper ControlWord : False
Oper BW(Kbps) : 0
Signaling : n/a

Statistics :
I. Fwd. Pkts. : 0
I. Fwd. Octs. : 0
E. Fwd. Pkts. : 0

I. Dro. Pkts. : 0
I. Dro. Octs. : 0
E. Fwd. Octets : 0

Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

```

```

Sdp Id 3:4 -(10.10.10.105)

```

```

SDP Id : 3:4
VC Type : n/a
Admin Path MTU : 0
Far End : 10.10.10.105

Type : Spoke
VC Tag : n/a
Oper Path MTU : 0
Delivery : GRE

Admin State : Up
Acct. Pol : None
Ingress Label : 3000
Ing mac Fltr : n/a
Ing ip Fltr : 10
Ing ipv6 Fltr : n/a
Admin ControlWord : Not Preferred
Admin BW(Kbps) : 0
Last Status Change : 06/18/2007 10:06:49
Last Mgmt Change : 06/18/2007 10:07:01
Class Fwding State : Down
Flags : SdpOperDown
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None

Oper State : Down
Collect Stats : Disabled
Egress Label : 2000
Egr mac Fltr : n/a
Egr ip Fltr : 10
Egr ipv6 Fltr : n/a
Oper ControlWord : False
Oper BW(Kbps) : 0
Signaling : n/a

KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Max Drop Count : 3

Oper State : Disabled
Hello Msg Len : 0
Hold Down Time : 10

Statistics :

```

## Show, Clear, Debug Commands

```
I. Fwd. Pkts. : 0
I. Fwd. Octs. : 0
E. Fwd. Pkts. : 0
I. Dro. Pkts. : 0
I. Dro. Octs. : 0
E. Fwd. Octets : 0

Associated LSP LIST :
SDP Delivery Mechanism is not MPLS

Number of SDPs : 3

Service Access Points

SAP 1/1/21:0

Service Id : 1
SAP : 1/1/21:0
Dot1Q Ethertype : 0x8100
Encap : q-tag
QinQ Ethertype : 0x8100

Admin State : Up
Flags : PortOperDown
Last Status Change : 06/18/2007 10:06:49
Last Mgmt Change : 06/18/2007 10:07:01
Admin MTU : 1518
Ingress qos-policy : 1
Shared Q plcy : n/a
Ingr IP Fltr-Id : n/a
Ingr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a
tod-suite : None
Egr Agg Rate Limit : max
Oper State : Down
Oper MTU : 1518
Egress qos-policy : 1
Multipoint shared : Disabled
Egr IP Fltr-Id : n/a
Egr Mac Fltr-Id : n/a
Egr IPv6 Fltr-Id : n/a
qinq-pbit-marking : both

Multi Svc Site : None
Acct. Pol : None
Collect Stats : Disabled

Anti Spoofing : None
Nbr Static Hosts : 0

Sap Statistics

Last Cleared Time : N/A
 Packets
Forwarding Engine Stats
Dropped : 0
Off. HiPrio : 0
Off. LowPrio : 0
Off. Uncolor : 0
 Octets

Queueing Stats(Ingress QoS Policy 1)
Dro. HiPrio : 0
Dro. LowPrio : 0
For. InProf : 0
For. OutProf : 0

Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0
Dro. OutProf : 0
For. InProf : 0
For. OutProf : 0

Sap per Queue stats

 Packets
Ingress Queue 1 (Unicast) (Priority)
 Octets
```



```

Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0

SAP 1/2/4:0

Service Id : 1
SAP : 1/2/4:0 Encap : q-tag
Dot1Q Ethertype : 0x8100 QinQ Ethertype : 0x8100

Admin State : Up Oper State : Down
Flags : PortOperDown
Last Status Change : 06/18/2007 10:06:49
Last Mgmt Change : 06/18/2007 10:07:01
Admin MTU : 1518 Oper MTU : 1518
Ingress qos-policy : 1 Egress qos-policy : 1
Shared Q plcy : n/a Multipoint shared : Disabled
Ingr IP Fltr-Id : n/a Egr IP Fltr-Id : n/a
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a Egr IPv6 Fltr-Id : n/a
tod-suite : None qinq-pbit-marking : both
Egr Agg Rate Limit : max

Multi Svc Site : None
Acct. Pol : None Collect Stats : Disabled

Anti Spoofing : Ip-Mac Nbr Static Hosts : 0

Subscriber Management

Admin State : Down MAC DA Hashing : False
Def Sub-Id : None
Def Sub-Profile : None
Def SLA-Profile : None
Def App-Profile : None
Sub-Ident-Policy : None

Subscriber Limit : 1
Single-Sub-Parameters
 Prof Traffic Only : False
 Non-Sub-Traffic : N/A

Sap Statistics

Last Cleared Time : N/A
 Packets Octets
Forwarding Engine Stats
Dropped : 0 0
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0

Queueing Stats(Ingress QoS Policy 1)
Dro. HiPrio : 0 0

```

## Show, Clear, Debug Commands

```

Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

Packets Octets
Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0

Service Interfaces

Interface

If Name : to-cel
Admin State : Up Oper (v4/v6) : Down/Down
Protocols : None
IP Addr/mask : 11.1.0.1/24 Address Type : Primary
IGP Inhibit : Disabled Broadcast Address : Host-ones

Details

If Index : 2 Virt. If Index : 2
Last Oper Chg : 06/18/2007 10:07:01 Global If Index : 96
SAP Id : 1/1/21:0
TOS Marking : Trusted If Type : VPRN
SNTP B.Cast : False
MAC Address : 14:30:01:01:00:15 Arp Timeout : 14400
IP MTU : 1500 ICMP Mask Reply : True
Arp Populate : Disabled Host Conn Verify : Enabled

Proxy ARP Details
Rem Proxy ARP : Disabled Local Proxy ARP : Disabled
Policies : none

Proxy Neighbor Discovery Details
Local Pxy ND : Disabled
Policies : none

DHCP Details
Admin State : Up Lease Populate : 1
Gi-Addr : 11.1.0.1* Gi-Addr as Src Ip : Disabled
* = inferred gi-address from interface IP address

```

```

Action : Keep Trusted : Disabled

DHCP Proxy Details
Admin State : Down
Lease Time : N/A
Emul. Server : Not configured

Subscriber Authentication Details
Auth Policy : None

DHCP6 Relay Details
Admin State : Down Lease Populate : 0
Oper State : Down Nbr Resolution : Disabled
If-Id Option : None Remote Id : Disabled
Src Addr : Not configured

DHCP6 Server Details
Admin State : Down Max. Lease States : 8000

ICMP Details
Redirects : Number - 100 Time (seconds) : 10
Unreachables : Number - 100 Time (seconds) : 10
TTL Expired : Number - 100 Time (seconds) : 10

IPCP Address Extension Details
Peer IP Addr : Not configured
Peer Pri DNS Addr : Not configured
Peer Sec DNS Addr : Not configured

Interface

If Name : test
Admin State : Up Oper (v4/v6) : Down/Down
Protocols : IGMP PIM

IP Addr/mask : Not Assigned

Details

If Index : 3 Virt. If Index : 3
Last Oper Chg : 06/18/2007 10:07:01 Global If Index : 95
Port Id : n/a
TOS Marking : Trusted If Type : VPRN
SNTP B.Cast : False
MAC Address :
IP MTU : 0 Arp Timeout : 14400
Arp Populate : Disabled ICMP Mask Reply : True
Host Conn Verify : Disabled

Proxy ARP Details
Rem Proxy ARP : Disabled Local Proxy ARP : Disabled
Policies : none

Proxy Neighbor Discovery Details
Local Pxy ND : Disabled
Policies : none

DHCP Details
Admin State : Down Lease Populate : 0
Gi-Addr : Not configured Gi-Addr as Src Ip : Disabled
Action : Keep Trusted : Disabled

DHCP Proxy Details
Admin State : Down

```

## Show, Clear, Debug Commands

Lease Time : N/A  
Emul. Server : Not configured

Subscriber Authentication Details  
Auth Policy : None

DHCP6 Relay Details  
Admin State : Down  
Oper State : Down  
If-Id Option : None  
Src Addr : Not configured  
Lease Populate : 0  
Nbr Resolution : Disabled  
Remote Id : Disabled

DHCP6 Server Details  
Admin State : Down  
Max. Lease States : 8000

ICMP Details  
Redirects : Number - 100  
Unreachables : Number - 100  
TTL Expired : Number - 100  
Time (seconds) - 10  
Time (seconds) - 10  
Time (seconds) - 10

IPCP Address Extension Details  
Peer IP Addr : Not configured  
Peer Pri DNS Addr : Not configured  
Peer Sec DNS Addr : Not configured

### Interface

If Name : SpokeSDP  
Admin State : Up  
Protocols : None  
Oper (v4/v6) : Down/Down

IP Addr/mask : Not Assigned

### Details

If Index : 4  
Last Oper Chg : 06/18/2007 10:07:01  
SDP Id : spoke-3:4  
TOS Marking : Trusted  
SNTP B.Cast : False  
MAC Address : 14:30:ff:00:00:00  
IP MTU : 0  
Arp Populate : Disabled  
Virt. If Index : 4  
Global If Index : 94  
If Type : VPRN  
Arp Timeout : 14400  
ICMP Mask Reply : True  
Host Conn Verify : Disabled

Proxy ARP Details  
Rem Proxy ARP : Disabled  
Policies : none  
Local Proxy ARP : Disabled

Proxy Neighbor Discovery Details  
Local Pxy ND : Disabled  
Policies : none

DHCP Details  
Admin State : Down  
Gi-Addr : Not configured  
Action : Keep  
Lease Populate : 0  
Gi-Addr as Src Ip : Disabled  
Trusted : Disabled

DHCP Proxy Details  
Admin State : Down  
Lease Time : N/A

Emul. Server : Not configured

#### Subscriber Authentication Details

Auth Policy : None

#### DHCP6 Relay Details

|              |                  |                |            |
|--------------|------------------|----------------|------------|
| Admin State  | : Down           | Lease Populate | : 0        |
| Oper State   | : Down           | Nbr Resolution | : Disabled |
| If-Id Option | : None           | Remote Id      | : Disabled |
| Src Addr     | : Not configured |                |            |

#### DHCP6 Server Details

|             |        |                   |        |
|-------------|--------|-------------------|--------|
| Admin State | : Down | Max. Lease States | : 8000 |
|-------------|--------|-------------------|--------|

#### ICMP Details

|              |                |                |      |
|--------------|----------------|----------------|------|
| Redirects    | : Number - 100 | Time (seconds) | - 10 |
| Unreachables | : Number - 100 | Time (seconds) | - 10 |
| TTL Expired  | : Number - 100 | Time (seconds) | - 10 |

#### IPCP Address Extension Details

Peer IP Addr : Not configured  
 Peer Pri DNS Addr : Not configured  
 Peer Sec DNS Addr : Not configured

#### Interface

|             |         |              |           |
|-------------|---------|--------------|-----------|
| If Name     | : gizmo |              |           |
| Admin State | : Up    | Oper (v4/v6) | : Down/-- |
| Protocols   | : None  |              |           |

IP Addr/mask : Not Assigned

#### Details

|               |                       |                 |            |
|---------------|-----------------------|-----------------|------------|
| If Index      | : 5                   | Virt. If Index  | : 5        |
| Last Oper Chg | : 06/18/2007 10:07:01 | Global If Index | : 93       |
| SDP Id        | : spoke-1:10          |                 |            |
| TOS Marking   | : Trusted             | If Type         | : VPRN Red |
| Egress Filter | : none                | Ingress Filter  | : none     |
| SNTP B.Cast   | : False               | QoS Policy      | : 1        |
| MAC Address   | : 14:30:ff:00:00:00   |                 |            |
| IP MTU        | : 0                   | ICMP Mask Reply | : True     |

#### Interface

|             |           |              |           |
|-------------|-----------|--------------|-----------|
| If Name     | : test123 |              |           |
| Admin State | : Up      | Oper (v4/v6) | : Down/-- |
| Protocols   | : None    |              |           |

IP Addr/mask : Not Assigned

#### Details

|               |                       |                 |            |
|---------------|-----------------------|-----------------|------------|
| If Index      | : 6                   | Virt. If Index  | : 6        |
| Last Oper Chg | : 06/18/2007 10:07:01 | Global If Index | : 92       |
| Port Id       | : n/a                 |                 |            |
| TOS Marking   | : Trusted             | If Type         | : VPRN Red |
| Egress Filter | : none                | Ingress Filter  | : none     |
| SNTP B.Cast   | : False               | QoS Policy      | : 1        |
| MAC Address   | :                     |                 |            |
| IP MTU        | : 0                   | ICMP Mask Reply | : True     |

```

Interface

If Name : test1
Admin State : Up Oper (v4/v6) : Down/--
Protocols : None

IP Addr/mask : Not Assigned

Details

If Index : 7 Virt. If Index : 7
Last Oper Chg : 06/18/2007 10:07:01 Global If Index : 91
Port Id : n/a
TOS Marking : Trusted If Type : VPRN Red
Egress Filter : none Ingress Filter : none
SNTP B.Cast : False QoS Policy : 1
MAC Address :
IP MTU : 0 ICMP Mask Reply : True

Interface

If Name : bozocrown
Admin State : Up Oper (v4/v6) : Down/--
Protocols : None

IP Addr/mask : Not Assigned

Details

If Index : 8 Virt. If Index : 8
Last Oper Chg : 06/18/2007 10:07:01 Global If Index : 90
Port Id : n/a
TOS Marking : Trusted If Type : VPRN Red
Egress Filter : none Ingress Filter : none
SNTP B.Cast : False QoS Policy : 1
MAC Address :
IP MTU : 0 ICMP Mask Reply : True

Interface

If Name : testabc
Admin State : Up Oper (v4/v6) : Down/--
Protocols : None

IP Addr/mask : Not Assigned

Details

If Index : 9 Virt. If Index : 9
Last Oper Chg : 06/18/2007 10:07:01 Global If Index : 89
If Type : VPRN Sub

DHCP Details
Gi-Addr : Not configured Gi-Addr as Src Ip : Disabled
=====
Interface testabc group-interfaces
=====

```

```

Interface-Name Adm Opr (v4/v6) Mode Port/SapId
IP-Address PfxState

bozo Up Down/-- VPRN G* n/a

Group-Interfaces : 1
=====
* indicates that the corresponding row element may have been truncated.

Interface

If Name : bozo
Sub If Name : testabc
Red If Name :
Admin State : Up Oper (v4/v6) : Down/--
Protocols : None

Details

If Index : 10 Virt. If Index : 10
Last Oper Chg : 06/18/2007 10:07:01 Global If Index : 88
Port Id : n/a
TOS Marking : Trusted If Type : VPRN Grp
SNTP B.Cast : False
MAC Address :
IP MTU : 0
Arp Populate : Disabled Arp Timeout : 14400
ICMP Mask Reply : True
Host Conn Verify : Disabled

Proxy ARP Details
Rem Proxy ARP : Disabled Local Proxy ARP : Enabled
Policies : none

Proxy Neighbor Discovery Details
Local Pxy ND : Disabled
Policies : none

DHCP Details
Admin State : Down Lease Populate : 1
Gi-Addr : Unknown Gi-Addr as Src Ip : Disabled
Action : Keep Trusted : Disabled
Match CircId : Disabled

DHCP Proxy Details
Admin State : Down
Lease Time : N/A
Emul. Server : Not configured

Subscriber Authentication Details
Auth Policy : None

DHCP6 Relay Details
Admin State : Down Lease Populate : 0
Oper State : Down Nbr Resolution : Disabled
If-Id Option : None Remote Id : Disabled
Src Addr : Not configured

DHCP6 Server Details
Admin State : Down Max. Lease States : 8000

ICMP Details
Redirects : Number - 100 Time (seconds) - 10
Unreachables : Number - 100 Time (seconds) - 10
TTL Expired : Number - 100 Time (seconds) - 10

```

```

IPCP Address Extension Details
Peer IP Addr : Not configured
Peer Pri DNS Addr : Not configured
Peer Sec DNS Addr : Not configured

PPPoE Details
Last Mgmt Chg: 06/18/2007 10:06:49
Session limit : 1 SAP session limit : 1
PPPoE Policy : N/A
User DB : N/A

=====
Service Access Point(Summary), Service 1 Interface bozo
=====
PortId SvcId Ing. Ing. Egr. Egr. Anti Adm Opr
 QoS Fltr QoS Fltr Spoof

No Service Access Point found.
=====
Interface

If Name : santa
Admin State : Up Oper (v4/v6) : Down/--
Protocols : None

IP Addr/mask : Not Assigned

Details

If Index : 11 Virt. If Index : 11
Last Oper Chg : 06/18/2007 10:07:01 Global If Index : 87
If Type : VPRN Sub

DHCP Details
Gi-Addr : Not configured Gi-Addr as Src Ip : Disabled
=====
Interface santa group-interfaces
=====
Interface-Name Adm Opr (v4/v6) Mode Port/SapId
IP-Address PfxState

interface Up Down/-- VPRN G* 1/2/4

Group-Interfaces : 1
=====
* indicates that the corresponding row element may have been truncated.

Interface

If Name : interface
Sub If Name : santa
Red If Name :
Admin State : Up Oper (v4/v6) : Down/--
Protocols : None

Details

If Index : 12 Virt. If Index : 12
Last Oper Chg : 06/18/2007 10:07:01 Global If Index : 86
Group Port : 1/2/4
TOS Marking : Trusted If Type : VPRN Grp

```



```

SNTP B.Cast : False
MAC Address : 14:30:01:02:00:04
IP MTU : 1500
Arp Populate : Disabled
Arp Timeout : 14400
ICMP Mask Reply : True
Host Conn Verify : Disabled

```

```

Proxy ARP Details
Rem Proxy ARP : Disabled
Policies : none
Local Proxy ARP : Enabled

```

```

Proxy Neighbor Discovery Details
Local Pxy ND : Disabled
Policies : none

```

```

DHCP Details
Admin State : Down
Gi-Addr : Unknown
Action : Keep
Match CircId : Disabled
Lease Populate : 1
Gi-Addr as Src Ip : Disabled
Trusted : Disabled

```

```

DHCP Proxy Details
Admin State : Down
Lease Time : N/A
Emul. Server : Not configured

```

```

Subscriber Authentication Details
Auth Policy : None

```

```

DHCP6 Relay Details
Admin State : Down
Oper State : Down
If-Id Option : None
Src Addr : Not configured
Lease Populate : 0
Nbr Resolution : Disabled
Remote Id : Disabled

```

```

DHCP6 Server Details
Admin State : Down
Max. Lease States : 8000

```

```

ICMP Details
Redirects : Number - 100
Unreachables : Number - 100
TTL Expired : Number - 100
Time (seconds) : 10
Time (seconds) : 10
Time (seconds) : 10

```

```

IPCP Address Extension Details
Peer IP Addr : Not configured
Peer Pri DNS Addr : Not configured
Peer Sec DNS Addr : Not configured

```

```

PPPoE Details
Last Mgmt Chg: 06/18/2007 10:06:49
Session limit : 1
PPPoE Policy : N/A
User DB : N/A
SAP session limit : 1

```

```

=====
Service Access Point(Summary), Service 1 Interface interface
=====

```

| PortId  | SvcId | Ing.<br>QoS | Ing.<br>Fltr | Egr.<br>QoS | Egr.<br>Fltr | Anti<br>Spoof | Adm | Opr  |
|---------|-------|-------------|--------------|-------------|--------------|---------------|-----|------|
| 1/2/4:0 | 1     | 1           | none         | 1           | none         | ip-mac        | Up  | Down |

```

=====
*#A:ALA-48#

```

authentication

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>authentication</b>                                                              |
| <b>Context</b>     | show>service>id                                                                    |
| <b>Description</b> | This command enables the context to display subscriber authentication information. |

statistics

|                    |                                                                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <i>policy name</i> ] [ <b>sap</b> <i>sap-id</i> ]                                                                                                                                                                              |
| <b>Context</b>     | show>service>id>authentication                                                                                                                                                                                                                     |
| <b>Description</b> | This command displays session authentication statistics for this service.                                                                                                                                                                          |
| <b>Parameters</b>  | <b>policy name</b> — Specifies the subscriber authentication policy statistics to display.<br><b>sap sap-id</b> — Specifies the SAP ID statistics to display. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax. |

Sample Output

```
*A:ALA-1# show service id 11 authentication statistics
=====
Authentication statistics
=====
Interface / SAP Authentication Authentication
 Successful Failed

vpls-11-90.1.0.254 1582 3

Number of entries: 1
=====
*A:ALA-1#
```

arp

|                    |                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp</b> [ <i>ip-address</i> ]   [ <b>mac</b> <i>ieee-address</i> ]   [ <b>sap</b> <i>sap-id</i> ]   [ <b>interface</b> <i>ip-int-name</i> ] [ <b>sdp</b> <i>sdp-id:vc-id</i> ] [ <b>summary</b> ] |
| <b>Context</b>     | show>service>id                                                                                                                                                                                      |
| <b>Description</b> | Displays the ARP table for the IES instance.                                                                                                                                                         |
| <b>Parameters</b>  | <i>ip-address</i> — Displays only ARP entries in the ARP table with the specified IP address.<br><b>Default</b> All IP addresses.                                                                    |

**mac** *ieee-address* — Displays only ARP entries in the ARP table with the specified 48-bit MAC address. The MAC address can be expressed in the form *aa:bb:cc:dd:ee:ff* or *aa-bb-cc-dd-ee-ff* where *aa*, *bb*, *cc*, *dd*, *ee* and *ff* are hexadecimal numbers.

**Default** All MAC addresses.

**sap** *sap-id* — Displays SAP information for the specified SAP ID. See [Common CLI Command Descriptions on page 1933](#) for command syntax.

*port id* — Specifies matching service ARP entries associated with the specified IP interface.

*ip-address* — The IP address of the interface for which to display matching ARP entries.

**Values** 1.0.0.0 — 223.255.255.255

*ip-int-name* — The IP interface name for which to display matching ARPs.

**Output** **Show Service-ID ARP** — The following table describes show service-id ARP output fields.

| Label             | Description                                                                                                                                            |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service ID        | The service ID number.                                                                                                                                 |
| MAC               | The specified MAC address                                                                                                                              |
| Source-Identifier | The location the MAC is defined.                                                                                                                       |
| Type              | Static — FDB entries created by management.<br>Learned — Dynamic entries created by the learning process.<br>OAM — Entries created by the OAM process. |
| Age               | The time elapsed since the service was enabled.                                                                                                        |
| Interface         | The interface applied to the service.                                                                                                                  |
| Port              | The port where the SAP is applied.                                                                                                                     |

### Sample Output

```
*A:ALA-12# show service id 2 arp
=====
ARP Table
=====
IP Address MAC Address Type Age Interface Port

190.11.1.1 00:03:fa:00:08:22 Other 00:00:00 ies-100-190.11.1 1/1/11:0
=====
*A:ALA-12#
```

## arp-host

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-host</b> [wholesaler service-id] [ <b>sap</b> sap-id   <b>interface</b> interface-name   <b>ip-address</b> ip-address[/mask]   <b>mac</b> ieee-address   {[ <b>port</b> port-id] [ <b>no-inter-dest-id</b>   <b>inter-dest-id</b> inter-dest-id]]} [ <b>detail</b> ]<br><b>arp-host statistics</b> [ <b>sap</b> sap-id   <b>interface</b> interface-name]<br><b>arp-host summary</b> [ <b>interface</b> interface-name] |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays ARP host related information.                                                                                                                                                                                                                                                                                                                                                                            |

## Sample Output

```
*A:Dut-C# show service id 2 arp-host
=====
ARP host table, service 2
=====
IP Address Mac Address Sap Id Remaining MC
 Time Stdbby

128.128.1.2 00:80:00:00:00:01 2/1/5:2 00h04m41s
128.128.1.3 00:80:00:00:00:02 2/1/5:2 00h04m42s
128.128.1.4 00:80:00:00:00:03 2/1/5:2 00h04m43s
128.128.1.5 00:80:00:00:00:04 2/1/5:2 00h04m44s
128.128.1.6 00:80:00:00:00:05 2/1/5:2 00h04m45s
128.128.1.7 00:80:00:00:00:06 2/1/5:2 00h04m46s
128.128.1.8 00:80:00:00:00:07 2/1/5:2 00h04m47s
128.128.1.9 00:80:00:00:00:08 2/1/5:2 00h04m48s
128.128.1.10 00:80:00:00:00:09 2/1/5:2 00h04m49s
128.128.1.11 00:80:00:00:00:0a 2/1/5:2 00h04m50s

Number of ARP hosts : 10
=====
*A:Dut-C#

*A:Dut-C# show service id 2 arp-host ip-address 128.128.1.2 detail
=====
ARP hosts for service 2
=====
Service ID : 2
IP Address : 128.128.1.2
MAC Address : 00:80:00:00:00:01
SAP : 2/1/5:2
Remaining Time : 00h04m58s

Sub-Ident : "alu_1_2"
Sub-Profile-String : ""
SLA-Profile-String : ""
App-Profile-String : ""
ARP host ANCP-String : ""
ARP host Int Dest Id : ""
RADIUS-User-Name : "128.128.1.2"

Session Timeout (s) : 301
Start Time : 02/09/2009 16:35:07
Last Auth : 02/09/2009 16:36:34
```

```

Last Refresh : 02/09/2009 16:36:38
Persistence Key : N/A

Number of ARP hosts : 1
=====
*A:Dut-C#

*A:Dut-C# show service id 2 arp-host statistics
=====
ARP host statistics
=====
Num Active Hosts : 20
Received Triggers : 70
Ignored Triggers : 10
Ignored Triggers (overload) : 0
SHCV Checks Forced : 0
Hosts Created : 20
Hosts Updated : 40
Hosts Deleted : 0
Authentication Requests Sent : 40
=====
*A:Dut-C#

*A:Dut-C# show service id 2 arp-host summary
=====
ARP host Summary, service 2
=====
Sap Used Provided Admin State

sap:2/1/5:2 20 8000 inService

Number of SAPs : 1

=====
*A:Dut-C#

```

## base

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>base</b>                                                                                         |
| <b>Context</b>     | show>service>id                                                                                     |
| <b>Description</b> | Displays basic information about the service ID including service type, description, SAPs and SDPs. |
| <b>Output</b>      | <b>Show Service-ID Base</b> — The following table describes show service-id base output fields:     |

| Label        | Description                                                              |
|--------------|--------------------------------------------------------------------------|
| Service Id   | The service identifier.                                                  |
| Vpn Id       | Specifies the VPN ID assigned to the service.                            |
| Service Type | The type of service: Apipe, Cpipe, Epipe, Fpipe, IES, Ipipe, VPLS, VPRN. |

| Label            | Description                                                                                                                                                              |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description      | Generic information about the service.                                                                                                                                   |
| Customer Id      | The customer identifier.                                                                                                                                                 |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this customer.                                                                                       |
| Adm              | The desired state of the service.                                                                                                                                        |
| Oper             | The operating state of the service.                                                                                                                                      |
| Mtu              | The largest frame size (in octets) that the service can handle.                                                                                                          |
| Def. Mesh VC Id  | This object is only valid in services that accept mesh SDP bindings. It is used to validate the VC ID portion of each mesh SDP binding defined in the service.           |
| SAP Count        | The number of SAPs defined on the service.                                                                                                                               |
| SDP Bind Count   | The number of SDPs bound to the service.                                                                                                                                 |
| Identifier       | Specifies the service access (SAP) and destination (SDP) points.                                                                                                         |
| Type             | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                        |
| AdmMTU           | Specifies the desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end ESR, without requiring the packet to be fragmented. |
| OprMTU           | Specifies the actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end ESR, without requiring the packet to be fragmented.  |
| Opr              | The operating state of the SDP.                                                                                                                                          |

### Sample Output

```
*A:ALA-12# show service id 1 base
=====
Service Basic Information
=====
Service Id : 1 Vpn Id : 0
Service Type : VPRN
Customer Id : 1
Last Status Change: 02/01/2007 09:11:39
Last Mgmt Change : 02/01/2007 09:11:46
Admin State : Up Oper State : Down
Route Dist. : 10001:1
AS Number : 10000 Router Id : 10.10.10.103
ECMP : Enabled ECMP Max Routes : 8
Max Routes : No Limit Auto Bind : LDP
```

```

Vrf Target : target:10001:1
Vrf Import : vrfImpPolCust1
Vrf Export : vrfExpPolCust1
SAP Count : 1 SDP Bind Count : 18

Service Access & Destination Points

Identifier Type AdmMTU OprMTU Adm Opr

sap:1/1/7:0 q-tag 1518 1518 Up Up
sdp:10:1 M(10.20.1.3) TLDP 4462 4462 Up TLDP Down
sdp:20:1 M(10.20.1.4) TLDP 4462 4462 Up TLDP Down
sdp:30:1 M(10.20.1.5) TLDP 4462 4462 Up TLDP Down
sdp:40:1 M(10.20.1.20) TLDP 1534 4462 Up Up
sdp:200:1 M(10.20.1.30) TLDP 1514 4462 Up Up
sdp:300:1 M(10.20.1.31) TLDP 4462 4462 Up TLDP Down
sdp:500:1 M(10.20.1.50) TLDP 4462 4462 Up TLDP Down
=====
*A:ALA-12#

```

## dhcp

|                    |                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                                             |
| <b>Context</b>     | show>service>id                                                                         |
| <b>Description</b> | This command enables the context to display DHCP information for the specified service. |

## lease-state

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>lease-state</b> <i>[[sap sap-id] [sdp [sdp-id[:vc-id]]]   [interface interface-name]   [ip-address ip-address[/mask]]   [mac ieee-address]   [wholesaler service-id] ] [detail]</i>                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | show>service>id>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b> | <p>This command displays DHCP lease state related information. Refer to the following for various show command output:</p> <ul style="list-style-type: none"> <li>• <a href="#">Lease State Sample Output on page 1820</a></li> <li>• <a href="#">Routed CO Sample Output on page 1820</a></li> <li>• <a href="#">Wholesaler/Retailer Sample Output on page 1821</a></li> </ul>                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <p><i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><i>sdp-id</i> — The SDP identifier.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID for which to display information.</p> <p><b>Values</b> 1 — 4294967295</p> <p><b>interface</b> <i>interface-name</i> — Displays information for the specified IP interface.</p> <p><b>ip-address</b> <i>ip-address</i> — Displays information associated with the specified IP address.</p> |

**detail** — Displays detailed information.

**wholesaler service-id** — The VPRN service ID of the wholesaler. When specified in this context, SAP, SDP, interface, IP address and MAC parameters are ignored.

**Values** 1 — 2147483647

### Sample Output

```
*A:ALA-48>config# show service id 101 dhcp lease-state
=====
DHCP lease state table, service 101
=====
IP Address Mac Address Sap/Sdp Id Remaining Lease MC
 LifeTime Origin Stdbby

102.1.1.52 00:00:1f:bd:00:bb lag-1:101 00h02m56s DHCP-R
103.3.2.62 00:00:1f:bd:00:c6 lag-1:105 00h02m59s Radius

Number of lease states : 2
=====
*A:ALA-48>config#

*A:ALA-48>config# show service id 105 dhcp lease-state wholesaler 101
=====
DHCP lease state table, service 105
=====
IP Address Mac Address Sap/Sdp Id Remaining Lease MC
 LifeTime Origin Stdbby

Wholesaler 101 Leases

103.3.2.62 00:00:1f:bd:00:c6 lag-1:105 00h00m39s Radius

Number of lease states : 1
=====
*A:ALA-48>config#
```

### Routed CO Sample Output

```
A:ALA-_Dut-A# show service id 13 dhcp lease-state
=====
DHCP lease state table, service 13
=====
IP Address Mac Address Sap/Sdp Id Remaining Lease MC
 LifeTime Origin Stdbby

13.13.40.1 00:00:00:00:00:13 1/1/1:13 00h00m58s Radius

Number of lease states : 1
=====
A:ALA-_Dut-A#

A:ALA-_Dut-A# show service id 13 dhcp lease-state detail
=====
DHCP lease states for service 13
=====
```



```

Service ID : 13
IP Address : 13.13.40.1
Mac Address : 00:00:00:00:00:13
Subscriber-interface : ies-13-13.13.1.1
Group-interface : intf-13
SAP : 1/1/1:13
Remaining Lifetime : 00h00m58s
Persistence Key : N/A

Sub-Ident : "Belgacom"
Sub-Profile-String : "ADSL GO"
SLA-Profile-String : "BE-Video"
Lease ANCP-String : ""

Sub-Ident origin : Radius
Strings origin : Radius
Lease Info origin : Radius

Ip-Netmask : 255.255.0.0
Broadcast-Ip-Addr : 13.13.255.255
Default-Router : N/A
Primary-Dns : 13.13.254.254
Secondary-Dns : 13.13.254.253

ServerLeaseStart : 12/24/2006 23:48:23
ServerLastRenew : 12/24/2006 23:48:23
ServerLeaseEnd : 12/24/2006 23:49:23
Session-Timeout : 0d 00:01:00
DHCP Server Addr : N/A

Persistent Relay Agent Information
 Circuit Id : ancstb6_Dut-A|13|intf-13|0|13
 Remote Id : stringtest

```

```

Number of lease states : 1
=====
```

```
A:ALA-_Dut-A#
```

### Wholesaler/Retailer Sample Output

```
A:ALA-_Dut-A# show service id 2000 dhcp lease-state detail
```

```
=====
DHCP lease states for service 2000
=====
```

```
Wholesaler 1000 Leases

```

```

Service ID : 1000
IP Address : 13.13.1.254
Mac Address : 00:00:00:00:00:13
Subscriber-interface : whole-sub
Group-interface : intf-13
Retailer : 2000
Retailer If : retail-sub
SAP : 1/1/1:13
Remaining Lifetime : 00h09m59s
Persistence Key : N/A

Sub-Ident : "Belgacom"
Sub-Profile-String : "ADSL GO"
SLA-Profile-String : "BE-Video"
Lease ANCP-String : ""

```

```
Sub-Ident origin : Retail DHCP
Strings origin : Retail DHCP
Lease Info origin : Retail DHCP

Ip-Netmask : 255.255.0.0
Broadcast-Ip-Addr : 13.13.255.255
Default-Router : N/A
Primary-Dns : N/A
Secondary-Dns : N/A

ServerLeaseStart : 12/25/2006 00:29:41
ServerLastRenew : 12/25/2006 00:29:41
ServerLeaseEnd : 12/25/2006 00:39:41
Session-Timeout : 0d 00:10:00
DHCP Server Addr : 10.232.237.2

Persistent Relay Agent Information
 Circuit Id : 1/1/1:13
 Remote Id : stringtest

Number of lease states : 1
=====
A:ALA-_Dut-A#
```

statistics

- Syntax

**statistics** [**sap** *sap-id*]  
**statistics** [**sdp** *sdp-id:vc-id*]  
**statistics** [**interface** *interface-name*]
- Context

show>service>id>dhcp
- Description

Displays DHCP statistics information.
- Parameters

*sap-id* — Specifies the physical port identifier portion of the SAP definition. See [Common CLI Command Descriptions on page 1933](#) for command syntax.

*sdp-id* — The SDP identifier.

**Values**      1 — 17407

*vc-id* — The virtual circuit ID on the SDP ID for which to display information.

**Values**      1 — 4294967295

**interface** *interface-name* — Displays information for the specified IP interface.

**Show DHCP Statistics Output** — The following table describes the output fields for DHCP statistics.

| Label               | Description                                            |
|---------------------|--------------------------------------------------------|
| Received Packets    | The number of packets received from the DHCP clients.  |
| Transmitted Packets | The number of packets transmitted to the DHCP clients. |

| Label                       | Description                                                                                                                                                                                                               |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Received Mal-formed Packets | The number of corrupted/invalid packets received from the DHCP clients.                                                                                                                                                   |
| Received Untrusted Packets  | The number of untrusted packets received from the DHCP clients. In this case, a frame is dropped due to the client sending a DHCP packet with Option 82 filled in before “trust” is set under the DHCP interface command. |
| Client Packets Discarded    | The number of packets received from the DHCP clients that were discarded.                                                                                                                                                 |
| Client Packets Relayed      | The number of packets received from the DHCP clients that were forwarded.                                                                                                                                                 |
| Client Packets Snooped      | The number of packets received from the DHCP clients that were snooped.                                                                                                                                                   |
| Server Packets Discarded    | The number of packets received from the DHCP server that were discarded.                                                                                                                                                  |
| Server Packets Relayed      | The number of packets received from the DHCP server that were forwarded.                                                                                                                                                  |
| Server Packets Snooped      | The number of packets received from the DHCP server that were snooped.                                                                                                                                                    |

### Sample Output

```
A:sim1# show service id 11 dhcp statistics
=====
DHCP Global Statistics, service 11
=====
Rx Packets : 32
Tx Packets : 12
Rx Malformed Packets : 0
Rx Untrusted Packets : 0
Client Packets Discarded : 0
Client Packets Relayed : 11
Client Packets Snooped : 21
Server Packets Discarded : 0
Server Packets Relayed : 0
Server Packets Snooped : 0
=====
A:sim1#
```

## gsmp

|                    |                                         |
|--------------------|-----------------------------------------|
| <b>Syntax</b>      | <b>gsmp</b>                             |
| <b>Context</b>     | show>service>id                         |
| <b>Description</b> | This command displays GSMP information. |

## neighbors

|                    |                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>neighbors group</b> [ <i>name</i> ] [ <i>ip-address</i> ]                                                                                                                                                                                                                                    |
| <b>Context</b>     | show>service>id>gsmp                                                                                                                                                                                                                                                                            |
| <b>Description</b> | This command displays GSMP neighbor information.                                                                                                                                                                                                                                                |
| <b>Parameters</b>  | <p><b>group</b> — A GSMP group defines a set of GSMP neighbors which have the same properties.</p> <p><b>name</b> — Specifies a GSMP group name is unique only within the scope of the service in which it is defined.</p> <p><b>ip-address</b> — Specifies the ip-address of the neighbor.</p> |

### Sample Output

These commands show the configured neighbors per service, regardless of the fact there exists an open TCP connection with this neighbor. The admin state is shown because for a neighbor to be admin enabled, the service, gsmp node, group node and the neighbor node in this service must all be in 'no shutdown' state. Session gives the number of session (open TCP connections) for each configured neighbor.

```
A:active>show>service>id>gsmp# neighbors
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
dslam1 192.168.1.3 Enabled 0

Number of neighbors shown: 2
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# neighbors group dslam1
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
dslam1 192.168.1.3 Enabled 0

Number of neighbors shown: 2
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# neighbors group dslam1 192.168.1.2
=====
GSMP neighbors
=====
Group Neighbor AdminState Sessions

dslam1 192.168.1.2 Enabled 0
=====
A:active>show>service>id>gsmp#
```

## sessions

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sessions</b> [ <i>group name</i> ] <b>neighbor</b> <i>ip-address</i> ] [ <i>port port-number</i> ] [ <i>association</i> ] [ <i>statistics</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Context</b>     | show>service>id>gsmp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays GSMP sessions information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><b>group</b> — A GSMP group defines a set of GSMP neighbors which have the same properties.</p> <p><i>name</i> — Specifies a GSMP group name is unique only within the scope of the service in which it is defined.</p> <p><i>ip-address</i> — Specifies the ip-address of the neighbor.</p> <p><i>port</i> — Specifies the neighbor TCP port number use for this ANCP session.</p> <p><b>Values</b>      0 — 65535</p> <p><b>association</b> — Displays to what object the ANCP-string is associated.</p> <p><b>statistics</b> — Displays statistics information about an ANCP session known to the system.</p> |

**Sample Output**

This show command gives information about the open TCP connections with DSLAMs.

```
A:active>show>service>id>gsmp# sessions
=====
GSMP sessions for service 999 (VPRN)
=====
Port Ngbr-IPAddr Gsmp-Group

40590 192.168.1.2 dslam1

Number of GSMP sessions : 1
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590
=====
GSMP sessions for service 999 (VPRN), neighbor 192.168.1.2, Port 40590
=====
State : Established
Peer Instance : 1 Sender Instance : a3cf58
Peer Port : 0 Sender Port : 0
Peer Name : 12:12:12:12:12:12 Sender Name : 00:00:00:00:00:00
Timeouts : 0 Max. Timeouts : 3
Peer Timer : 100 Sender Timer : 100
Capabilities : DTD OAM
Conf Capabilities : DTD OAM
Priority Marking : dscp nc2
Local Addr. : 192.168.1.4
Conf Local Addr. : N/A
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 association
=====
ANCP-Strings
```

```
=====
ANCP-String Assoc. State

No ANCP-Strings found
=====
A:active>show>service>id>gsmp#

A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 statistics
=====
GSMP session stats, service 999 (VPRN), neighbor 192.168.1.2, Port 40590
=====
Event Received Transmitted

Dropped 0 0
Syn 1 1
Syn Ack 1 1
Ack 14 14
Rst Ack 0 0
Port Up 0 0
Port Down 0 0
OAM Loopback 0 0
=====
A:active>show>service>id>gsmp#
```

Note: The association command gives an overview of each ANCP string received from this session.

```
A:active>show>service>id>gsmp# sessions neighbor 192.168.1.2 port 40590 association
=====
ANCP-Strings
=====
ANCP-String Assoc.
State

7330-ISAM-E47 atm 1/1/01/01:19425.64048 ANCP Up

Number of ANCP-Strings : 1
=====
A:active>show>service>id>gsmp#
```

host

|             |                                                                                                                                                                                                                                                                                                                                                          |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | <b>host</b> [ <b>sap</b> <i>sap-id</i> ] [ <b>detail</b> ]<br><b>host summary</b><br><b>host</b> [ <b>detail</b> ] <b>wholesaler</b> <i>service-id</i>                                                                                                                                                                                                   |
| Context     | show>service>id                                                                                                                                                                                                                                                                                                                                          |
| Description | This command displays static host information configured on this service.                                                                                                                                                                                                                                                                                |
| Parameters  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.<br><br><b>summary</b> — Displays summary host information.<br><br><b>wholesaler</b> <i>service-id</i> — The service ID of the wholesaler.<br><br><b>Values</b> 1 — 2147483647 |

## summary

|                    |                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>summary</b>                                                                                                                                                                   |
| <b>Context</b>     | show>service>id>dhcp                                                                                                                                                             |
| <b>Description</b> | This command displays DHCP configuration summary information.<br><b>Show Service-ID DHCP Summary</b> — The following table describes show service-id DHCP summary output fields: |

| Label           | Description                                                                                                                                                                                                                                                                                                           |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sap/Sdp         | The configuration identification, expressed by a string containing “card/mda/port:/logical-id”.                                                                                                                                                                                                                       |
| Snoop           | Yes — The packets received from the DHCP clients were snooped.<br>No — The packets received from the DHCP clients were not snooped.                                                                                                                                                                                   |
| Used/Provided   | Used — The number of lease-states that are currently in use on a specific interface, that is, the number of clients on that interface got an IP address by DHCP. This value is always less than or equal to the ‘Provided’ field.<br>Provided — The lease-populate value that is configured for a specific interface. |
| Arp Reply Agent | Displays whether or not there is proper handling of received ARP requests from subscribers.                                                                                                                                                                                                                           |
| Info Option     | Keep — The existing information is kept on the packet and the router does not add any additional information.<br><br>Replace — On ingress, the existing information-option is replaced with the information-option from the router.<br><br>Drop — The packet is dropped and an error is logged.                       |
| Admin State     | Indicates the administrative state.                                                                                                                                                                                                                                                                                   |

## Sample Output

```
A:ALA-49# show service id 1 dhcp summary
=====
DHCP Summary, service 1
=====
Interface Name Arp Used/ Info Admin
SapId/Sdp Populate Provided Option State

SpokeSDP No 0/0 Keep Up
 sdp:spoke-3:4 0/0
test No 0/0 Keep Up
 sap:1/1/4:50/5 0/0
to-cel No 0/0 Keep Up
 sap:1/1/10:1 0/0

Interfaces: 3
=====
```

A:ALA-49#

## interface

|                    |                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> [ <i>ip-address</i>   <i>ip-int-name</i> ] [ <b>detail</b> ]                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | Displays information for the IP interfaces associated with the service.<br>If no optional parameters are specified, a summary of all IP interfaces associated to the service are displayed.                                                                                                                                                                     |
| <b>Parameters</b>  | <p><i>ip-address</i> — The IP address of the interface for which to display information.</p> <p><b>Values</b>      1.0.0.0 — 223.255.255.255</p> <p><i>ip-int-name</i> — The IP interface name for which to display information.</p> <p><b>detail</b> — Displays detailed IP interface information.</p> <p><b>Default</b>      IP interface summary output.</p> |
| <b>Output</b>      | <b>Show Service-ID Interface</b> — The following table describes show service-id interface output fields:                                                                                                                                                                                                                                                       |

| Label          | Description                                                                                                                                    |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface-Name | The name used to refer to the interface.                                                                                                       |
| Type           | Specifies the interface type.                                                                                                                  |
| IP-Address     | Specifies the IP address/IP subnet/broadcast address of the interface.                                                                         |
| Adm            | The desired state of the interface.                                                                                                            |
| Opr            | The operating state of the interface.                                                                                                          |
| Interface      |                                                                                                                                                |
| If Name        | The name used to refer to the interface.                                                                                                       |
| Admin State    | The desired state of the interface.                                                                                                            |
| Oper State     | The operating state of the interface.                                                                                                          |
| IP Addr/mask   | Specifies the IP address/IP subnet/broadcast address of the interface.                                                                         |
| Details        |                                                                                                                                                |
| If Index       | The index corresponding to this interface. The primary index is 1. For example, all interfaces are defined in the Base virtual router context. |
| If Type        | Specifies the interface type.                                                                                                                  |
| Port Id        | Specifies the SAP's port ID.                                                                                                                   |
| SNTP B.Cast    | Specifies whether SNTP broadcast client mode is enabled or disabled.                                                                           |



| Label           | Description (Continued)                                                                   |
|-----------------|-------------------------------------------------------------------------------------------|
| Arp Timeout     | Specifies the timeout for an ARP entry learned on the interface.                          |
| MAC Address     | Specifies the 48-bit IEEE 802.3 MAC address.                                              |
| ICMP Mask Reply | Specifies whether ICMP mask reply is enabled or disabled.                                 |
| Cflowd          | Specifies whether Cflowd collection and analysis on the interface is enabled or disabled. |
| ICMP Details    |                                                                                           |
| Redirects       | Specifies the rate for ICMP redirect messages.                                            |
| Unreachables    | Specifies the rate for ICMP unreachable messages.                                         |
| TTL Expired     | Specifies the rate for ICMP TTL messages.                                                 |

### Sample Output

```
*A:ALA-12# show service id 321 interface
=====
Interface Table
=====
Interface-Name Type IP-Address Adm Opr Type

test Pri 190.11.1.1/24 Up Up IES

Interfaces : 1
=====
*A:ALA-12#

A:ALA-49# show service id 88 interface detail
=====
Interface Table
=====
Interface

If Name : Sector A
Admin State : Up
Protocols : None
Oper State : Down

IP Addr/mask : Not Assigned

Details

Description :
If Index : 26
SAP Id : 7/1/1.2.2
TOS Marking : Untrusted
SNTP B.Cast : False
MAC Address : Not configured.
IP MTU : 1500
Arp Populate : Disabled
Cflowd : None
Virt. If Index : 26
If Type : IES
IES ID : 88
Arp Timeout : 14400
ICMP Mask Reply : True

Proxy ARP Details
```

Show, Clear, Debug Commands

```
Proxy ARP : Enabled
Policies : ProxyARP

DHCP Details
Admin State : Up
Action : Keep
ICMP Details
Redirects : Number - 100
Unreachables : Number - 100
TTL Expired : Number - 100

Local Proxy ARP : Disabled
Lease Populate : 0
Trusted : Disabled
Time (seconds) : 10
Time (seconds) : 10
Time (seconds) : 10

Interface

If Name : test
Admin State : Up
Protocols : None
Oper State : Down
IP Addr/mask : Not Assigned

Details

Description :
If Index : 27
SAP Id : 10/1/2:0
TOS Marking : Untrusted
SNTP B.Cast : False
MAC Address : Not configured.
IP MTU : 1500
Arp Populate : Disabled
Cflowd : None

Virt. If Index : 27
If Type : IES
IES ID : 88
Arp Timeout : 14400
ICMP Mask Reply : True

Proxy ARP Details
Proxy ARP : Disabled

Local Proxy ARP : Disabled

DHCP Details
Admin State : Up
Action : Keep
ICMP Details
Redirects : Number - 100
Unreachables : Number - 100
TTL Expired : Number - 100

Lease Populate : 0
Trusted : Disabled
Time (seconds) : 10
Time (seconds) : 10
Time (seconds) : 10

Interfaces : 2
=====
A:ALA-49#
```

retailers

|               |                                                                                                           |
|---------------|-----------------------------------------------------------------------------------------------------------|
| Syntax        | retailers                                                                                                 |
| Context       | show>service>id                                                                                           |
| Description   | This command displays the service ID of the retailer subscriber service to which this DHCP lease belongs. |
| Sample Output |                                                                                                           |

```
*A:ALA-48>config# show service id 101 retailers
=====
Retailers for service 101
=====
Retailer Svc ID Num Static Hosts Num Dynamic Hosts

102 3 1
105 0 1

Number of retailers : 2
=====
*A:ALA-48>config#
```

## wholesalers

|                    |                                                       |
|--------------------|-------------------------------------------------------|
| <b>Syntax</b>      | <b>wholesalers</b>                                    |
| <b>Context</b>     | show>service>id                                       |
| <b>Description</b> | This command displays service wholesaler information. |

### Sample Output

```
*A:ALA-48>config# show service id 102 wholesalers
=====
Wholesalers for service 102
=====
Wholesaler Svc ID Num Static Hosts Num Dynamic Hosts

101 3 1

Number of wholesalers : 1
=====
*A:ALA-48>config#
```

Wholesaler information can also be displayed in the lease-state context.

```
*A:ALA-48>config# show service id 105 dhcp lease-state wholesaler 101
=====
DHCP lease state table, service 105
=====
IP Address Mac Address Sap/Sdp Id Remaining Lease MC
 LifeTime Origin Stdbby

Wholesaler 101 Leasesok

103.3.2.62 00:00:1f:bd:00:c6 lag-1:105 00h00m39s Radius

Number of lease states : 1
=====
*A:ALA-48>config#
```

## sap

|                    |                                                                                                                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> [ <b>detail</b> ]                                                                                                                                                                    |
| <b>Context</b>     | show>service>id                                                                                                                                                                                               |
| <b>Description</b> | Displays information for the SAPs associated with the service.<br>If no optional parameters are specified, a summary of all associated SAPs is displayed.                                                     |
| <b>Parameters</b>  | <i>sap-id</i> — The ID that displays SAPs for the service. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.<br><b>detail</b> — Displays detailed information for the SAP. |
| <b>Output</b>      | <b>Show Service-ID SAP</b> — The following table describes show service SAP fields:                                                                                                                           |

## Sample Output

| Label              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id         | The service identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| SAP                | The SAP and qtag.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Encap              | The encapsulation type of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Ethertype          | Specifies an Ethernet type II Ether type value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Admin State        | The administrative state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Oper State         | The operating state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Flags              | Specifies the conditions that affect the operating status of this SAP.<br>Display output includes: ServiceAdminDown, SapAdminDown, InterfaceAdminDown, PortOperDown, PortMTUTooSmall, L2OperDown, SapIngressQoSMismatch, SapEgressQoSMismatch, RelearnLimitExceeded, RxProtSrcMac, ParentIfAdminDown, NoSapIpipeCeIpAddr, TodResourceUnavail, TodMssResourceUnavail, SapParamMismatch, CemSapNoEcidOrMacAddr, StandByForMcRing, ServiceMTUTooSmall, SapIngressNamedPoolMismatch, SapEgressNamedPoolMismatch, NoSapEpipeRingNode. |
| Last Status Change | Specifies the time of the most recent operating status change to this SAP                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Last Mgmt Change   | Specifies the time of the most recent management-initiated change to this SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Admin MTU          | The desired largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented.                                                                                                                                                                                                                                                                                                                                                                 |

| Label                               | Description (Continued)                                                                                                                                                  |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oper MTU                            | The actual largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented.          |
| Ingress qos-policy                  | The ingress QoS policy ID assigned to the SAP.                                                                                                                           |
| Egress qos-policy                   | The egress QoS policy ID assigned to the SAP.                                                                                                                            |
| Ingress Filter-Id                   | The ingress filter policy ID assigned to the SAP.                                                                                                                        |
| Egress Filter-Id                    | The egress filter policy ID assigned to the SAP.                                                                                                                         |
| Acct. Pol                           | The accounting policy ID assigned to the SAP.                                                                                                                            |
| Collect Stats                       | Specifies whether collect stats is enabled.                                                                                                                              |
| Forwarding Engine Stats             |                                                                                                                                                                          |
| Dropped                             | The number of packets and octets dropped due to SAP state, ingress MAC or IP filter, same segment discard, bad checksum, etc.                                            |
| Off. HiPrio                         | The number of high priority packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                          |
| Off. LowPrio                        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                           |
| Off. Uncolor                        | The number of uncolored packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                              |
| Queueing Stats (Ingress QoS Policy) |                                                                                                                                                                          |
| Dro. HiPrio                         | The number of high priority packets and octets, as determined by the SAP ingress QoS policy, dropped by the Qchip due to: MBS exceeded, buffer pool limit exceeded, etc. |
| Dro. LowPrio                        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy, dropped by the Qchip due to: MBS exceeded, buffer pool limit exceeded, etc.  |
| For. InProf                         | The number of in-profile packets and octets (rate below CIR) forwarded by the ingress Qchip.                                                                             |
| For. OutProf                        | The number of out-of-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                      |
| Queueing Stats (Egress QoS Policy)  |                                                                                                                                                                          |
| Dro. InProf                         | The number of in-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                          |
| Dro. OutProf                        | The number of out-of-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                      |
| For. InProf                         | The number of in-profile packets and octets (rate below CIR) forwarded by the egress Qchip.                                                                              |

| Label                               | Description (Continued)                                                                                                                                                  |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ingress qos-policy                  | The ingress QoS policy ID assigned to the SAP.                                                                                                                           |
| Egress qos-policy                   | The egress QoS policy ID assigned to the SAP.                                                                                                                            |
| Ingress Filter-Id                   | The ingress filter policy ID assigned to the SAP.                                                                                                                        |
| Egress Filter-Id                    | The egress filter policy ID assigned to the SAP.                                                                                                                         |
| Acct. Pol                           | The accounting policy ID assigned to the SAP.                                                                                                                            |
| Collect Stats                       | Specifies whether collect stats is enabled.                                                                                                                              |
| Forwarding Engine Stats             |                                                                                                                                                                          |
| Dropped                             | The number of packets and octets dropped due to SAP state, ingress MAC or IP filter, same segment discard, bad checksum, etc.                                            |
| Off. HiPrio                         | The number of high priority packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                          |
| Off. LowPrio                        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                           |
| Off. Uncolor                        | The number of uncolored packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                              |
| Queueing Stats (Ingress QoS Policy) |                                                                                                                                                                          |
| Dro. HiPrio                         | The number of high priority packets and octets, as determined by the SAP ingress QoS policy, dropped by the Qchip due to: MBS exceeded, buffer pool limit exceeded, etc. |
| Dro. LowPrio                        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy, dropped by the Qchip due to: MBS exceeded, buffer pool limit exceeded, etc.  |
| For. InProf                         | The number of in-profile packets and octets (rate below CIR) forwarded by the ingress Qchip.                                                                             |
| For. OutProf                        | The number of out-of-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                      |
| Queueing Stats (Egress QoS Policy)  |                                                                                                                                                                          |
| Dro. InProf                         | The number of in-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                          |
| Dro. OutProf                        | The number of out-of-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                      |
| For. InProf                         | The number of in-profile packets and octets (rate below CIR) forwarded by the egress Qchip.                                                                              |

| Label                                             | Description (Continued)                            |                          |
|---------------------------------------------------|----------------------------------------------------|--------------------------|
| Ingress TD Profile                                | The profile ID applied to the ingress SAP.         |                          |
| Egress TD Profile                                 | The profile ID applied to the egress SAP.          |                          |
| Alarm Cell Handling                               | The indication that OAM cells are being processed. |                          |
| AAL-5 Encap                                       | The AAL-5 encapsulation type.                      |                          |
| *A:ALA-12# show service id 321 sap 1/1/4:0        |                                                    |                          |
| =====                                             |                                                    |                          |
| Service Access Points(SAP)                        |                                                    |                          |
| =====                                             |                                                    |                          |
| Service Id                                        | : 321                                              |                          |
| SAP                                               | : 1/1/4:0                                          | Encap : q-tag            |
| Dot1Q Ethertype                                   | : 0x8100                                           | QinQ Ethertype : 0x8100  |
| Admin State                                       | : Up                                               | Oper State : Down        |
| Flags                                             | : PortOperDown                                     |                          |
|                                                   | SapIngressQoSMismatch                              |                          |
| Last Status Change                                | : 02/03/2007 12:58:37                              |                          |
| Last Mgmt Change                                  | : 02/03/2007 12:59:10                              |                          |
| Admin MTU                                         | : 1518                                             | Oper MTU : 1518          |
| Ingress qos-policy                                | : 100                                              | Egress qos-policy : 1    |
| Ingress Filter-Id                                 | : n/a                                              | Egress Filter-Id : n/a   |
| Multi Svc Site                                    | : None                                             |                          |
| Acct. Pol                                         | : None                                             | Collect Stats : Disabled |
| =====                                             |                                                    |                          |
| *A:ALA-12#                                        |                                                    |                          |
|                                                   |                                                    |                          |
| *A:ALA-12# show service id 321 sap 1/1/4:0 detail |                                                    |                          |
| =====                                             |                                                    |                          |
| Service Access Points(SAP)                        |                                                    |                          |
| =====                                             |                                                    |                          |
| Service Id                                        | : 321                                              |                          |
| SAP                                               | : 1/1/4:0                                          | Encap : q-tag            |
| Dot1Q Ethertype                                   | : 0x8100                                           | QinQ Ethertype : 0x8100  |
| Admin State                                       | : Up                                               | Oper State : Down        |
| Flags                                             | : PortOperDown                                     |                          |
|                                                   | SapIngressQoSMismatch                              |                          |
| Last Status Change                                | : 02/03/2007 12:58:37                              |                          |
| Last Mgmt Change                                  | : 02/03/2007 12:59:10                              |                          |
| Admin MTU                                         | : 1518                                             | Oper MTU : 1518          |
| Ingress qos-policy                                | : 100                                              | Egress qos-policy : 1    |
| Ingress Filter-Id                                 | : n/a                                              | Egress Filter-Id : n/a   |
| Multi Svc Site                                    | : None                                             |                          |
| Acct. Pol                                         | : None                                             | Collect Stats : Disabled |
| -----                                             |                                                    |                          |
| Sap Statistics                                    |                                                    |                          |
| -----                                             |                                                    |                          |
|                                                   | Packets                                            | Octets                   |
| Forwarding Engine Stats                           |                                                    |                          |
| Dropped                                           | : 0                                                | 0                        |
| Off. HiPrio                                       | : 0                                                | 0                        |
| Off. LowPrio                                      | : 0                                                | 0                        |
| Off. Uncolor                                      | : 0                                                | 0                        |
|                                                   |                                                    |                          |
| Queueing Stats(Ingress QoS Policy 100)            |                                                    |                          |
| Dro. HiPrio                                       | : 0                                                | 0                        |

Show, Clear, Debug Commands

```
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

 Packets Octets

Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 10 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
'''

ATM SAP Configuration Information

Ingress TD Profile : 1 Egress TD Profile : 1
Alarm Cell Handling: Enabled AAL-5 Encap : VC-MUX

...
=====
*A:ALA-12#
```



## sdp

- Syntax** `sdp [sdp-id | far-end ip-addr] [detail]`
- Context** `show>service>id`
- Description** Displays information for the SDPs associated with the service. If no optional parameters are specified, a summary of all associated SDPs is displayed.
- Parameters** *sdp-id* — Displays only information for the specified SDP ID.
- Default** All SDPs.
- Values** 1 — 17407
- far-end ip-addr* — Displays only SDPs matching with the specified far-end IP address.
- Default** SDPs with any far-end IP address.
- detail** — Displays detailed SDP information.
- Output** **Show Service-ID SDP** — The following table describes show service-id SDP output fields:

| Label               | Description                                                                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sdp Id              | The SDP identifier.                                                                                                                                                          |
| Type                | Indicates whether the SDP is a spoke or a mesh.                                                                                                                              |
| Split Horizon Group | Name of the split horizon group that the SDP belongs to.                                                                                                                     |
| VC Type             | Displays the VC type: ether or vlan.                                                                                                                                         |
| VC Tag              | Displays the explicit dot1Q value used when encapsulating to the SDP far end.                                                                                                |
| I. Lbl              | The VC label used by the far-end device to send packets to this device in this service by the SDP.                                                                           |
| Admin Path MTU      | The operating path MTU of the SDP is equal to the admin path MTU (when one is set) or the dynamically computed tunnel MTU, when no admin path MTU is set (the default case.) |
| Oper Path MTU       | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.             |
| Far End             | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                    |
| Delivery            | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                 |
| Admin State         | The administrative state of this SDP.                                                                                                                                        |
| Oper State          | The operational state of this SDP.                                                                                                                                           |
| Ingress Label       | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                             |

| Label               | Description (Continued)                                                                                                                                                                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Egress Label        | The label used by this device to send packets to the far-end device in this service by the SDP.                                                                                                                                                                                       |
| Last Changed        | The date and time of the most recent change to the SDP.                                                                                                                                                                                                                               |
| Signaling           | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on this SDP.                                                                                                                                                    |
| Admin State         | The administrative state of the keepalive process.                                                                                                                                                                                                                                    |
| Oper State          | he operational state of the keepalive process.                                                                                                                                                                                                                                        |
| Hello Time          | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                        |
| Max Drop Count      | Specifies the maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                       |
| Hello Msg Len       | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                        |
| Hold Down Time      | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                      |
| I. Fwd. Pkts.       | Specifies the number of forwarded ingress packets.                                                                                                                                                                                                                                    |
| I. Dro. Pkts.       | Specifies the number of dropped ingress packets.                                                                                                                                                                                                                                      |
| E. Fwd. Pkts.       | Specifies the number of forwarded egress packets.                                                                                                                                                                                                                                     |
| Associated LSP List | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far end field.<br>If the SDP type is GRE, then the following message displays:<br>SDP delivery mechanism is not MPLS. |

### Sample Output

```
A:Dut-A# show service id 1 sdp detail
=====
Services: Service Destination Points Details
=====
Sdp Id 1:1 -(10.20.1.2)

Description : Default sdp description
SDP Id : 1:1 Type : Spoke
VC Type : Ether VC Tag : n/a
Admin Path MTU : 0 Oper Path MTU : 9186
Far End : 10.20.1.2 Delivery : MPLS

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 2048 Egress Label : 2048
Ing mac Fltr : n/a Egr mac Fltr : n/a
```

```

Ing ip Fltr : n/a
Ing ipv6 Fltr : n/a
Admin ControlWord : Not Preferred
Last Status Change : 05/31/2007 00:45:43
Last Mgmt Change : 05/31/2007 00:45:43
Class Fwding State : Up
Flags : None
Peer Pw Bits : None
Peer Fault Ip : None
Peer Vccv CV Bits : None
Peer Vccv CC Bits : None
Max Nbr of MAC Addr: No Limit
Learned MAC Addr : 0

MAC Learning : Enabled
MAC Aging : Enabled
L2PT Termination : Disabled
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Disabled
Hello Time : 10
Max Drop Count : 3

Statistics :
I. Fwd. Pkts. : 0
I. Fwd. Octs. : 0
E. Fwd. Pkts. : 0
MCAC Policy Name :
MCAC Max Unconst BW: no limit
MCAC In use Mand BW: 0
MCAC In use Opnl BW: 0

Egr ip Fltr : n/a
Egr ipv6 Fltr : n/a
Oper ControlWord : False
Signaling : None

Total MAC Addr : 0
Static MAC Addr : 0

Discard Unkwn Srce: Disabled
BPDU Translation : Disabled

Oper State : Disabled
Hello Msg Len : 0
Hold Down Time : 10

I. Dro. Pkts. : 0
I. Dro. Octs. : 0
E. Fwd. Octets : 0
MCAC Max Mand BW : no limit
MCAC Avail Mand BW: unlimited
MCAC Avail Opnl BW: unlimited

Associated LSP LIST :
Lsp Name : A_B_1
Admin State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_2
Admin State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_3
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_4
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_5
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_6
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_7
Admin State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_8

```

## Show, Clear, Debug Commands

```

Admin State : Up Oper State : Up
Time Since Last Tr*: 00h26m35s

Lsp Name : A_B_9
Admin State : Up Oper State : Up
Time Since Last Tr*: 00h26m34s

Lsp Name : A_B_10
Admin State : Up Oper State : Up
Time Since Last Tr*: 00h26m34s

Class-based forwarding :

Class forwarding : enabled
Default LSP : A_B_10 Multicast LSP : A_B_9
=====
FC Mapping Table
=====
FC Name LSP Name

af A_B_3
be A_B_1
ef A_B_6
h1 A_B_7
h2 A_B_5
l1 A_B_4
l2 A_B_2
nc A_B_8
=====
Stp Service Destination Point specifics

Mac Move : Blockable
Stp Admin State : Up Stp Oper State : Down
Core Connectivity : Down
Port Role : N/A Port State : Forwarding
Port Number : 2049 Port Priority : 128
Port Path Cost : 10 Auto Edge : Enabled
Admin Edge : Disabled Oper Edge : N/A
Link Type : Pt-pt BPDU Encap : Dot1d
Root Guard : Disabled Active Protocol : N/A
Last BPDU from : N/A Designated Port Id: 0
Designated Bridge : N/A

Fwd Transitions : 0 Bad BPDUs rcvd : 0
Cfg BPDUs rcvd : 0 Cfg BPDUs tx : 0
TCN BPDUs rcvd : 0 TCN BPDUs tx : 0
RST BPDUs rcvd : 0 RST BPDUs tx : 0

Number of SDPs : 1

* indicates that the corresponding row element may have been truncated.

A:Dut-A#

```

## subscriber-hosts

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>subscriber-hosts</b> [ <b>sap</b> <i>sap-id</i> ] [ <b>ip</b> <i>ip-address[/mask]</i> ] [ <b>mac</b> <i>ieee-address</i> ] [ <b>sub-profile</b> <i>sub-profile-name</i> ] [ <b>sla-profile</b> <i>sla-profile-name</i> ] [ <b>detail</b> ]<br><b>subscriber-hosts</b> [ <b>detail</b> ] <b>wholesaler</b> <i>service-id</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b> | This command displays subscriber host information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Parameters</b>  | <p><b>sap</b> <i>sap-id</i> — Displays the specified subscriber host SAP information. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>ip</b> <i>ip-address/mask</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation.</p> <p><b>Values</b>      1.0.0.0 – 223.255.255.255 (with support of /31 subnets).<br/>mask: 1 — 32</p> <p><b>ieee-address</b> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.</p> <p><b>sub-profile</b> <i>sub-profile-name</i> — Specifies an existing subscriber profile name to be associated with the static subscriber host. The subscriber profile is configured in the <b>config&gt;subscr-mgmt&gt;sub-profile</b> context.</p> <p><b>sla-profile</b> <i>sla-profile-name</i> — Specifies an existing SLA profile name to be associated with the static subscriber host. The SLA profile is configured in the <b>config&gt;subscr-mgmt&gt;sla-profile</b> context.</p> <p><b>detail</b> — Displays detailed information.</p> <p><b>wholesaler</b> <i>service-id</i> — The VPRN service ID of the wholesaler.</p> <p><b>Values</b>      1 — 2147483648</p> |

## aggregate

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>aggregate</b> [ <b>active</b> ]                                                                  |
| <b>Context</b>     | show>router                                                                                         |
| <b>Description</b> | This command displays aggregated routes.                                                            |
| <b>Parameters</b>  | <b>active</b> — This keyword filters out inactive aggregates.                                       |
| <b>Output</b>      | <b>Show Aggregate Output Fields</b> — The following table describes router aggregate output fields. |

| Label   | Description                                                                         |
|---------|-------------------------------------------------------------------------------------|
| Prefix  | Displays the destination address of the aggregate route in dotted decimal notation. |
| Summary | Specifies whether the aggregate or more specific components are advertised.         |

|                   |                                                                                                                                          |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| AS Set            | Displays an aggregate where the path advertised for the route consists of all elements contained in all paths that are being summarized. |
| Aggr AS           | Displays the aggregator path attribute to the aggregate route.                                                                           |
| Aggr IP-Address   | The IP address of the aggregated route.                                                                                                  |
| State             | The operational state of the aggregated route.                                                                                           |
| No. of Aggregates | The total number of aggregated routes.                                                                                                   |

Sample Output

```
*A:ALA-12# show router 3 aggregate
=====
Aggregates (Service: 3)
=====
Prefix Summary AS Set Aggr AS Aggr IP-Address State

No. of Aggregates: 0

*A:ALA-12#
```

arp

|             |                                                                                                                                                                                                                                                                                                   |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax      | arp [ <i>ip-address</i>   <i>ip-int-name</i>   <b>mac</b> <i>ieee-mac-addr</i> ]                                                                                                                                                                                                                  |
| Context     | show>router                                                                                                                                                                                                                                                                                       |
| Description | This command displays the router ARP table sorted by IP address.<br>If no command line options are specified, all ARP entries are displayed.                                                                                                                                                      |
| Parameters  | <i>ip-addr</i> — Only displays ARP entries associated with the specified IP address.<br><i>ip-int-name</i> — Only displays ARP entries associated with the specified IP interface name.<br><b>mac</b> <i>ieee-mac-addr</i> — Only displays ARP entries associated with the specified MAC address. |
| Output      | <b>ARP Table Output</b> — The following table describes ARP table output fields:                                                                                                                                                                                                                  |

| Label       | Description                       |
|-------------|-----------------------------------|
| IP Address  | The IP address of the ARP entry.  |
| MAC Address | The MAC address of the ARP entry. |
| Expiry      | The age of the ARP entry.         |

| Label              | Description (Continued)                                                                                                                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type               | <p>Dyn — The ARP entry is a dynamic ARP entry.</p> <p>Inv — The ARP entry is an inactive static ARP entry (invalid).</p> <p>Oth — The ARP entry is a local or system ARP entry.</p> <p>Sta — The ARP entry is an active static ARP entry.</p> |
| Interface          | The IP interface name associated with the ARP entry.                                                                                                                                                                                          |
| No. of ARP Entries | The number of ARP entries displayed in the list.                                                                                                                                                                                              |

### Sample Output

```
*A:ALA-12# show router 3 arp
=====
ARP Table (Service: 3)
=====
IP Address MAC Address Expiry Type Interface

10.10.10.103 04:67:ff:00:00:01 00h00m00s Oth system
10.10.4.3 00:00:00:00:00:00 00h00m00s Oth ALA-1-2
10.10.5.3 00:00:00:00:00:00 00h00m00s Oth ALA-1-3
10.10.7.3 00:00:00:00:00:00 00h00m00s Oth ALA-1-5
10.10.0.16 00:00:00:00:00:00 00h00m00s Oth bozo
10.10.3.3 00:00:00:00:00:00 00h00m00s Oth gizmo
10.10.2.3 00:00:00:00:00:00 00h00m00s Oth hobo
10.10.1.17 00:00:00:00:00:00 00h00m00s Oth int-cflowd
10.0.0.92 00:00:00:00:00:00 04h00m00s Dyn to-104
10.0.0.103 04:67:01:01:00:01 00h00m00s Oth[I] to-104
10.0.0.104 04:68:01:01:00:01 03h59m49s Dyn[I] to-104
10.10.36.2 00:00:00:00:00:00 00h00m00s Oth tuesday
192.168.2.98 00:03:47:c8:b4:86 00h14m37s Dyn[I] management
192.168.2.103 00:03:47:dc:98:1d 00h00m00s Oth[I] management

No. of ARP Entries: 14
=====
*A:ALA-12#

*A:ALA-12# show router 3 arp 10.10.0.3
=====
ARP Table
=====
IP Address MAC Address Expiry Type Interface

10.10.0.3 04:5d:ff:00:00:00 00:00:00 Oth system
=====
*A:ALA-12#

*A:ALA-12# show router 3 arp to-ser1
=====
ARP Table
=====
IP Address MAC Address Expiry Type Interface

10.10.13.1 04:5b:01:01:00:02 03:53:09 Dyn to-ser1
=====
```

\*A:ALA-12#

## damping

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>damping</b> [ <i>ip-prefix/mask</i>   <i>ip-address</i> ] [ <b>detail</b> ]<br><b>damping</b> [ <i>damp-type</i> ] [ <b>detail</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | show>router>bgp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | <p>This command displays BGP routes with have been dampened due to route flapping. This command can be entered with or without a route parameter.</p> <p>When the keyword <b>detail</b> is included, more detailed information displays.</p> <p>When only the command is entered (without any parameters included except <b>detail</b>), then all dampened routes are listed.</p> <p>When a parameter is specified, then the matching route or routes are listed.</p> <p>When a <b>decayed</b>, <b>history</b>, or <b>suppressed</b> keyword is specified, only those types of dampened routes are listed.</p>                 |
| <b>Parameters</b>  | <p><i>ip-prefix/mask</i> — Displays damping information for the specified IP prefix and mask length.</p> <p><i>ip-address</i> — Displays damping entry for the best match route for the specified IP address.</p> <p><i>damp-type</i> — Displays damping type for the specified IP address.</p> <p><b>decayed</b> — Displays damping entries that are decayed but are not suppressed.</p> <p><b>history</b> — Displays damping entries that are withdrawn but have history.</p> <p><b>suppressed</b> — Displays damping entries suppressed because of route damping.</p> <p><b>detail</b> — Displays detailed information.</p> |
| <b>Output</b>      | <b>Show Damping Output Fields</b> — The following table describes BGP damping output fields:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Label         | Description                                                                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BGP Router ID | The local BGP router ID.                                                                                                                                                                 |
| AS            | The configured autonomous system number.                                                                                                                                                 |
| Local AS      | The configured or inherited local AS for the specified peer group. If not configured, then it is the same value as the AS.                                                               |
| Network       | Route IP prefix and mask length for the route.                                                                                                                                           |
| Flag(s)       | Legend:<br>Status codes: u- used, s-suppressed, h-history, d-decayed,<br>*-valid. If a * is not present, then the status is invalid.<br>Origin codes: i-IGP, e-EGP, ?-incomplete, >-best |
| Network       | The IP prefix and mask length for the route.                                                                                                                                             |
| From          | The originator ID path attribute value.                                                                                                                                                  |



| Label           | Description (Continued)                                                     |
|-----------------|-----------------------------------------------------------------------------|
| Reuse time      | The time when a suppressed route can be used again.                         |
| AS Path         | The BGP AS path for the route.                                              |
| Peer            | The router ID of the advertising router.                                    |
| NextHop         | BGP nexthop for the route.                                                  |
| Peer AS         | The autonomous system number of the advertising router.                     |
| Peer Router-Id  | The router ID of the advertising router.                                    |
| Local Pref      | BGP local preference path attribute for the route.                          |
| Age             | The time elapsed since the service was enabled.                             |
| Last update     | The time when BGP was updated last in second/minute/hour (SS:MM:HH) format. |
| FOM Present     | The current Figure of Merit (FOM) value.                                    |
| Number of Flaps | The number of flaps in the neighbor connection.                             |
| Reuse time      | The time when the route can be reused.                                      |
| Path            | The BGP AS path for the route.                                              |
| Applied Policy  | The applied route policy name.                                              |

### Sample Output

```
*A:ALA-12# show router 3 bgp damping
=====
BGP Router ID : 10.0.0.14 AS : 65206 Local AS : 65206
=====
Legend -
Status codes : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes : i - IGP, e - EGP, ? - incomplete, - best
=====
BGP Damped Routes
=====
Flag Network From Reuse AS-Path

ud*i 12.149.7.0/24 10.0.28.1 00h00m00s 60203 65001 19855 3356
 1239 22406
si 24.155.6.0/23 10.0.28.1 00h43m41s 60203 65001 19855 3356
 2914 7459
si 24.155.8.0/22 10.0.28.1 00h38m31s 60203 65001 19855 3356
 2914 7459
si 24.155.12.0/22 10.0.28.1 00h35m41s 60203 65001 19855 3356
 2914 7459
si 24.155.22.0/23 10.0.28.1 00h35m41s 60203 65001 19855 3356
 2914 7459
si 24.155.24.0/22 10.0.28.1 00h35m41s 60203 65001 19855 3356
 2914 7459
si 24.155.28.0/22 10.0.28.1 00h34m31s 60203 65001 19855 3356
 2914 7459
si 24.155.40.0/21 10.0.28.1 00h28m24s 60203 65001 19855 3356
```

## Show, Clear, Debug Commands

```

 7911 7459
si 24.155.48.0/20 10.0.28.1 00h28m24s 60203 65001 19855 3356
 7911 7459
ud*i 61.8.140.0/24 10.0.28.1 00h00m00s 60203 65001 19855 3356
 4637 17447
ud*i 61.8.141.0/24 10.0.28.1 00h00m00s 60203 65001 19855 3356
 4637 17447
ud*i 61.9.0.0/18 10.0.28.1 00h00m00s 60203 65001 19855 3356
 3561 9658 6163
. . .
ud*i 62.213.184.0/23 10.0.28.1 00h00m00s 60203 65001 19855 3356
 6774 6774 9154

*A:ALA-12#

*A:ALA-12# show router 3 bgp damping detail
=====
BGP Router ID : 10.0.0.14 AS : 65206 Local AS : 65206
=====
Legend -
Status codes : u - used, s - suppressed, h - history, d - decayed, * -
valid
Origin codes : i - IGP, e - EGP, ? - incomplete, - best
=====
BGP Damped Routes
=====

Network : 12.149.7.0/24

Network : 12.149.7.0/24 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h00m00s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h22m09s Last update : 02d00h58m
FOM Present : 738 FOM Last upd. : 2039
Number of Flaps : 2 Flags : ud*i
Path : 60203 65001 19855 3356 1239 22406
Applied Policy : default-damping-profile

Network : 15.142.48.0/20

Network : 15.142.48.0/20 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h00m00s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h00m38s Last update : 02d01h20m
FOM Present : 2011 FOM Last upd. : 2023
Number of Flaps : 2 Flags : ud*i
Path : 60203 65001 19855 3356 3561 5551 1889
Applied Policy : default-damping-profile

Network : 15.200.128.0/19

Network : 15.200.128.0/19 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h00m00s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h00m38s Last update : 02d01h20m
FOM Present : 2011 FOM Last upd. : 2023
Number of Flaps : 2 Flags : ud*i
```

```

Path : 60203 65001 19855 1299 702 1889
Applied Policy : default-damping-profile

Network : 15.203.192.0/18

Network : 15.203.192.0/18 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h00m00s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h00m07s Last update : 02d01h20m
FOM Present : 1018 FOM Last upd. : 1024
Number of Flaps : 1 Flags : ud*i
Path : 60203 65001 19855 1299 702 1889
Applied Policy : default-damping-profile

*A:ALA-12#

*A:ALA-12# show router 3 bgp damping 15.203.192.0/18 detail
=====
BGP Router ID : 10.0.0.14 AS : 65206 Local AS : 65206
=====
Legend -
Status codes : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes : i - IGP, e - EGP, ? - incomplete, - best
=====
BGP Damped Routes 15.203.192.0/18
=====
Network : 15.203.192.0/18

Network : 15.203.192.0/18 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h00m00s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h00m42s Last update : 02d01h20m
FOM Present : 2003 FOM Last upd. : 2025
Number of Flaps : 2 Flags : ud*i
Path : 60203 65001 19855 3356 702 1889
Applied Policy : default-damping-profile

Paths : 1
=====
*A:ALA-12#

*A:ALA-12# show router 3 bgp damping suppressed detail
=====
BGP Router ID : 10.0.0.14 AS : 65206 Local AS : 65206
=====
Legend -
Status codes : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes : i - IGP, e - EGP, ? - incomplete, - best
=====
BGP Damped Routes (Suppressed)
=====
Network : 15.142.48.0/20

Network : 15.142.48.0/20 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h29m22s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h01m28s Last update : 02d01h20m
FOM Present : 2936 FOM Last upd. : 3001
Number of Flaps : 3 Flags : si
Path : 60203 65001 19855 3356 702 1889

```

## Show, Clear, Debug Commands

```
Applied Policy : default-damping-profile

Network : 15.200.128.0/19

Network : 15.200.128.0/19 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h29m22s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h01m28s Last update : 02d01h20m
FOM Present : 2936 FOM Last upd. : 3001
Number of Flaps : 3 Flags : si
Path : 60203 65001 19855 3356 702 1889
Applied Policy : default-damping-profile

Network : 15.203.240.0/20

Network : 15.203.240.0/20 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h29m22s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h01m28s Last update : 02d01h20m
FOM Present : 2936 FOM Last upd. : 3001
Number of Flaps : 3 Flags : si
Path : 60203 65001 19855 3356 702 1889
Applied Policy : default-damping-profile

Network : 15.206.0.0/17

Network : 15.206.0.0/17 Peer : 10.0.28.1
NextHop : 10.0.28.1 Reuse time : 00h29m22s
Peer AS : 60203 Peer Router-Id : 32.32.27.203
Local Pref : none
Age : 00h01m28s Last update : 02d01h20m
FOM Present : 2936 FOM Last upd. : 3001
Number of Flaps : 3 Flags : si
Path : 60203 65001 19855 3356 702 1889
Applied Policy : default-damping-profile

*A:ALA-12#
```

## group

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>group</b> [ <i>name</i> ] [ <i>detail</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Context</b>     | show>router>bgp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | <p>This command displays group information for a BGP peer group. This command can be entered with or without parameters.</p> <p>When this command is entered without a group name, information about all peer groups displays.</p> <p>When the command is issued with a specific group name, information only pertaining to that specific peer group displays.</p> <p>The ‘State’ field displays the BGP group’s operational state. Other valid states are:</p> <ul style="list-style-type: none"><li>Up - BGP global process is configured and running.</li></ul> |

Down - BGP global process is administratively shutdown and not running.

Disabled - BGP global process is operationally disabled. The process must be restarted by the operator.

**Parameters** *name* — Displays information for the BGP group specified.

**detail** — Displays detailed information.

**Output** **Standard and Detailed Group Output** — The following table describes the standard and detailed command output fields for a BGP group:

### Sample Output

| Label            | Description                                                                                                                                                                |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group            | BGP group name                                                                                                                                                             |
| Group Type       | No Type — Peer type not configured.<br>External — Peer type configured as external BGP peers.<br>Internal — Peer type configured as internal BGP peers.                    |
| State            | Disabled — The BGP peer group has been operationally disabled.<br>Down — The BGP peer group is operationally inactive.<br>Up — The BGP peer group is operationally active. |
| Peer AS          | The configured or inherited peer AS for the specified peer group.                                                                                                          |
| Local AS         | The configured or inherited local AS for the specified peer group.                                                                                                         |
| Local Address    | The configured or inherited local address for originating peering for the specified peer group.                                                                            |
| Loop Detect      | The configured or inherited loop detect setting for the specified peer group.                                                                                              |
| Connect Retry    | The configured or inherited connect retry timer value.                                                                                                                     |
|                  | Authentication                                                                                                                                                             |
|                  | None — No authentication is configured.<br>MD5 — MD5 authentication is configured.                                                                                         |
| Local Pref       | The configured or inherited local preference value.                                                                                                                        |
| MED Out          | The configured or inherited MED value assigned to advertised routes without a MED attribute.                                                                               |
| Min Route Advt.  | The minimum amount of time that must pass between route updates for the same IP prefix.                                                                                    |
| Min AS Originate | The minimum amount of time that must pass between updates for a route originated by the local router.                                                                      |

| Label           | Description (Continued)                                                                                                                                                                                                                                                                           |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multihop        | The maximum number of router hops a BGP connection can traverse.                                                                                                                                                                                                                                  |
| Multipath       | The configured or inherited multipath value, determining the maximum number of ECMP routes BGP can advertise to the RTM.                                                                                                                                                                          |
| Prefix Limit    | No Limit — No route limit assigned to the BGP peer group.<br><br>1 - 4294967295 — The maximum number of routes BGP can learn from a peer.                                                                                                                                                         |
| Passive         | Disabled — BGP attempts to establish BGP connections with neighbors in the specified peer group.<br><br>Enabled — BGP will not actively attempt to establish BGP connections with neighbors in the specified peer group.                                                                          |
| Next Hop Self   | Disabled — BGP is not configured to send only its own IP address as the BGP nexthop in route updates to neighbors in the peer group.<br><br>Enabled — BGP sends only its own IP address as the BGP nexthop in route updates to neighbors in the specified peer group.                             |
| Aggregator ID 0 | Disabled — BGP is not configured to set the aggregator ID to 0.0.0.0 in all originated route aggregates sent to the neighbor in the peer group.<br><br>Enabled — BGP is configured to set the aggregator ID to 0.0.0.0 in all originated route aggregates sent to the neighbor in the peer group. |
| Remove Private  | Disabled — BGP will not remove all private AS numbers from the AS path attribute in updates sent to the neighbor in the peer group.<br><br>Enabled — BGP removes all private AS numbers from the AS path attribute in updates sent to the neighbor in the peer group.                             |
| Damping         | Disabled — The peer group is configured not to dampen route flaps.<br><br>Enabled — The peer group is configured to dampen route flaps.                                                                                                                                                           |
| Export Policy   | The configured export policies for the peer group.                                                                                                                                                                                                                                                |
| Import Policy   | The configured import policies for the peer group.                                                                                                                                                                                                                                                |
| Hold Time       | The configured hold time setting.                                                                                                                                                                                                                                                                 |
| Keep Alive      | The configured keepalive setting.                                                                                                                                                                                                                                                                 |
| Cluster Id      | None — No cluster ID has been configured.                                                                                                                                                                                                                                                         |
| Client Reflect  | Disabled — The BGP route reflector will not reflect routes to this neighbor.<br><br>Enabled — The BGP route reflector is configured to reflect routes to this neighbor.                                                                                                                           |

| Label         | Description (Continued)                                                                                                              |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------|
| NLRI          | The type of NLRI information that the specified peer group can accept.<br>Unicast — IPv4 unicast routing information can be carried. |
| Preference    | The configured route preference value for the peer group.                                                                            |
| List of Peers | A list of BGP peers configured under the peer group.                                                                                 |
| Total Peers   | The total number of peers configured under the peer group.                                                                           |
| Established   | The total number of peers that are in an established state.                                                                          |

```
*A:ALA-12# show router 3 bgp group
```

```
=====
```

```
BGP Groups
```

```
=====
```

```
Group : To_AS_40000
```

```

```

```
Description : Not Available
```

```
Group Type : No Type State : Up
```

```
Peer AS : 40000 Local AS : 65206
```

```
Local Address : n/a Loop Detect : Ignore
```

```
Export Policy : direct2bgp
```

```
Hold Time : 90 Keep Alive : 30
```

```
Cluster Id : None Client Reflect : Enabled
```

```
NLRI : Unicast Preference : 170
```

```
List of Peers
```

```
- 10.0.0.1 : To_Jukebox
```

```
- 10.0.0.12 : Not Available
```

```
- 10.0.0.13 : Not Available
```

```
- 10.0.0.14 : To_ALA-1
```

```
- 10.0.0.15 : To_H-215
```

```
Total Peers : 5 Established : 2
```

```
=====
```

```
*A:ALA-12#
```

## neighbor

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>neighbor</b> <i>[ip-address [[family family] filter1]]</i><br><b>neighbor</b> <i>[as-number [[family family] filter2]]</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | show>router>bgp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | <p>This command displays BGP neighbor information. This command can be entered with or without any parameters.</p> <p>When this command is issued without any parameters, information about all BGP peers displays.</p> <p>When the command is issued with a specific IP address or ASN, information regarding only that specific peer or peers with the same AS display.</p> <p>When either <b>received-routes</b> or <b>advertised-routes</b> is specified, then the routes received from or sent to the specified peer is listed (see second output example).</p> <p>Note: This information is not available by SNMP.</p> |

When either **history** or **suppressed** is specified, then the routes learned from those peers that either have a history or are suppressed (respectively) are listed.

The 'State' field displays the BGP peer's protocol state. In addition to the standard protocol states, this field can also display the 'Disabled' operational state which indicates the peer is operationally disabled and must be restarted by the operator.

**Parameters** *ip-addr* — Displays the BGP neighbor with the specified IP address.

**family** *family* — Specifies the type of routing information to be distributed by the BGP instance.

**Values**      ipv4, vpn-ipv4

*filter1* — Specifies route criteria.

**Values**      received-routes, advertised-routes, history, suppressed, detail

*filter2* — Specifies route criteria.

**Values**      history, suppressed, detail

**Output**      **Standard and Detailed Neighbor** — The following table describes the standard and detailed command output fields for a BGP neighbor:

| Label         | Description                                                                                                                                                                                                                                                                                                             |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Peer          | The IP address of the configured BGP peer.                                                                                                                                                                                                                                                                              |
| Group         | The BGP peer group to which this peer is assigned.                                                                                                                                                                                                                                                                      |
| Peer AS       | The configured or inherited peer AS for the peer group.                                                                                                                                                                                                                                                                 |
| Peer Address  | The configured address for the BGP peer.                                                                                                                                                                                                                                                                                |
| Peer Port     | The TCP port number used on the far-end system.                                                                                                                                                                                                                                                                         |
| Local AS      | The configured or inherited local AS for the peer group.                                                                                                                                                                                                                                                                |
| Local Address | The configured or inherited local address for originating peering for the peer group.                                                                                                                                                                                                                                   |
| Local Port    | The TCP port number used on the local system.                                                                                                                                                                                                                                                                           |
| Peer Type     | External — Peer type configured as external BGP peers.<br>Internal — Peer type configured as internal BGP peers.                                                                                                                                                                                                        |
| State         | Idle — The BGP peer is not accepting connections.<br>Active — BGP is listening for and accepting TCP connections from this peer.<br>Connect — BGP is attempting to establish a TCP connection from this peer.<br>Open Sent — BGP has sent an OPEN message to the peer and is waiting for an OPEN message from the peer. |



| Label      | Description (Continued)                                                                                         |
|------------|-----------------------------------------------------------------------------------------------------------------|
| Last State | Open Confirm — BGP has received a valid OPEN message from the peer and is awaiting a KEEPALIVE or NOTIFICATION. |
|            | Established — BGP has successfully established a peering and is exchanging routing information.                 |
|            | Idle — The BGP peer is not accepting connections.                                                               |
|            | Active — BGP is listening for and accepting TCP connections from this peer.                                     |
|            | Connect — BGP is attempting to establish a TCP connection with this peer.                                       |
|            | Connect — BGP is attempting to establish a TCP connections from this peer.                                      |
| Last Event | Open Sent — BGP has sent an OPEN message to the peer and is waiting for an OPEN message from the peer.          |
|            | Open Confirm — BGP has received a valid OPEN message from the peer and is awaiting a KEEPALIVE or NOTIFICATION. |
|            | Open Confirm — BGP has received a valid OPEN message from the peer and is awaiting a KEEPALIVE or NOTIFICATION. |
|            | start — BGP has initialized the BGP neighbor.                                                                   |
|            | stop — BGP has disabled the BGP neighbor.                                                                       |
|            | open — BGP transport connection opened.                                                                         |
|            | close — BGP transport connection closed.                                                                        |
|            | openFail — BGP transport connection failed to open.                                                             |
|            | error — BGP transport connection error.                                                                         |
|            | connectRetry — Connect retry timer expired.                                                                     |
|            | holdTime — Hold time timer expired.                                                                             |
|            | keepAlive — Keepalive timer expired.                                                                            |
|            | recvOpen — Receive an OPEN message.                                                                             |
|            | revKeepalive — Receive an KEEPALIVE message.                                                                    |
|            | recvUpdate — Receive an UPDATE message.                                                                         |
|            | recvNotify — Receive an NOTIFICATION message.                                                                   |
|            | None — No events have occurred.                                                                                 |
| Last Error | Displays the last BGP error and sub-code to occur on the BGP neighbor.                                          |

| Label             | Description (Continued)                                                                                                                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connect Retry     | The configured or inherited connect retry timer value.                                                                                                                                                                                                      |
| Local Pref.       | The configured or inherited local preference value.                                                                                                                                                                                                         |
| Min Route Advt.   | The minimum amount of time that must pass between route updates for the same IP prefix.                                                                                                                                                                     |
| Min AS Originate  | The minimum amount of time that must pass between updates for a route originated by the local router.                                                                                                                                                       |
| Multihop          | The maximum number of router hops a BGP connection can traverse.                                                                                                                                                                                            |
| Multipath         | The configured or inherited multipath value, determining the maximum number of ECMP routes BGP can advertise to the RTM.                                                                                                                                    |
| Damping           | Disabled — BGP neighbor is configured not to dampen route flaps.<br><br>Enabled — BGP neighbor is configured to dampen route flaps.                                                                                                                         |
| Loop Detect       | Ignore — The BGP neighbor is configured to ignore routes with an AS loop.<br><br>Drop — The BGP neighbor is configured to drop the BGP peering if an AS loop is detected.<br><br>Off — AS loop detection is disabled for the neighbor.                      |
| MED Out           | The configured or inherited MED value assigned to advertised routes without a MED attribute.                                                                                                                                                                |
| Authentication    | None — No authentication is configured.<br><br>MD5 — MD5 authentication is configured.                                                                                                                                                                      |
| Next Hop Self     | Disabled — BGP is not configured to send only its own IP address as the BGP nexthop in route updates to the specified neighbor.<br><br>Enabled — BGP will send only its own IP address as the BGP nexthop in route updates to the neighbor.                 |
| AggregatorID Zero | Disabled — The BGP Neighbor is not configured to set the aggregator ID to 0.0.0.0 in all originated route aggregates.<br><br>Enabled — The BGP Neighbor is configured to set the aggregator ID to 0.0.0.0 in all originated route aggregates.               |
| Remove Private    | Disabled — BGP will not remove all private AS numbers from the AS path attribute, in updates sent to the specified neighbor.<br><br>Enabled — BGP will remove all private AS numbers from the AS path attribute, in updates sent to the specified neighbor. |
| Passive           | Disabled — BGP will actively attempt to establish a BGP connection with the specified neighbor.                                                                                                                                                             |

| Label             | Description (Continued)                                                                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | Enabled — BGP will not actively attempt to establish a BGP connection with the specified neighbor.                                                                                  |
| Prefix Limit      | No Limit — No route limit assigned to the BGP peer group.                                                                                                                           |
|                   | 1 - 4294967295 — The maximum number of routes BGP can learn from a peer.                                                                                                            |
| Hold Time         | The configured hold time setting.                                                                                                                                                   |
| Keep Alive        | The configured keepalive setting.                                                                                                                                                   |
| Active Hold Time  | The negotiated hold time, if the BGP neighbor is in an established state.                                                                                                           |
| Active Keep Alive | The negotiated keepalive time, if the BGP neighbor is in an established state.                                                                                                      |
| Cluster Id        | The configured route reflector cluster ID.<br>None — No cluster ID has been configured                                                                                              |
| Client Reflect    | Disabled — The BGP route reflector is configured not to reflect routes to this neighbor.<br><br>Enabled — The BGP route reflector is configured to reflect routes to this neighbor. |
| Preference        | The configured route preference value for the peer group.                                                                                                                           |
| Num of Flaps      | The number of flaps in the neighbor connection.                                                                                                                                     |
| Recd. Prefixes    | The number of routes received from the BGP neighbor.                                                                                                                                |
| Active Prefixes   | The number of routes received from the BGP neighbor and active in the forwarding table.                                                                                             |
| Recd. Paths       | The number of unique sets of path attributes received from the BGP neighbor.                                                                                                        |
| Suppressed Paths  | The number of unique sets of path attributes received from the BGP neighbor and suppressed due to route damping.                                                                    |
| Input Queue       | The number of BGP messages to be processed.                                                                                                                                         |
| Output Queue      | The number of BGP messages to be transmitted.                                                                                                                                       |
| i/p Messages      | Total number of packets received from the BGP neighbor.                                                                                                                             |
| o/p Messages      | Total number of packets sent to the BGP neighbor.                                                                                                                                   |
| i/p Octets        | Total number of octets received from the BGP neighbor.                                                                                                                              |
| o/p Octets        | Total number of octets sent to the BGP neighbor.                                                                                                                                    |
| i/p Updates       | Total number of BGP updates received from the BGP neighbor.                                                                                                                         |
| o/p Updates       | Total number of BGP updates sent to the BGP neighbor.                                                                                                                               |

| Label         | Description (Continued)                            |
|---------------|----------------------------------------------------|
| Export Policy | The configured export policies for the peer group. |
| Import Policy | The configured import policies for the peer group. |

**Sample Output**

```
*A:ALA-12# show router 3 bgp neighbor
```

```
=====
BGP Neighbor
=====
```

```

Peer : 10.0.0.15 Group : To_AS_40000

```

```
Peer AS : 65205
Peer Address : 10.0.0.15 Peer Port : 0
Local AS : 65206
Local Address : 10.0.0.16 Local Port : 0
Peer Type : External
State : Active Last State : Connect
Last Event : openFail
Last Error : Hold Timer Expire
Hold Time : 90
Active Hold Time : 0 Keep Alive : 30
Cluster Id : None Active Keep Alive: 0
Preference : 170
Recd. Prefixes : 0 Num of Flaps : 0
Recd. Paths : 0 Active Prefixes : 0
Input Queue : 0 Suppressed Paths : 0
i/p Messages : 0 Output Queue : 0
i/p Octets : 0 o/p Messages : 0
i/p Updates : 0 o/p Octets : 0
Export Policy : direct2bgp o/p Updates : 0
=====
```

```
*A:ALA-12#
```

```
*A:ALA-12# show router 3 bgp neighbor detail
```

```
=====
BGP Neighbor (detail)
=====
```

```

Peer : 10.0.0.15 Group : To_AS_40000

```

```
Peer AS : 65205
Peer Address : 10.0.0.15 Peer Port : 0
Local AS : 65206
Local Address : 10.0.0.16 Local Port : 0
Peer Type : External
State : Active Last State : Connect
Last Event : openFail
Last Error : Hold Timer Expire
Connect Retry : 20 Local Pref. : 100
Min Route Advt. : 30 Min AS Orig. : 15
Multipath : 1 Multihop : 5
Damping : Disabled Loop Detect : Ignore
MED Out : No MED Out Authentication : None
Next Hop Self : Disabled AggregatorID Zero: Disabled
```

```

Remove Private : Disabled Passive : Disabled
Prefix Limit : No Limit
Hold Time : 90
Active Hold Time : 0
Cluster Id : None
Preference : 170
Recd. Prefixes : 0
Recd. Paths : 0
Input Queue : 0
i/p Messages : 0
i/p Octets : 0
i/p Updates : 0
Export Policy : direct2bgp
Keep Alive : 30
Active Keep Alive: 0
Client Reflect : Enabled
Num of Flaps : 0
Active Prefixes : 0
Suppressed Paths : 0
Output Queue : 0
o/p Messages : 0
o/p Octets : 0
o/p Updates : 0

```

```
=====
*A:ALA-12#
```

**Output**     **Show Advertised and Received Routes Output** — The following table describes the command output fields for both the standard and detailed information for a neighbor:

| Label         | Description                                                                                                    |
|---------------|----------------------------------------------------------------------------------------------------------------|
| BGP Router ID | The local BGP router ID.                                                                                       |
| AS            | The configured autonomous system number.                                                                       |
| Local AS      | The configured local AS setting. If not configured, then it is the same value as the AS.                       |
| Flag          | u — used<br>s — suppressed<br>h — history<br>d — decayed<br>* — valid<br>i — igp<br>? — incomplete<br>> — best |
| Network       | Route IP prefix and mask length for the route.                                                                 |
| Next Hop      | BGP nexthop for the route.                                                                                     |
| LocalPref     | BGP local preference path attribute for the route.                                                             |
| MED           | BGP Multi-Exit Discriminator (MED) path attribute for the route.                                               |
| AS Path       | The BGP AS path for the route.                                                                                 |

#### Sample Output

```
*A:ALA-12# show router 3 bgp neighbor 10.0.0.16 received-routes
=====
BGP Router ID : 10.0.0.16 AS : 65206 Local AS : 65206
=====
Legend -
Status codes : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes : i - IGP, e - EGP, ? - incomplete, > - best
=====
BGP Neighbor
=====
Flag Network Nexthop LocalPref MED As-Path

? 10.0.0.16/32 10.0.0.16 100 none No As-Path
? 10.0.6.0/24 10.0.0.16 100 none No As-Path
? 10.0.8.0/24 10.0.0.16 100 none No As-Path
? 10.0.12.0/24 10.0.0.16 100 none No As-Path
? 10.0.13.0/24 10.0.0.16 100 none No As-Path
? 10.0.204.0/24 10.0.0.16 100 none No As-Path
=====
*A:ALA-12#
```

## paths

|                    |                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>paths</b>                                                                                      |
| <b>Context</b>     | show>router>bgp                                                                                   |
| <b>Description</b> | This command displays a summary of BGP path attributes.                                           |
| <b>Output</b>      | <b>Show Path Output</b> — The following table describes the command output fields for a BGP path. |

| Label            | Description                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| BGP Router ID    | The local BGP router ID.                                                                                                                         |
| AS               | The configured autonomous system number.                                                                                                         |
| Local AS         | The configured local AS setting. If not configured, then the value is the same as the AS.                                                        |
| Path             | The AS path attribute.                                                                                                                           |
| Origin           | EGP — The NLRI is learned by an EGP protocol.<br>IGP — The NLRI is interior to the originating AS.<br>INCOMPLETE — NLRI was learned another way. |
| Next Hop         | The advertised BGP nexthop.                                                                                                                      |
| MED              | The Multi-Exit Discriminator value.                                                                                                              |
| Local Preference | The local preference value.                                                                                                                      |
| Refs             | The number of routes using a specified set of path attributes.                                                                                   |

| Label         | Description (Continued)                                                                                                  |
|---------------|--------------------------------------------------------------------------------------------------------------------------|
| ASes          | The number of autonomous system numbers in the AS path attribute.                                                        |
| Segments      | The number of segments in the AS path attribute.                                                                         |
| Flags         | EBGP-learned — Path attributes learned by an EBGp peering.<br>IBGP-Learned — Path attributes learned by an IBGP peering. |
| Aggregator    | The route aggregator ID.                                                                                                 |
| Community     | The BGP community attribute list.                                                                                        |
| Originator ID | The originator ID path attribute value.                                                                                  |
| Cluster List  | The route reflector cluster list.                                                                                        |

### Sample Output

```
*A:ALA-12# show router 3 bgp paths
=====
BGP Router ID : 10.0.0.14 AS : 65206 Local AS : 65206
=====
BGP Paths

Path: 60203 65001 19855 3356 15412

Origin : IGP Next Hop : 10.0.28.1
MED : 60203 Local Preference : none
Refs : 4 ASes : 5
Segments : 1
Flags : EBGp-learned
Aggregator : 15412 62.216.140.1

Path: 60203 65001 19855 3356 1 1236 1236 1236 1236

Origin : IGP Next Hop : 10.0.28.1
MED : 60203 Local Preference : none
Refs : 2 ASes : 9
Segments : 1
Flags : EBGp-learned

*A:ALA-12#
```

## routes

|                    |                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>routes [family <i>family</i>] [prefix [detail   longer]]</b><br><b>routes [family <i>family</i>] [prefix [hunt   brief]]</b><br><b>routes [family <i>family</i>] [community <i>comm-id</i>]</b><br><b>routes [family <i>family</i>] [aspath-regex <i>reg-ex1</i>]</b><br><b>routes [family <i>family</i>] [ipv6-prefix[/prefix-length] [detail   longer]   [hunt [brief]]]</b> |
| <b>Context</b>     | show>router>bgp                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b> | This command displays BGP route information.                                                                                                                                                                                                                                                                                                                                      |

When this command is issued without any parameters, then the entire BGP routing table displays.

When this command is issued with an IP prefix/mask or IP address, then the best match for the parameter displays.

**Parameters** **family** *family* — Specifies the type of routing information to be distributed by the BGP instance.

**Values** **ipv4** — Displays only those BGP peers that have the IPv4 family enable and not those capable of exchanging IP-VPN routes.

**vpn-ipv4** — Displays the BGP peers that are IP-VPN capable.

**ipv6** — Displays the BGP peers that are IPv6 capable.

**mcast-ipv4** — Displays the BGP peers that are mcast-ipv4 capable.

*prefix* — Specifies the type of routing information to display.

| Values            | <i>rd</i> [[ <i>rd</i> :] <i>ip-address</i> [/ <i>mask</i> ]]                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------|
|                   | <i>rd</i> { <i>ip-address</i> : <i>number1</i><br>as- <i>number1</i> : <i>number2</i><br>as- <i>number2</i> : <i>number3</i> } |
| <i>number1</i>    | 1 — 65535                                                                                                                      |
| <i>as-number1</i> | 1 — 65535                                                                                                                      |
| <i>number2</i>    | 0 — 4294967295                                                                                                                 |
| <i>as-number2</i> | 1 — 4294967295                                                                                                                 |
| <i>number3</i>    | 0 — 65535                                                                                                                      |
| <i>ip-address</i> | a.b.c.d                                                                                                                        |
| <i>mask</i>       | 0 — 32                                                                                                                         |

*ipv6-prefix[/prefix-length]* — Specifies the type of IPv6 routing information to display.

|               |              |                                     |
|---------------|--------------|-------------------------------------|
| <b>Values</b> | ipv6-prefix: | x:x:x:x:x:x:x (eight 16-bit pieces) |
|               |              | x:x:x:x:x:d.d.d.d                   |
|               |              | x: [0 — FFFF]H                      |
|               |              | d: [0 — 255]D                       |
| prefix-length | 0 — 128      |                                     |

*filter* — Specifies route criteria.

|               |             |                                                                           |
|---------------|-------------|---------------------------------------------------------------------------|
| <b>Values</b> | <b>hunt</b> | Displays entries for the specified route in the RIB-In, RIB-Out, and RTM. |
|---------------|-------------|---------------------------------------------------------------------------|

**longer** Displays the specified route and subsets of the route.

**detail** Display the longer, more detailed version of the output.

**aspath-regex** “*reg-exp*” — Displays all routes with an AS path matching the specified regular expression *reg-exp*.

**community** *comm.-id* — Displays all routes with the specified BGP community.

|                 |                                                                           |
|-----------------|---------------------------------------------------------------------------|
| <b>Values</b>   | [as-number1:comm-val1   ext-comm   well-known-comm]                       |
| ext-comm        | type:{ip-address:comm-val1   as-number1:comm-val2   as-number2:comm-val1} |
| as-number1      | 0..65535                                                                  |
| comm-val1       | 0..65535                                                                  |
| type            | keywords: target, origin                                                  |
| ip-address      | a.b.c.d                                                                   |
| comm-val2       | 0 — 4294967295                                                            |
| as-number2      | 0 — 4294967295                                                            |
| well-known-comm | no-export, no-export-subconfed, no-advertise                              |



**Output**    **Show BGP Routes** — The following table describes the command output fields for BGP routes.

| Label         | Description                                                                                                               |
|---------------|---------------------------------------------------------------------------------------------------------------------------|
| BGP Router ID | The local BGP router ID.                                                                                                  |
| AS            | The configured autonomous system number.                                                                                  |
| Local AS      | The configured local AS setting, if not configured it is the same as the system AS.                                       |
| Network       | The IP prefix and mask length.                                                                                            |
| Nexthop       | The BGP nexthop.                                                                                                          |
| From          | The advertising BGP neighbor's IP address.                                                                                |
| Res. Nexthop  | The resolved nexthop.                                                                                                     |
| Local Pref.   | The local preference value.                                                                                               |
| Flag          | u — used<br>s — suppressed<br>h — history<br>d — decayed<br>* — valid<br>i — igp<br>e — egp<br>? — incomplete<br>> — best |
| Aggregator AS | The aggregator AS value.<br>none — No aggregator AS attributes are present.                                               |
| Aggregator    | The aggregator attribute value.<br>none — no Aggregator attributes are present.                                           |
| Atomic Aggr.  | Atomic — The atomic aggregator flag is set.<br>Not Atomic — The atomic aggregator flag is not set.                        |
| MED           | The MED metric value.<br>none — No MED metric is present.                                                                 |
| Community     | The BGP community attribute list.                                                                                         |
| Cluster       | The route reflector cluster list.                                                                                         |
| Originator Id | The originator ID path attribute value.<br>none — The originator ID attribute is not present.                             |

| Label          | Description                                                                                  |
|----------------|----------------------------------------------------------------------------------------------|
| Peer Router Id | The router ID of the advertising router.                                                     |
| AS-Path        | The BGP AS path attribute.                                                                   |
| VPN Imported   | Displays the VPNs where a particular BGP-VPN received route has been imported and installed. |

### Sample Output

```
*A:ALA-12>config>router>bgp# show router 3 bgp routes family ipv4
=====
BGP Router ID : 10.10.10.103 AS : 200 Local AS : 200
=====
Legend -
Status codes : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes : i - IGP, e - EGP, ? - incomplete, > - best
=====
BGP Routes
=====
Flag Network Nexthop LocalPref MED
 VPN Label As-Path

No Matching Entries Found
=====
*A:ALA-12>config>router>bgp#

A:SR-12# show router bgp routes 100.0.0.0/31 hunt
=====
BGP Router ID : 10.20.1.1 AS : 100Local AS : 100
=====
Legend -
Status codes : u - used, s - suppressed, h - history, d - decayed, * - valid
Origin codes : i - IGP, e - EGP, ? - incomplete, > - best
=====
BGP Routes
=====
RIB In Entries

Network : 100.0.0.0/31
Nexthop : 10.20.1.2
Route Dist. : 10.20.1.2:1 VPN Label : 131070
From : 10.20.1.2
Res. Nexthop : 10.10.1.2
Local Pref. : 100 Interface Name: to-sr7
Aggregator AS : none Aggregator : none
Atomic Aggr. : Not Atomic MED : none
Community : target:10.20.1.2:1
Cluster : No Cluster Members
Originator Id : None Peer Router Id: 10.20.1.2
Flags : Used Valid Best IGP
AS-Path : No As-Path
VPN Imported : 1 2 10 12

RIB Out Entries

Routes : 1
=====
```

A:SR-12#

## summary

**Syntax** **summary [all]****Context** show>router>bgp

**Description** This command displays a summary of BGP neighbor information.

If confederations are not configured, that portion of the output will not display.

The “State” field displays the global BGP operational state. The valid values are:

- Up — BGP global process is configured and running.
- Down — BGP global process is administratively shutdown and not running.
- Disabled — BGP global process is operationally disabled. The process must be restarted by the operator.

For example, if a BGP peer is operationally disabled, then the state in the summary table shows the state ‘Disabled’

**Parameters** **all** — Displays BGP peers in all instances.**Output** **Show BGP Summary Output** — The following table describes the command output fields for a BGP summary:

| Label                   | Description                                                                         |
|-------------------------|-------------------------------------------------------------------------------------|
| BGP Router ID           | The local BGP router ID.                                                            |
| AS                      | The configured autonomous system number.                                            |
| Local AS                | The configured local AS setting, if not configured it is the same as the system AS. |
| BGP Admin State         | Down — BGP is administratively disabled.<br>Up — BGP is administratively enabled.   |
| BGP Oper State          | Down — BGP is operationally disabled.<br>Up — BGP is operationally enabled.         |
| Confederation AS        | The configured confederation AS.                                                    |
| Member Confederations   | The configured members of the BGP confederation.                                    |
| Number of Peer Groups   | The total number of configured BGP peer groups.                                     |
| Number of Peers         | The total number of configured BGP peers.                                           |
| Total BGP Active Routes | The total number of BGP routes used in the forwarding table.                        |
| Total BGP Routes        | The total number of BGP routes learned from BGP peers.                              |

| Label                    | Description                                                                                                                             |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Total BGP Paths          | The total number of unique sets of BGP path attributes learned from BGP peers.                                                          |
| Total Path Memory        | Total amount of memory used to store the path attributes.                                                                               |
| Total Suppressed Routes  | Total number of suppressed routes due to route damping.                                                                                 |
| Total History Routes     | Total number of routes with history due to route damping.                                                                               |
| Total Decayed Routes     | Total number of decayed routes due to route damping.                                                                                    |
| Neighbor                 | BGP neighbor address.                                                                                                                   |
| AS<br>(Neighbor)         | BGP neighbor autonomous system number.                                                                                                  |
| PktRcvd                  | Total number of packets received from the BGP neighbor.                                                                                 |
| PktSent                  | Total number of packets sent to the BGP neighbor.                                                                                       |
| InQ                      | The number of BGP messages to be processed.                                                                                             |
| OutQ                     | The number of BGP messages to be transmitted.                                                                                           |
| Up/Down                  | The amount of time that the BGP neighbor has either been established or not established depending on its current state.                 |
| State Recv/Actv/<br>Sent | The BGP neighbor's current state (if not established) or the number of received routes, active routes and sent routes (if established). |

### Sample Output

```
*A:ALA-12# show router 3 bgp summary
=====
BGP Router ID : 10.0.0.14 AS : 65206 Local AS : 65206
=====
BGP Admin State : Up BGP Oper State : Up
Confederation AS : 40000
Member Confederations : 65205 65206 65207 65208

Number of Peer Groups : 2 Number of Peers : 7
Total BGP Active Routes : 86689 Total BGP Routes : 116999
Total BGP Paths : 35860 Total Path Memory : 2749476
Total Supressed Routes : 0 Total History Routes : 0
Total Decayed Routes : 0

=====
BGP Summary
=====
Neighbor AS PktRcvd PktSent InQ OutQ Up/Down State|Recv/Actv/Sent

10.0.0.1 65206 5 21849 0 0 00h01m29s 32/0/86683
10.0.0.12 65206 0 0 0 0 00h01m29s Active
10.0.0.13 65206 5 10545 0 50 00h01m29s 6/0/86683
10.0.0.15 65205 0 0 0 0 00h01m29s Active
```

```
10.0.0.16 65206 5 9636 0 50 00h01m29s 6/0/86683
10.0.27.1 2 0 0 0 0 00h01m29s Active
10.0.28.1 60203 22512 15 0 0 00h01m29s 116955/86689/9
=====
*A:ALA-12#
```

ecmp

- Syntax** `ecmp`
- Context** `show>router`
- Description** This command displays the ECMP settings for the router.
- Output** **Show ECMP Settings Output** — The following table describes the output fields for the router ECMP settings.

| Label                  | Description                                                                            |
|------------------------|----------------------------------------------------------------------------------------|
| Instance               | The router instance number.                                                            |
| Router Name            | The name of the router instance.                                                       |
| ECMP                   | False — ECMP is disabled for the instance.<br>True — ECMP is enabled for the instance. |
| Configured-ECMP-Routes | The number of ECMP routes configured for path sharing.                                 |

Sample Output

```
*A:ALA-12# show router 3 ecmp
=====
Router ECMP
=====
Instance Router Name ECMP Configured-ECMP-Routes

1 Base True 8
=====
*A:ALA-12#
```

## interface

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> <i>[[ip-address   ip-int-name] [detail]]</i>   <i>[summary]</i>   <i>[exclude-services]</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Context</b>     | show>router                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command displays the router IP interface table sorted by interface index.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><i>ip-address</i> — Only displays the interface information associated with the specified IP address.</p> <p><i>ip-int-name</i> — Only displays the interface information associated with the specified IP interface name.</p> <p><b>detail</b> — Displays detailed IP interface information.</p> <p><b>summary</b> — Displays summary IP interface information for the router.</p> <p><b>exclude-services</b> — Displays IP interface information, excluding IP interfaces configured for customer services. Only core network IP interfaces are displayed.</p> |
| <b>Output</b>      | <b>Standard IP Interface Output</b> — The following table describes the standard output fields for an IP interface:                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Label          | Description                                                                                                                                                                                                                                                                                           |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface-Name | The IP interface name.                                                                                                                                                                                                                                                                                |
| Type           | <p>n/a — No IP address has been assigned to the IP interface, so the IP address type is not applicable.</p> <p>Pri — The IP address for the IP interface is the Primary address on the IP interface.</p> <p>Sec — The IP address for the IP interface is a secondary address on the IP interface.</p> |
| IP-Address     | <p>The IP address and subnet mask length of the IP interface.</p> <p>n/a — Indicates no IP address has been assigned to the IP interface.</p>                                                                                                                                                         |
| Adm            | <p>Down — The IP interface is administratively disabled.</p> <p>Up — The IP interface is administratively enabled.</p>                                                                                                                                                                                |
| Opr            | <p>Down — The IP interface is operationally disabled.</p> <p>Up — The IP interface is operationally enabled.</p>                                                                                                                                                                                      |
| Mode           | <p>Network — The IP interface is a network/core IP interface.</p> <p>Service — The IP interface is a service IP interface.</p>                                                                                                                                                                        |

**Sample Output**

```
*A:ALA-12# show router 3 interface
=====
Interface Table
```

```

=====
Interface-Name Type IP-Address Adm Opr Mode

system Pri 10.10.0.3/32 Up Up Network
to-ser1 Pri 10.10.13.3/24 Up Up Network
to-ser4 Pri 10.10.34.3/24 Up Up Network
to-ser5 Pri 10.10.35.3/24 Up Up Network
to-ser6 n/a n/a Up Down Network
to-web Pri 10.1.1.3/24 Up Down Service
management Pri 192.168.2.93/20 Up Up Network
=====

```

\*A:ALA-12#

\*A:ALA-12# **show router 3 interface 10.10.0.3/32**

```

=====
Interface Table
=====
Interface-Name Type IP-Address Adm Opr Mode

system Pri 10.10.0.3/32 Up Up Network
=====

```

SR4#

\*A:ALA-12# **show router 3 interface to-ser1**

```

=====
Interface Table
=====
Interface-Name Type IP-Address Adm Opr Mode

to-ser1 Pri 10.10.13.3/24 Up Up Network
=====

```

\*A:ALA-12#

\*A:ALA-12# **show router 3 interface exclude-services**

```

=====
Interface Table
=====
Interface-Name Type IP-Address Adm Opr Mode

system Pri 10.10.0.3/32 Up Up Network
to-ser1 Pri 10.10.13.3/24 Up Up Network
to-ser4 Pri 10.10.34.3/24 Up Up Network
to-ser5 Pri 10.10.35.3/24 Up Up Network
to-ser6 n/a n/a Up Down Network
management Pri 192.168.2.93/20 Up Up Network
=====

```

\*A:ALA-12#

**Detailed IP Interface Output** — The following table describes the detailed output fields for an IP interface.

| Label       | Description                                           |
|-------------|-------------------------------------------------------|
| If Name     | The IP interface name.                                |
| Admin State | Down — The IP interface is administratively disabled. |

| Label             | Description (Continued)                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Oper State        | Up — The IP interface is administratively enabled.                                                                                          |
|                   | Down — The IP interface is operationally disabled.                                                                                          |
| IP Addr/mask      | Up — The IP interface is operationally disabled.                                                                                            |
|                   | The IP address and subnet mask length of the IP interface.<br>Not Assigned — Indicates no IP address has been assigned to the IP interface. |
| Address Type      | Primary — The IP address for the IP interface is the Primary address on the IP interface.                                                   |
|                   | Secondary — The IP address for the IP interface is a Secondary address on the IP interface.                                                 |
| IGP Inhibit       | Disabled — The secondary IP address on the interface will be recognized as a local interface by the IGP.                                    |
|                   | Enabled — The secondary IP address on the interface will not be recognized as a local interface by the IGP.                                 |
| Broadcast Address | All-ones — The broadcast format on the IP interface is all ones.                                                                            |
|                   | Host-ones — The broadcast format on the IP interface is host ones.                                                                          |
| If Index          | The interface index of the IP router interface.                                                                                             |
| If Type           | Network — The IP interface is a network/core IP interface.                                                                                  |
|                   | Service — The IP interface is a service IP interface.                                                                                       |
| Port Id           | The port ID of the IP interface.                                                                                                            |
| Egress Filter     | The egress IP filter policy ID associated with the IP interface.                                                                            |
|                   | none — Indicates no egress filter policy is associated with the interface.                                                                  |
| Ingress Filter    | The ingress IP filter policy ID associated with the IP interface.                                                                           |
|                   | none — Indicates no ingress filter policy is associated with the interface.                                                                 |
| QoS Policy        | The QoS policy ID associated with the IP interface.                                                                                         |
| SNTP Broadcast    | False — Receipt of SNTP broadcasts on the IP interface is disabled.                                                                         |
|                   | True — Receipt of SNTP broadcasts on the IP interface is enabled.                                                                           |
| MAC Address       | The MAC address of the IP interface.                                                                                                        |
| Arp Timeout       | The ARP timeout for the interface, in seconds, which is the time an ARP entry is maintained in the ARP cache without being refreshed.       |
| IP MTU            | The IP Maximum Transmission Unit (MTU) for the IP interface.                                                                                |



| Label           | Description (Continued)                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ICMP Mask Reply | <p>False — The IP interface will not reply to a received ICMP mask request.</p> <p>True — The IP interface will reply to a received ICMP mask request.</p>                                                                                                                           |
| Cflowd          | <p>Specifies the type of Cflowd analysis that is applied to the interface.</p> <p>acl — ACL Cflowd analysis is applied to the interface.</p> <p>interface — Interface cflowd analysis is applied to the interface.</p> <p>none — No Cflowd analysis is applied to the interface.</p> |
| Redirects       | <p>Specifies the maximum number of ICMP redirect messages the IP interface will issue in a given period of time (Time (seconds)).</p> <p>Disabled — Indicates the IP interface will not generate ICMP redirect messages.</p>                                                         |
| Unreachables    | <p>Specifies the maximum number of ICMP destination unreachable messages the IP interface will issue in a given period of time.</p> <p>Disabled — Indicates the IP interface will not generate ICMP destination unreachable messages.</p>                                            |
| TTL Expired     | <p>The maximum number (Number) of ICMP TTL expired messages the IP interface will issue in a given period of time (Time (seconds)).</p> <p>Disabled — Indicates the IP interface will not generate ICMP TTL expired messages.</p>                                                    |

\*A:ALA-12# show router 3 interface detail

=====

Interface Table

=====

Interface

-----

|              |                 |                   |             |
|--------------|-----------------|-------------------|-------------|
| If Name      | : to-ser1       |                   |             |
| Admin State  | : Up            | Oper State        | : Up        |
| IP Addr/mask | : 10.10.13.3/24 | Address Type      | : Primary   |
| IGP Inhibit  | : Disabled      | Broadcast Address | : Host-ones |

|              |                 |                   |             |
|--------------|-----------------|-------------------|-------------|
| IP Addr/mask | : 10.200.0.1/16 | Address Type      | : Secondary |
| IGP Inhibit  | : Enabled       | Broadcast Address | : Host-ones |

-----

Details

-----

|               |                     |                 |           |
|---------------|---------------------|-----------------|-----------|
| If Index      | : 2                 | If Type         | : Network |
| Port Id       | : 1/1/2             | Ingress Filter  | : 100     |
| Egress Filter | : none              | SNTP Broadcast  | : False   |
| QoS Policy    | : 1                 | Arp Timeout     | : 14400   |
| MAC Address   | : 04:5d:01:01:00:02 | ICMP Mask Reply | : True    |
| IP MTU        | : 1500              |                 |           |
| Cflowd        | : none              |                 |           |

ICMP Details

|              |                |                |      |
|--------------|----------------|----------------|------|
| Redirects    | : Disabled     |                |      |
| Unreachables | : Number - 100 | Time (seconds) | - 10 |
| TTL Expired  | : Number - 100 | Time (seconds) | - 10 |

=====

\*A:ALA-12#

**Summary IP Interface Output** — The following table describes the summary output fields for the router IP interfaces.

| Label       | Description                                                                  |
|-------------|------------------------------------------------------------------------------|
| Instance    | The router instance number.                                                  |
| Router Name | The name of the router instance.                                             |
| Interfaces  | The number of IP interfaces in the router instance.                          |
| Admin-Up    | The number of administratively enabled IP interfaces in the router instance. |
| Oper-Up     | The number of operationally enabled IP interfaces in the router instance.    |

### Sample Output

```
*A:ALA-12# show router 3 interface summary
=====
Router Summary (Interfaces)
=====
Instance Router Name Interfaces Admin-Up Oper-Up

1 Base 7 7 5
=====
*A:ALA-12#
```

## mvpn

|                    |                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>mvpn</b>                                                                                     |
| <b>Context</b>     | show>router <i>router-instance</i>                                                              |
| <b>Description</b> | This command displays Multicast VPN related information. The router instance must be specified. |

### Sample Output

```
*A:Dut-C# show router 1 mvpn
=====
MVPN 1 configuration data
=====
signaling : Bgp auto-discovery : Enabled
UMH Selection : Highest-Ip intersite-shared : Enabled
vrf-import : N/A
vrf-export : N/A
vrf-target : target:1:1
C-Mcast Import RT : target:10.20.1.3:2

ipmsi : pim-asm 224.1.1.1
admin status : Up
hello-interval : N/A
tracking support : Disabled
three-way-hello : N/A
hello-multiplier : 35 * 0.1
Improved Assert : N/A
```

```

spmsi : pim-ssm 225.0.0.0/32
join-tlv-packing : N/A
data-delay-interval: 3 seconds
data-threshold : 224.0.0.0/4 --> 1 kbps
=====

```

## database

|                    |                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>database</b> [ <i>ip-prefix</i> ] [ <i>/mask</i> ] [ <i>longer</i> ] [ <i>peer ip-address</i> ]            |
| <b>Context</b>     | show>router>rip                                                                                               |
| <b>Description</b> | Displays all routes in the RIP database.                                                                      |
| <b>Output</b>      | <b>Show RIP Database Output</b> — The following table describes the output fields for the RIP route database. |

| Label       | Description                                                                                                                                   |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Destination | The RIP destination for the route.                                                                                                            |
| Peer        | The router ID of the peer router.                                                                                                             |
| NextHop     | The IP address of the next hop.                                                                                                               |
| Metric      | The hop count to rate the value of different hops.                                                                                            |
| Tag         | The value to distinguish between internal routes (learned by RIP) and external routes (learned from other protocols).                         |
| TTL         | Displays how many seconds the specific route will remain in the routing table. When an entry reaches 0, it is removed from the routing table. |
| Valid       | No — The route is not valid.<br>Yes — The route is valid.                                                                                     |

## Sample Output

```

*A:ALA-1# show rip database
=====
RIP Route Database
=====
Destination Peer NextHop Metric Tag TTL Valid

180.0.0.10/32 180.1.7.15 0.0.0.0 2 0x0000 163 No
180.0.0.10/32 180.1.8.14 0.0.0.0 2 0x0000 179 No
180.0.0.14/32 180.1.8.14 0.0.0.0 1 0x0000 179 Yes
180.0.6.0/24 180.1.7.15 0.0.0.0 11 0x2002 163 No
180.0.6.0/24 180.1.8.14 0.0.0.0 11 0x2002 179 No
180.0.7.0/24 180.1.7.15 0.0.0.0 11 0x2002 163 No
180.0.7.0/24 180.1.8.14 0.0.0.0 11 0x2002 179 No
180.1.5.0/24 180.1.7.15 0.0.0.0 2 0x0000 151 Yes
180.1.5.0/24 180.1.8.14 0.0.0.0 1 0x0000 167 No
180.100.17.16/31 180.1.7.15 0.0.0.0 2 0x0000 151 No
180.100.17.16/31 180.1.8.14 0.0.0.0 2 0x0000 167 No

```

```

No. of Routes: 11
=====
*A:ALA-12#
```

neighbor

- Syntax** neighbor [*ip-address* | *ip-int-name*] [**detail**] [**advertised-routes**]
- Context** show>router>rip
- Description** Displays RIP neighbor interface information.
- Parameters** *ip-address* | *ip-int-name* — Displays information for the specified IP interface.

**Default** All neighbor interfaces.

**advertised-routes** — Displays the routes advertised to RIP neighbors. If no neighbors are specified, then all routes advertised to all neighbors are displayed. If a specific neighbor is given then only routes advertised to the given neighbor/interface are displayed.

**Default** Display RIP information.

**Output** **Standard Show RIP Neighbor Output** — The following table describes the standard command output fields for a RIP group.
- | Label      | Description                                                                                                                                                                                                                                                                                                                               |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Neighbor   | The RIP neighbor interface name.                                                                                                                                                                                                                                                                                                          |
| Adm        | Down — The RIP neighbor interface is administratively down.<br>Up — The RIP neighbor interface is administratively up.                                                                                                                                                                                                                    |
| Opr        | Down — The RIP neighbor interface is operationally down.<br>Up — The RIP neighbor interface is operationally up.                                                                                                                                                                                                                          |
| Primary IP | The primary IP address of the RIP neighbor interface.                                                                                                                                                                                                                                                                                     |
| Send Mode  | Bcast — Specifies that RIPv2 formatted messages are sent to the broadcast address.<br>Mcast — Specifies that RIPv2 formatted messages are sent to the multicast address.<br>None — Specifies that no RIP messages are sent (i.e., silent listener).<br>RIPv1 — Specifies that RIPv1 formatted messages are sent to the broadcast address. |
| Recv Mode  | Both — Specifies that RIP updates in either version 1 or version 2 format will be accepted.<br>None — Specifies that RIP updates will not be accepted.                                                                                                                                                                                    |
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| Label     | Description                                                                   |
|-----------|-------------------------------------------------------------------------------|
|           | RIPv1 — Specifies that RIP updates in version 1 format only will be accepted. |
|           | RIPv2 — Specifies that RIP updates in version 2 format only will be accepted. |
| Metric In | The metric added to routes received from a RIP neighbor.                      |

### Sample Output

```
*A:ALA-12# show router 3 rip neighbor
=====
RIP Neighbors
=====
Interface Adm Opr Primary IP Send Recv Metric
 Mode Mode In

router-2/1 Up Up 10.0.3.12 None Both 1
router-2/2 Up Up 10.0.5.12 BCast Both 1
router-2/3 Up Up 10.0.6.12 BCast Both 1
router-2/4 Up Up 10.0.10.12 BCast Both 1
router-2/5 Up Up 10.0.9.12 BCast Both 1
router-2/6 Up Up 10.0.17.12 None Both 1
router-2/7 Up Up 10.0.16.12 None Both 1
=====
*A:ALA-12#
```

**Detailed Show RIP Neighbor Output** — The following table describes the standard command output fields for a RIP group.

| Label       | Description                                                                                                                                                              |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Neighbor    | The RIP neighbor name.                                                                                                                                                   |
| Description | The RIP neighbor description. No Description Available indicates no description is configured.                                                                           |
| Primary IP  | The RIP neighbor interface primary IP address.                                                                                                                           |
| Group       | The RIP group name of the neighbor interface.                                                                                                                            |
| Admin State | Down — The RIP neighbor interface is administratively down.<br>Up — The RIP neighbor interface is administratively up.                                                   |
| Oper State  | Down — The RIP neighbor interface is operationally down.<br>Up — The RIP neighbor interface is operationally up.                                                         |
| Send Mode   | Bcast — Specifies that RIPv2 formatted messages are sent to the broadcast address.<br>Mcast — Specifies that RIPv2 formatted messages are sent to the multicast address. |

| Label           | Description (Continued)                                                                                                                                                                              |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | None — Specifies that no RIP messages are sent (i.e., silent listener).                                                                                                                              |
|                 | RIPv1 — Specifies that RIPv1 formatted messages are sent to the broadcast address.                                                                                                                   |
| Recv Mode       | Both — Specifies that RIP updates in either version 1 or version 2 format will be accepted.                                                                                                          |
|                 | None — Specifies that RIP updates will not be accepted.                                                                                                                                              |
|                 | RIPv1 — Specifies that RIP updates in version 1 format only will be accepted.                                                                                                                        |
|                 | RIPv2 — Specifies that RIP updates in version 2 format only will be accepted.                                                                                                                        |
| Metric In       | The metric value added to routes received from a RIP neighbor.                                                                                                                                       |
| Metric Out      | The value added to routes exported into RIP and advertised to RIP neighbors.                                                                                                                         |
| Split Horizon   | Disabled — Split horizon disabled for the neighbor.                                                                                                                                                  |
|                 | Enabled — Split horizon and poison reverse enabled for the neighbor.                                                                                                                                 |
| Check Zero      | Disabled — Checking of the mandatory zero fields in the RIPv1 and RIPv2 specifications are not checked allowing receipt of RIP messages even if mandatory zero fields are non-zero for the neighbor. |
|                 | Enabled — checking of the mandatory zero fields in the RIPv1 and RIPv2 specifications and rejecting non-compliant RIP messages is enabled for the neighbor.                                          |
| Message Size    | The maximum number of routes per RIP update message.                                                                                                                                                 |
| Preference      | The preference of RIP routes from the neighbor.                                                                                                                                                      |
| Auth. Type      | Specifies the authentication type.                                                                                                                                                                   |
| Update Timer    | The current setting of the RIP update timer value expressed in seconds.                                                                                                                              |
| Timeout Timer   | The current RIP timeout timer value expressed in seconds.                                                                                                                                            |
| Export Policies | The export route policy that is used to determine routes advertised to all peers.                                                                                                                    |
| Import Policies | The import route policy that is used to determine which routes are accepted from RIP neighbors.                                                                                                      |

### Sample Output

```
*A:ALA-12# show router 3 rip peers
```

```
=====
```

```

RIP Peers
=====
Peer IP Addr Interface Name Version Last Update

10.0.5.13 router-2/2 RIPv2 0
10.0.6.16 router-2/3 RIPv2 2
10.0.9.14 router-2/5 RIPv2 8
10.0.10.15 router-2/4 RIPv2 0

No. of Peers: 4
=====
*A:ALA-12#

*A:ALA-12# show router 3 rip neighbor detail
=====
RIP Neighbors (Detail)
=====
Neighbor "router-2/7"

Description : No Description Available
Primary IP : 10.0.16.12 Group : seven
Admin State : Up Oper State : Up
Send Mode : None Receive Mode : Both
Metric In : 1 Metric Out : 1
Split Horizon : Enabled Check Zero : Disabled
Message Size : 25 Preference : 100
Auth. Type : None Update Timer : 3
Timeout Timer : 6 Flush Timer : 6
Export Policies:
 Rip2Rip
 direct2Rip
 bgp2Rip
Import Policies:
 None
=====
*A:ALA-12#

```

### Sample Output

```

*A:ALA-12# show router 3 rip neighbors interface advertised-routes
=====
RIP Advertised Routes
=====
Destination Interface NextHop Metric Tag TTL

180.0.0.2/32 180.1.8.12 0.0.0.0 10 0x2002 n/a
180.0.0.5/32 180.1.8.12 0.0.0.0 10 0x2002 n/a
180.0.0.8/32 180.1.8.12 0.0.0.0 10 0x2002 n/a
180.0.0.9/32 180.1.8.12 0.0.0.0 10 0x2002 n/a
180.0.0.10/32 180.1.8.12 0.0.0.0 10 0x2002 n/a
180.0.0.12/32 180.1.8.12 0.0.0.0 1 0x0000 n/a
180.0.0.13/32 180.1.8.12 0.0.0.0 10 0x2002 n/a
180.0.0.14/32 180.1.8.12 0.0.0.0 16 0x0000 n/a
180.0.0.15/32 180.1.8.12 0.0.0.0 2 0x0000 n/a
180.0.0.16/32 180.1.8.12 0.0.0.0 3 0x0000 n/a

No. of Advertised Routes: 10
=====
*A:ALA-12#

```

## peer

|                    |                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>peer</b> [ <i>ip-int-name</i> ]                                                                                                          |
| <b>Context</b>     | show>router>rip                                                                                                                             |
| <b>Description</b> | Displays RIP peer information.                                                                                                              |
| <b>Parameters</b>  | <i>ip-int-name</i> — Displays peer information for peers on the specified IP interface.<br><b>Default</b> Display peers for all interfaces. |
| <b>Output</b>      | <b>Show RIP Peer Output</b> — The following table describes the command output fields for a RIP peer:                                       |

| Label          | Description                               |
|----------------|-------------------------------------------|
| Peer IP Addr   | The IP address of the peer router.        |
| Interface Name | The peer interface name.                  |
| Version        | The version of RIP running on the peer.   |
| Last Update    | The number of days since the last update. |
| No. of Peers   | The number of RIP peers.                  |

## statistics

|                    |                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <i>ip-addr</i>   <i>ip-int-name</i> ]                                                                                                                                                                                                                             |
| <b>Context</b>     | show>router>rip                                                                                                                                                                                                                                                                       |
| <b>Description</b> | Display Interface level statistics for the RIP protocol.<br>If no IP address or interface name is specified, then all configured RIP interfaces are displayed.<br>If an IP address or interface name is specified, then only data regarding the specified RIP interface is displayed. |
| <b>Parameters</b>  | <i>ip-addr</i>   <i>ip-int-name</i> — Displays statistics for the specified IP interface.                                                                                                                                                                                             |
| <b>Output</b>      | <b>Show RIP Statistics Output</b> — The following table describes the output fields for RIP statistics.                                                                                                                                                                               |

## Sample Output

| Label            | Description                                                      |
|------------------|------------------------------------------------------------------|
| Learned Routes   | The number of RIP-learned routes were exported to RIP neighbors. |
| Timed Out Routes | The number of routes that have been timed out.                   |
| Current Memory   | The amount of memory used by this RIP router instance.           |



| Label                  | Description (Continued)                                                                                                                                                                                                                                                                                                                                                |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum Memory         | The amount of memory allocated for this RIP router instance.                                                                                                                                                                                                                                                                                                           |
| Interface              | Displays the name of each interface configured in RIP and associated RIP statistics.                                                                                                                                                                                                                                                                                   |
| Primary IP             | The interface IP address.                                                                                                                                                                                                                                                                                                                                              |
| Update Timer           | The current setting of the RIP update timer value expressed in seconds.                                                                                                                                                                                                                                                                                                |
| Timeout Timer          | The current RIP timeout timer value expressed in seconds.                                                                                                                                                                                                                                                                                                              |
| Flush Timer            | The number of seconds after a route has been declared invalid that it is flushed from the route database.                                                                                                                                                                                                                                                              |
| Updates Sent           | <p>Total — The total number of RIP updates that were sent.</p> <p>Last 5 Min — The number of RIP updates that were sent in the last 5 minutes.</p> <p>Last 1 Min — The number of RIP updates that were sent in the last 1 minute.</p>                                                                                                                                  |
| Triggered Updates      | <p>Total — The total number of triggered updates sent. These updates are sent before the entire RIP routing table is sent.</p> <p>Last 5 Min — The number of triggered updates that were sent in the last 5 minutes.</p> <p>Last 1 Min — The number of triggered updates that were sent in the last 1 minute.</p>                                                      |
| Bad Packets Received   | <p>Total — The total number of RIP updates received on this interface that were discarded as invalid.</p> <p>Last 5 Min — The number of RIP updates received on this interface that were discarded as invalid in the last 5 minutes.</p> <p>Last 1 Min — The number of RIP updates received on this interface that were discarded as invalid in the last 1 minute.</p> |
| RIPv1 Updates Received | <p>Total — The total number of RIPv1 updates received.</p> <p>Last 5 Min — The number of RIPv1 updates received in the last 5 minutes.</p> <p>Last 1 Min — The number of RIPv1 updates received in the last 1 minute.</p>                                                                                                                                              |
| RIPv1 Updates Ignored  | <p>Total — The total number of RIPv1 updates ignored.</p> <p>Last 5 Min — The number of RIPv1 updates ignored in the last 5 minutes.</p> <p>Last 1 Min — The number of RIPv1 updates ignored in the last 1 minute.</p>                                                                                                                                                 |

| Label                   | Description (Continued)                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------|
| RIPv1 Bad Routes        | Total — The total number of bad routes received from the peer.                                                      |
|                         | Last 5 Min — The number of bad routes received from the peer in the last 5 minutes.                                 |
|                         | Last 1 Min — The number of bad routes received from the peer in the last minute.                                    |
| RIPv1 Requests Received | Total — The total number of times the router received RIPv1 route requests from other routers.                      |
|                         | Last 5 Min — The number of times the router received RIPv1 route requests from other routers in the last 5 minutes. |
|                         | Last 1 Min — The number of times the router received RIPv1 route requests from other routers in the last 1 minute.  |
| RIPv1 Requests Ignored  | Total — The total number of times the router ignored RIPv1 route requests from other routers.                       |
|                         | Last 5 Min — The number of times the router ignored RIPv1 route requests from other routers in the last 5 minutes.  |
|                         | Last 1 Min — The number of times the router ignored RIPv1 route requests from other routers in the last 1 minute.   |
| RIPv2 Updates Received  | Total — The total number of RIPv2 updates received.                                                                 |
|                         | Last 5 Min — The number of RIPv2 updates received in the last 5 minutes.                                            |
|                         | Last 1 Min — The number of RIPv2 updates received in the last minute.                                               |
| RIPv2 Updates Ignored   | Total — The total number of RIPv2 updates ignored.                                                                  |
|                         | Last 5 Min — The number of RIPv2 updates ignored in the last 5 minutes.                                             |
|                         | Last 1 Min — The number of RIPv2 updates ignored in the last minute.                                                |
| RIPv2 Bad Routes        | Total — The total number of bad routes received from the peer.                                                      |
|                         | Last 5 Min — The number of bad routes received from the peer in the last 5 minutes.                                 |
|                         | Last 1 Min — The number of bad routes received from the peer in the last minute.                                    |
| RIPv2 Requests Received | Total — The total number of times the router received RIPv2 route requests from other routers.                      |

| Label                  | Description (Continued)                                                                                             |
|------------------------|---------------------------------------------------------------------------------------------------------------------|
|                        | Last 5 Min — The number of times the router received RIPv2 route requests from other routers in the last 5 minutes. |
|                        | Last 1 Min — The number of times the router received RIPv2 route requests from other routers in the last minute.    |
| RIPv2 Requests Ignored | Total — The total number of times the router ignored RIPv2 route requests from other routers.                       |
|                        | Last 5 Min — The number of times the router ignored RIPv2 route requests from other routers in the last 5 minutes.  |
|                        | Last 1 Min — The number of times the router ignored RIPv2 route requests from other routers in the last minute.     |
| Authentication Errors  | Total — The total number of authentication errors to secure table updates.                                          |
|                        | Last 5 Min — The number of authentication errors to secure table updates in the last 5 minutes.                     |
|                        | Last 1 Min — The number of authentication errors to secure table updates in the last minute.                        |

\*A:ALA-12# show router 3 rip statistics

=====

RIP Statistics

=====

|                |          |                  |          |
|----------------|----------|------------------|----------|
| Learned Routes | : 0      | Timed Out Routes | : 0      |
| Current Memory | : 120624 | Maximum Memory   | : 262144 |

-----

Interface "to-web"

-----

|                         |            |              |            |
|-------------------------|------------|--------------|------------|
| Primary IP              | : 10.1.1.3 | Update Timer | : 30       |
| Timeout Timer           | : 180      | Flush Timer  | : 120      |
| Counter                 | Total      | Last 5 Min   | Last 1 Min |
| Updates Sent            | 0          | 0            | 0          |
| Triggered Updates       | 0          | 0            | 0          |
| Bad Packets Received    | 0          | 0            | 0          |
| RIPv1 Updates Received  | 0          | 0            | 0          |
| RIPv1 Updates Ignored   | 0          | 0            | 0          |
| RIPv1 Bad Routes        | 0          | 0            | 0          |
| RIPv1 Requests Received | 0          | 0            | 0          |
| RIPv1 Requests Ignored  | 0          | 0            | 0          |
| RIPv2 Updates Received  | 0          | 0            | 0          |
| RIPv2 Updates Ignored   | 0          | 0            | 0          |
| RIPv2 Bad Routes        | 0          | 0            | 0          |
| RIPv2 Requests Received | 0          | 0            | 0          |
| RIPv2 Requests Ignored  | 0          | 0            | 0          |
| Authentication Errors   | 0          | 0            | 0          |

=====

\*A:ALA-12#

route-table

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>route-table</b> [ <i>ip-prefix</i> [/mask] [ <b>longer</b> ]   [ <b>protocol</b> <i>protocol</i> ]   [ <b>summary</b> ]]                                                                                                                                                                                                                                                                                                                      |
| <b>Context</b>     | show>router                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | This command displays the active routes in the routing table.<br>If no command line arguments are specified, all routes are displayed, sorted by prefix.                                                                                                                                                                                                                                                                                         |
| <b>Parameters</b>  | <i>ip-prefix</i> [/mask] — Displays routes only matching the specified <i>ip-prefix</i> and optional <i>mask</i> .<br><b>longer</b> — Displays routes matching the <i>ip-prefix/mask</i> and routes with longer masks.<br><b>protocol</b> <i>protocol</i> — Displays routes learned from the specified protocol.<br><b>Values</b> bgp, isis, local, ospf, rip, static, aggregate<br><b>summary</b> — Displays a route table summary information. |
| <b>Output</b>      | <b>Standard Show Route Table Output</b> — The following table describes the standard output fields for the route table.                                                                                                                                                                                                                                                                                                                          |

| Label          | Description                                                                  |
|----------------|------------------------------------------------------------------------------|
| Dest Address   | The route destination address and mask.                                      |
| Next Hop       | The next hop IP address for the route destination.                           |
| Type           | Local — The route is a local route.<br>Remote — The route is a remote route. |
| Protocol       | The protocol through which the route was learned.                            |
| Age            | The route age in seconds for the route.                                      |
| Metric         | The route metric value for the route.                                        |
| Pref           | The route preference value for the route.                                    |
| No. of Routes: | The number of routes displayed in the list.                                  |

Sample Output

```
*A:ALA-12# show router 3 route-table
=====
Route Table
=====
```

| Dest Address  | Next Hop   | Type   | Protocol | Age     | Metric | Pref |
|---------------|------------|--------|----------|---------|--------|------|
| 10.10.0.1/32  | 10.10.13.1 | Remote | OSPF     | 65844   | 1001   | 10   |
| 10.10.0.2/32  | 10.10.13.1 | Remote | OSPF     | 65844   | 2001   | 10   |
| 10.10.0.3/32  | 0.0.0.0    | Local  | Local    | 1329261 | 0      | 0    |
| 10.10.0.4/32  | 10.10.34.4 | Remote | OSPF     | 3523    | 1001   | 10   |
| 10.10.0.5/32  | 10.10.35.5 | Remote | OSPF     | 1084022 | 1001   | 10   |
| 10.10.12.0/24 | 10.10.13.1 | Remote | OSPF     | 65844   | 2000   | 10   |
| 10.10.13.0/24 | 0.0.0.0    | Local  | Local    | 65859   | 0      | 0    |

```

10.10.15.0/24 10.10.13.1 Remote OSPF 58836 2000 10
10.10.24.0/24 10.10.34.4 Remote OSPF 3523 2000 10
10.10.25.0/24 10.10.35.5 Remote OSPF 399059 2000 10
10.10.34.0/24 0.0.0.0 Local Local 3543 0 0
10.10.35.0/24 0.0.0.0 Local Local 1329259 0 0
10.10.45.0/24 10.10.34.4 Remote OSPF 3523 2000 10
10.200.0.0/16 0.0.0.0 Local Local 4513 0 0
192.168.0.0/20 0.0.0.0 Local Local 1329264 0 0
192.168.254.0/24 0.0.0.0 Remote Static 11 1 5

```

\*A:ALA-12#

\*A:ALA-12# **show router 3 route-table 10.10.0.4**

=====

Route Table

=====

| Dest Address | Next Hop   | Type   | Protocol | Age  | Metric | Pref |
|--------------|------------|--------|----------|------|--------|------|
| 10.10.0.4/32 | 10.10.34.4 | Remote | OSPF     | 3523 | 1001   | 10   |

-----

\*A:ALA-12#

\*A:ALA-12# **show router 3 route-table 10.10.0.4/32 longer**

=====

Route Table

=====

| Dest Address | Next Hop   | Type   | Protocol | Age  | Metric | Pref |
|--------------|------------|--------|----------|------|--------|------|
| 10.10.0.4/32 | 10.10.34.4 | Remote | OSPF     | 3523 | 1001   | 10   |

-----

No. of Routes: 1

=====

+ : indicates that the route matches on a longer prefix

\*A:ALA-12#

\*A:ALA-12# **show router 3 route-table protocol ospf**

=====

Route Table

=====

| Dest Address  | Next Hop   | Type   | Protocol | Age     | Metric | Pref |
|---------------|------------|--------|----------|---------|--------|------|
| 10.10.0.1/32  | 10.10.13.1 | Remote | OSPF     | 65844   | 1001   | 10   |
| 10.10.0.2/32  | 10.10.13.1 | Remote | OSPF     | 65844   | 2001   | 10   |
| 10.10.0.4/32  | 10.10.34.4 | Remote | OSPF     | 3523    | 1001   | 10   |
| 10.10.0.5/32  | 10.10.35.5 | Remote | OSPF     | 1084022 | 1001   | 10   |
| 10.10.12.0/24 | 10.10.13.1 | Remote | OSPF     | 65844   | 2000   | 10   |
| 10.10.15.0/24 | 10.10.13.1 | Remote | OSPF     | 58836   | 2000   | 10   |
| 10.10.24.0/24 | 10.10.34.4 | Remote | OSPF     | 3523    | 2000   | 10   |
| 10.10.25.0/24 | 10.10.35.5 | Remote | OSPF     | 399059  | 2000   | 10   |
| 10.10.45.0/24 | 10.10.34.4 | Remote | OSPF     | 3523    | 2000   | 10   |

-----

\*A:ALA-12#

\*A:ALA-12# **show router 3 route-table summary**

=====

Route Table Summary

=====

| Active | Available |
|--------|-----------|
| -----  | -----     |

|            |    |    |
|------------|----|----|
| Static     | 1  | 1  |
| Direct     | 6  | 6  |
| BGP        | 0  | 0  |
| OSPF       | 9  | 9  |
| ISIS       | 0  | 0  |
| RIP        | 0  | 0  |
| Aggregate  | 0  | 0  |
| -----      |    |    |
| Total      | 15 | 15 |
| =====      |    |    |
| *A:ALA-12# |    |    |

service-prefix

- Syntax** **service-prefix**
- Context** show>router
- Description** This command displays service-prefix information.
- Output** **Show Service Prefix Output** — The following table describes the service prefix output fields.

| Label     | Description                                         |
|-----------|-----------------------------------------------------|
| IP Prefix | Displays information for the specified IP prefix.   |
| Mask      | Displays information for the specified mask length. |

Sample Output

```
*A:ALA-12# show router 3 service-prefix
=====
Address Ranges Reserved for Services (Service: 3)
=====
IP Prefix Mask Exclusive

No Matching Entries Found
=====
*A:ALA-12>show>router#
```

## static-arp

|                    |                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>static-arp</b> [ <i>ip-address</i>   <i>ip-int-name</i>   <b>mac</b> <i>ieee-mac-addr</i> ]                                                                                                                                                                                                                            |
| <b>Context</b>     | show>router                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command displays the router static ARP table sorted by IP address.<br>If no options are present, all ARP entries are displayed.                                                                                                                                                                                      |
| <b>Parameters</b>  | <i>ip-address</i> — Only displays static ARP entries associated with the specified IP address.<br><i>ip-int-name</i> — Only displays static ARP entries associated with the specified IP interface name.<br><b>mac</b> <i>ieee-mac-addr</i> — Only displays static ARP entries associated with the specified MAC address. |
| <b>Output</b>      | <b>Static ARP Table Output</b> — The following table describes the output fields for the ARP table.                                                                                                                                                                                                                       |

| Label              | Description                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------|
| IP Address         | The IP address of the static ARP entry.                                                                              |
| MAC Address        | The MAC address of the static ARP entry.                                                                             |
| Age                | The age of the ARP entry. Static ARPs always have 00:00:00 for the age.                                              |
| Type               | Inv — The ARP entry is an inactive static ARP entry (invalid).<br>Sta — The ARP entry is an active static ARP entry. |
| Interface          | The IP interface name associated with the ARP entry.                                                                 |
| No. of ARP Entries | The number of ARP entries displayed in the list.                                                                     |

## Sample Output

```
*A:ALA-12# show router 3 static-arp
=====
ARP Table
=====
IP Address MAC Address Age Type Interface

10.200.0.253 00:00:5a:40:00:01 00:00:00 Sta to-ser1
12.200.1.1 00:00:5a:01:00:33 00:00:00 Inv to-ser1a

No. of ARP Entries: 2
=====
*A:ALA-12#

*A:ALA-12# show router 3 static-arp 12.200.1.1
=====
ARP Table
=====
IP Address MAC Address Age Type Interface

12.200.1.1 00:00:5a:01:00:33 00:00:00 Inv to-ser1 a
=====
*A:ALA-12#
```

```
*A:ALA-12# show router 3 static-arp to-ser1
=====
ARP Table
=====
IP Address MAC Address Age Type Interface

10.200.0.253 00:00:5a:40:00:01 00:00:00 Sta to-ser1
=====
S*A:ALA-12#

*A:ALA-12# show router 3 static-arp mac 00:00:5a:40:00:01
=====
ARP Table
=====
IP Address MAC Address Age Type Interface

10.200.0.253 00:00:5a:40:00:01 00:00:00 Sta to-ser1
=====
*A:ALA-12#
```

static-route

- Syntax

static-route [ip-prefix /mask] | [preference preference] | [next-hop ip-addr] [detail]
- Context

show>router
- Description

This command displays the static entries in the routing table.

If no options are present, all static routes are displayed sorted by prefix.
- Parameters

*ip-prefix /mask* — Displays static routes only matching the specified *ip-prefix* and *mask*.

*preference preference* — Only displays static routes with the specified route preference.

**Values**      0 — 65535

*next-hop ip-addr* — Only displays static routes with the specified next hop IP address.

**detail** — Displays detailed information about the static route.
- Output

**Show Static Route Output** — The following table describes the output fields for the static route table:

| Label        | Description                                                                                                                                                                                                                                                                      |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IP Addr/mask | The static route destination address and mask.                                                                                                                                                                                                                                   |
| Pref         | The route preference value for the static route.                                                                                                                                                                                                                                 |
| Metric       | The route metric value for the static route.                                                                                                                                                                                                                                     |
| Type         | <p>BH — The static route is a black hole route. The <code>NextHop</code> for this type of route is <code>black-hole</code>.</p> <p>ID — The static route is an indirect route, where the <code>nextHop</code> for this type of route is the non-directly connected next hop.</p> |



| Label          | Description (Continued)                                                                                                                                                   |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | NH — The route is a static route with a directly connected next hop. The Nexthop for this type of route is either the next hop IP address or an egress IP interface name. |
| Next Hop       | The next hop for the static route destination.                                                                                                                            |
| Interface      | The egress IP interface name for the static route.<br>n/a — indicates there is no current egress interface because the static route is inactive or a black hole route.    |
| Active         | N — The static route is inactive; for example, the static route is disabled or the next hop IP interface is down.<br><br>Y — The static route is active.                  |
| No. of Routes: | The number of routes displayed in the list.                                                                                                                               |

### Sample Output

```
*A:ALA-12# show router 3 static-route
=====
Route Table
=====
IP Addr/mask Pref Metric Type Nexthop Interface Active

192.168.250.0/24 5 1 ID 10.200.10.1 to-ser1 Y
192.168.252.0/24 5 1 NH 10.10.0.254 n/a N
192.168.253.0/24 5 1 NH to-ser1 n/a N
192.168.253.0/24 5 1 NH 10.10.0.254 n/a N
192.168.254.0/24 4 1 BH black-hole n/a Y
=====
*A:ALA-12#

*A:ALA-12# show router 3 static-route 192.168.250.0/24
=====
Route Table
=====
IP Addr/mask Pref Metric Type Nexthop Interface Active

192.168.250.0/24 5 1 ID 10.200.10.1 to-ser1 Y
=====
*A:ALA-12#

*A:ALA-12# show router 3 static-route preference 4
=====
Route Table
=====
IP Addr/mask Pref Metric Type Nexthop Interface Active

192.168.254.0/24 4 1 BH black-hole n/a Y
=====
*A:ALA-12#

*A:ALA-12# show router 3 static-route next-hop 10.10.0.254
=====
```

## Show, Clear, Debug Commands

```

Route Table
=====
IP Addr/mask Pref Metric Type Nexthop Interface Active

192.168.253.0/24 5 1 NH 10.10.0.254 n/a N
=====
*A:ALA-12#

*A:Dut-B# show router static-route

=====
Static Route Table (Router: Base) Family: IPv4
=====
Prefix Tag Met Pref Type Act
 Next Hop Interface

1.2.3.4/32 0 1 5 NH Y
 10.11.25.6
ip-10.11.25.5_base_to_cpe_static
10.11.15.0/24 0 1 5 NH Y
 10.11.25.6
ip-10.11.25.5_base_to_cpe_static

No. of Static Routes: 2
=====

*A:Dut-B# show router static-route detail

=====
Static Route Table (Router: Base) Family: IPv4
=====
Network : 1.2.3.4/32
Nexthop : 10.11.25.6
Type : Nexthop Nexthop Type : IP
Interface : ip-10.11.25.5_base_to_cpe_stat* Active : Y
Metric : 1 Preference : 5
Admin State : Up Tag : 0
BFD : disabled
CPE-check : enabled State : n/a
Target : 10.11.18.6
Interval : 1 Drop Count : 3
Log : N
CPE Host Up Time : 0d 00:00:02
CPE Echo Req Tx : 3 CPE Echo Reply Rx : 3
CPE Up Trans : 1 CPE Down Trans : 0
CPE TTL : 2

Network : 10.11.15.0/24
Nexthop : 10.11.25.6
Type : Nexthop Nexthop Type : IP
Interface : ip-10.11.25.5_base_to_cpe_stat* Active : Y
Metric : 1 Preference : 5
Admin State : Up Tag : 0
BFD : disabled
CPE-check : disabled

No. of Static Routes: 2
=====

```

## tunnel-table

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>tunnel-table</b> [ <i>ip-address[/mask]</i> ] [ <b>protocol</b> <i>protocol</i>   <b>sdp</b> <i>sdp-id</i> ]<br><b>tunnel-table</b> [ <b>summary</b> ]                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Context</b>     | show>router                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command displays tunnel table information.<br><br>Note that auto-bind GRE tunnels are not displayed in <b>show</b> command output. GRE tunnels are not the same as SDP tunnels that use the GRE encapsulation type. When the <b>auto-bind</b> command is used when configuring a VPRN service, it means the MP-BGP NH resolution is referring to core routing instance for IP reachability. For a VPRN service this object specifies the lookup to be used by the routing instance if no SDP to the destination exists. |
| <b>Parameters</b>  | <i>ip-address[/mask]</i> — Displays the specified tunnel table's destination IP address and mask.<br><b>protocol</b> <i>protocol</i> — Displays LDP protocol information.<br><b>sdp</b> <i>sdp-id</i> — Displays information pertaining to the specified SDP.<br><b>summary</b> — Displays summary tunnel table information.                                                                                                                                                                                                 |
| <b>Output</b>      | <b>Show Tunnel Table Output</b> — The following table describes tunnel table output fields:                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Label       | Description                                                                    |
|-------------|--------------------------------------------------------------------------------|
| Destination | The route's destination address and mask.                                      |
| Owner       | Specifies the tunnel owner.                                                    |
| Encap       | Specifies the tunnel's encapsulation type.                                     |
| Tunnel ID   | Specifies the tunnel (SDP) identifier.                                         |
| Pref        | Specifies the route preference for routes learned from the configured peer(s). |
| Nexthop     | The next hop for the route's destination.                                      |
| Metric      | The route metric value for the route.                                          |

## Sample Output

```
*A:ALA-12>config>service# show router 3 tunnel-table
=====
Tunnel Table
=====
Destination Owner Encap Tunnel Id Pref NexthopMetric

10.0.0.1/32 sdp GRE 10 5 10.0.0.1 0
10.0.0.1/32 sdp GRE 21 5 10.0.0.1 0
10.0.0.1/32 sdp GRE 31 5 10.0.0.1 0
10.0.0.1/32 sdp GRE 41 5 10.0.0.1 0
=====

*A:ALA-12>config>service#

*A:ALA-12>config>service# show router 3 tunnel-table summary
=====
```

```
Tunnel Table Summary (Router: Base)
=====
Active Available

LDP 1
SDP 1
=====
*A:ALA-12>config>service#
```

statistics

- Syntax** **statistics** [*ip-int-name* | *ip-address*]
- Context** show>router>dhcp
- Description** Display statistics for DHCP Relay and DHCP snooping.  
If no IP address or interface name is specified, then all configured interfaces are displayed.  
If an IP address or interface name is specified, then only data regarding the specified interface is displayed.
- Parameters** *ip-int-name* | *ip-address* — Displays statistics for the specified IP interface.
- Output** **Show DHCP Statistics Output** — The following table describes the output fields for DHCP statistics.

| Label                      | Description                                                               |
|----------------------------|---------------------------------------------------------------------------|
| Received Packets           | The number of packets received from the DHCP clients.                     |
| Transmitted Packets        | The number of packets transmitted to the DHCP clients.                    |
| Received Malformed Packets | The number of malformed packets received from the DHCP clients.           |
| Received Untrusted Packets | The number of untrusted packets received from the DHCP clients.           |
| Client Packets Discarded   | The number of packets received from the DHCP clients that were discarded. |
| Client Packets Relayed     | The number of packets received from the DHCP clients that were forwarded. |
| Client Packets Snooped     | The number of packets received from the DHCP clients that were snooped.   |
| Server Packets Discarded   | The number of packets received from the DHCP server that were discarded.  |
| Server Packets Relayed     | The number of packets received from the DHCP server that were forwarded.  |
| Server Packets Snooped     | The number of packets received from the DHCP server that were snooped.    |

**Sample Output**

```
*A:ALA-1# show router dhcp statistics
=====
DHCP Global Statistics
=====
Rx Packets : 0
Tx Packets : 0
Rx Malformed Packets : 0
Rx Untrusted Packets : 0
Client Packets Discarded : 0
Client Packets Relayed : 0
Client Packets Snooped : 0
Server Packets Discarded : 0
Server Packets Relayed : 0
Server Packets Snooped : 0
=====
*A:ALA-1#
```

**summary**

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>summary</b>                                                                                      |
| <b>Context</b>     | show>router>dhcp                                                                                    |
| <b>Description</b> | Display the status of the DHCP Relay and DHCP snooping functions on each interface.                 |
| <b>Output</b>      | <b>Show DHCP Summary Output</b> — The following table describes the output fields for DHCP summary. |

| Label          | Description                                       |
|----------------|---------------------------------------------------|
| Interface Name | Name of the router interface.                     |
| ARP Populate   | Indicates whether or nor ARP populate is enabled. |
| Info Option    | Indicates whether Option 82 is enabled.           |
| Admin State    | Indicates the administrative status.              |

**Sample Output**

```
A:ALA-48# show router dhcp summary
=====
Interface Name Arp Used/ Info Admin
 Populate Provided Option State

ies-10-10.10.1.1 Yes 1000/8000 Keep Up
ies-100-100.100.1.1 No 0/0 Keep Down
ies-11-11.11.1.1 Yes 1000/8000 Keep Up
ies-12-12.12.1.1 Yes 1000/8000 Keep Up
ies-13-13.13.1.1 Yes 1000/8000 Keep Up
ies-14-14.14.1.1 Yes 1000/8000 Keep Up
ies-15-15.15.1.1 Yes 1000/8000 Keep Up
ies-16-16.16.1.1 No 0/0 Keep Down
ies-2-10.17.1.1 No 0/0 Keep Down
ies-8-8.8.1.1 Yes 1000/8000 Keep Up
```

## Show, Clear, Debug Commands

```
ies-9-9.9.1.1 Yes 1000/8000 Keep Up

Interfaces: 11
=====
A:ALA-48#
```

## VPRN Clear Commands

---

### apr

|                    |                     |
|--------------------|---------------------|
| <b>Syntax</b>      | <b>arp</b>          |
| <b>Context</b>     | clear>service>id    |
| <b>Description</b> | This command clears |

### arp-host

|                    |                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>arp-host</b><br><b>arp-host</b> { <b>mac</b> <i>ieee-address</i>   <b>sap</b> <i>sap-id</i>   <b>ip-address</b> <i>ip-address</i> [/ <i>mask</i> ] }<br><b>arp-host</b> [ <b>port</b> <i>port-id</i> ] [ <b>inter-dest-id</b> <i>intermediate-destination-id</i>   <b>no-inter-dest-id</b> ]<br><b>arp-host statistics</b> [ <b>sap</b> <i>sap-id</i>   <b>interface</b> <i>interface-name</i> ] |
| <b>Context</b>     | clear>service>id                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b> | This command clears ARP host data.                                                                                                                                                                                                                                                                                                                                                                  |

### dhcp

|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                        |
| <b>Context</b>     | clear>router                                                       |
| <b>Description</b> | This command enables the context to clear and reset DHCP entities. |

### statistics

|                    |                                                                               |
|--------------------|-------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <b>interface</b> <i>ip-int-name</i>   <i>ip-address</i> ] |
| <b>Context</b>     | clear>router>dhcp                                                             |
| <b>Description</b> | Clears DHCP statistics.                                                       |

### forwarding-table

|                    |                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>forwarding-table</b> [ <i>slot-number</i> ]                                                                                                                                |
| <b>Context</b>     | clear>router                                                                                                                                                                  |
| <b>Description</b> | This command clears the route table on the specified IOM with the route table.<br>If the slot number is not specified, the command forces the route table to be recalculated. |

|                   |                                                     |
|-------------------|-----------------------------------------------------|
| <b>Parameters</b> | <i>slot-number</i> — Clears the specified IOM slot. |
| <b>Default</b>    | all IOMs                                            |
| <b>Values</b>     | 1 - 10                                              |

## interface

|                    |                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>interface</b> [ <i>ip-int-name</i>   <i>ip-addr</i> ] [ <b>icmp</b> ]                                                                                                                                                                    |
| <b>Context</b>     | clear>router                                                                                                                                                                                                                                |
| <b>Description</b> | This command clears IP interface statistics.<br><br>If no IP interface is specified either by IP interface name or IP address, the command will perform the clear operation on all IP interfaces.                                           |
| <b>Parameters</b>  | <i>ip-int-name</i>   <i>ip-addr</i> — The IP interface name or IP interface address.<br><br><b>Default</b> All IP interfaces.<br><br><b>icmp</b> — Specifies to reset the ICMP statistics for the IP interface(s) used for ICMP rate limit. |

## damping

|                    |                                                                                                                                                                                                                                                                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>damping</b> [[ <i>ip-prefix/mask</i> ] [ <b>neighbor</b> <i>ip-address</i> ]]   [ <b>group</b> <i>name</i> ]                                                                                                                                                                                                                                |
| <b>Context</b>     | clear>router>bgp                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command clears or resets the route damping information for received routes.                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <i>ip-prefix/mask</i> — Clears damping information for entries that match the IP prefix and mask length.<br><b>neighbor</b> <i>ip-address</i> — Clears damping information for entries received from the BGP neighbor.<br><b>group</b> <i>name</i> — Clears damping information for entries received from any BGP neighbors in the peer group. |

## flap-statistics

|                    |                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>flap-statistics</b> [[ <i>ip-prefix/mask</i> ] [ <b>neighbor</b> <i>ip-addr</i> ]]   [ <b>group</b> <i>group-name</i> ]   [ <b>regex</b> <i>reg-exp</i> ]   [ <b>policy</b> <i>policy-name</i> ]                                         |
| <b>Context</b>     | clear>router>bgp                                                                                                                                                                                                                            |
| <b>Description</b> | This command clears route flap statistics.                                                                                                                                                                                                  |
| <b>Parameters</b>  | <i>ip-prefix/mask</i> — Clears route flap statistics for entries that match the specified IP prefix and mask length.<br><b>neighbor</b> <i>ip-addr</i> — Clears route flap statistics for entries received from the specified BGP neighbor. |



**group** *group-name* — Clears route flap statistics for entries received from any BGP neighbors in the specified peer group.

**regex** *reg-exp* — Clears route flap statistics for all entries which have the regular expression and the AS path that matches the regular expression.

**policy** *policy-name* — Clears route flap statistics for entries that match the specified route policy.

## neighbor

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>neighbor</b> { <i>ip-addr</i>   <b>as</b> <i>as-number</i>   <b>external</b>   <b>all</b> } [ <b>soft</b>   <b>soft-inbound</b>   <b>statistics</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Context</b>     | clear>router>bgp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b> | This command resets the specified BGP peer or peers. This can cause existing BGP connections to be shutdown and restarted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Parameters</b>  | <p><i>ip-addr</i> — Resets the BGP neighbor with the specified IP address.</p> <p><b>as</b> <i>as-number</i> — Resets all BGP neighbors with the specified peer AS.</p> <p><b>external</b> — Resets all EBGp neighbors.</p> <p><b>all</b> — Resets all BGP neighbors.</p> <p><b>soft</b> — The specified BGP neighbor(s) re-evaluates all routes in the Local-RIB against the configured export policies.</p> <p><b>soft-inbound</b> — The specified BGP neighbor(s) re-evaluates all routes in the RIB-In against the configured import policies.</p> <p><b>statistics</b> — The BGP neighbor statistics.</p> |

## protocol

|                    |                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>protocol</b>                                                                                                                         |
| <b>Context</b>     | clear>router>bgp                                                                                                                        |
| <b>Description</b> | This command resets the entire BGP protocol. If the AS number was previously changed, the BGP AS number does not inherit the new value. |

## database

|                    |                                                      |
|--------------------|------------------------------------------------------|
| <b>Syntax</b>      | <b>database</b>                                      |
| <b>Context</b>     | clear>router>rip                                     |
| <b>Description</b> | This command flushes all routes in the RIP database. |

## statistics

|                    |                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <b>neighbor</b> { <i>ip-address</i>   <i>ip-int-name</i> }]                                     |
| <b>Context</b>     | clear>router>rip                                                                                                    |
| <b>Description</b> | This command clears statistics for RIP neighbors.                                                                   |
| <b>Parameters</b>  | <b>neighbor</b> { <i>ip-address</i>   <i>ip-int-name</i> } — Clears the statistics for the specified RIP interface. |
|                    | <b>Default</b> Clears statistics for all RIP interfaces.                                                            |

## id

|                    |                                                                |
|--------------------|----------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                    |
| <b>Context</b>     | clear>service<br>clear>service>statistics                      |
| <b>Description</b> | This command clears commands for a specific service.           |
| <b>Parameters</b>  | <i>service-id</i> — The ID that uniquely identifies a service. |
|                    | <b>Values</b> 1 — 2147483648                                   |

## sap

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> { <b>all</b>   <b>counters</b>   <b>stp</b> }                                                                                                     |
| <b>Context</b>     | clear>service>statistics                                                                                                                                                   |
| <b>Description</b> | Clears SAP statistics for a SAP.                                                                                                                                           |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax. |

## dhcp

|                    |                                                            |
|--------------------|------------------------------------------------------------|
| <b>Syntax</b>      | <b>dhcp</b>                                                |
| <b>Context</b>     | clear>router>dhcp                                          |
| <b>Description</b> | This command enables the context to clear DHCP parameters. |

## lease-state

|               |                                                                              |
|---------------|------------------------------------------------------------------------------|
| <b>Syntax</b> | <b>lease-state</b><br><b>lease-state</b> <i>ip-address</i> <i>ip-address</i> |
|---------------|------------------------------------------------------------------------------|

**lease-state mac** *ieee-address*  
**lease-state sap** *sap-id*  
**lease-state sdp** *sdp-id:vc-id*

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | clear>service>id>dhcp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b> | Clears DHCP lease state information for this service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Parameters</b>  | <p><i>ip-address</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets).</p> <p><i>ieee-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.</p> <p><i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><i>sdp-id</i> — The SDP ID to be cleared.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID to be cleared.</p> <p><b>Values</b> 1 — 4294967295</p> |

## site

|                    |                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>site</b> <i>service-id</i>                                                                                                          |
| <b>Context</b>     | clear>service>id                                                                                                                       |
| <b>Description</b> | This command clears site-specific information for the service.                                                                         |
| <b>Parameters</b>  | <p><i>service-id</i> — Specifies the service ID or service name up to 64 characters in length.</p> <p><b>Values</b> 1 — 2147483648</p> |

## spoke-sdp

|                    |                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>spoke-sdp</b> <i>sdp-id:vc-id ingress-vc-label</i>                                                                                                                                           |
| <b>Context</b>     | clear>service>id                                                                                                                                                                                |
| <b>Description</b> | This command clears and resets the spoke SDP bindings for the service.                                                                                                                          |
| <b>Parameters</b>  | <p><i>sdp-id</i> — The spoke SDP ID to be reset.</p> <p><b>Values</b> 1 — 17407</p> <p><i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.</p> <p><b>Values</b> 1 — 4294967295</p> |

## sdp

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp <i>sdp-id</i> keep-alive</b>                                                            |
| <b>Context</b>     | clear>service>statistics                                                                       |
| <b>Description</b> | This command clears keepalive statistics associated with the SDP ID.                           |
| <b>Parameters</b>  | <i>sdp-id</i> — The SDP ID for which to clear keepalive statistics.<br><b>Values</b> 1 — 17407 |

## counters

|                    |                                                                   |
|--------------------|-------------------------------------------------------------------|
| <b>Syntax</b>      | <b>counters</b>                                                   |
| <b>Context</b>     | clear>service>statistics>id                                       |
| <b>Description</b> | Clears all traffic queue counters associated with the service ID. |

## spoke-sdp

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>spoke-sdp <i>sdp-id</i>[:<i>vc-id</i>] {all   counters   stp}</b>                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | clear>service>statistics>id                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b> | This command clears statistics for the spoke SDP bound to the service.                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>sdp-id</i> — The spoke SDP ID for which to clear statistics.<br><b>Values</b> 1 — 17407<br><i>vc-id</i> — The virtual circuit ID on the SDP ID to be reset.<br><b>Values</b> 1 — 4294967295<br><b>all</b> — Clears all queue statistics and STP statistics associated with the SDP.<br><b>counters</b> — Clears all queue statistics associated with the SDP.<br><b>stp</b> — Clears all STP statistics associated with the SDP. |

## stp

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| <b>Syntax</b>      | <b>stp</b>                                              |
| <b>Context</b>     | clear>service>statistics>id                             |
| <b>Description</b> | Clears all spanning tree statistics for the service ID. |

## VPRN Debug Commands

---

### id

|                    |                                                                                                               |
|--------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] id</b> <i>service-id</i>                                                                              |
| <b>Context</b>     | debug>service                                                                                                 |
| <b>Description</b> | This command debugs commands for a specific service.<br>The <b>no</b> form of the command disables debugging. |
| <b>Parameters</b>  | <i>service-id</i> — The ID that uniquely identifies a service.                                                |

### arp-host

|                    |                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] arp-host</b>                                                                                                      |
| <b>Context</b>     | debug>service>id                                                                                                          |
| <b>Description</b> | This command enables and configures ARP host debugging.<br>The <b>no</b> form of the command disables ARP host debugging. |

### dhcp

|                    |                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] dhcp</b>                                                                                                   |
| <b>Context</b>     | debug>service>id                                                                                                   |
| <b>Description</b> | This command enables the context for DHCP debugging.<br>The <b>no</b> form of the command disables DHCP debugging. |

### detail-level

|                    |                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>detail-level {low   medium   high}</b><br><b>no detail-level</b>                                             |
| <b>Context</b>     | debug>service>id>dhcp                                                                                           |
| <b>Description</b> | This command configures the DHCP tracing detail level.<br>The <b>no</b> form of the command disables debugging. |

### mode

|               |                                                                      |
|---------------|----------------------------------------------------------------------|
| <b>Syntax</b> | <b>mode {dropped-only   ingr-and-dropped   egr-ingr-and-dropped}</b> |
|---------------|----------------------------------------------------------------------|

**no mode**

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Context</b>     | debug>service>id>dhcp                                                                                   |
| <b>Description</b> | This command configures the DHCP tracing mode.<br>The <b>no</b> form of the command disables debugging. |

## host-connectivity-verify

|                    |                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] host-connectivity-verify                                                                                                                      |
| <b>Context</b>     | debug>service>id                                                                                                                                   |
| <b>Description</b> | This command enables Subscriber Host Connectivity Verification (SHCV) debugging.<br>The <b>no</b> form of the command disables the SHCV debugging. |

## ip

|                    |                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] ip <i>ip-address</i>                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular IP address.                                                                                                                                                                                                                                                                                               |
| <b>Parameters</b>  | <i>ip-address</i> — The IP address of the IP interface. The <i>ip-address</i> portion of the <b>address</b> command specifies the IP host address that will be used by the IP interface within the subnet. This address must be unique within the subnet and specified in dotted decimal notation. Allowed values are IP addresses in the range 1.0.0.0 – 223.255.255.255 (with support of /31 subnets). |

## mac

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | [no] mac <i>ieee-address</i>                                                                                                                                                                                                                                                       |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                                                                                                                                                                                                          |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular MAC address.                                                                                                                                                                        |
| <b>Parameters</b>  | <i>mac-address</i> — Specifies the 48-bit MAC address for the static ARP in the form aa:bb:cc:dd:ee:ff or aa-bb-cc-dd-ee-ff where aa, bb, cc, dd, ee, and ff are hexadecimal numbers. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses. |

## sap

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap <i>sap-id</i></b>                                                                                                                                              |
| <b>Context</b>     | debug>service>id>host-connectivity-verify                                                                                                                                  |
| <b>Description</b> | This command displays Subscriber Host Connectivity Verification (SHCV) events for a particular SAP.                                                                        |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax. |

## sap

|                    |                                                                                                                                                                            |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sap <i>sap-id</i></b>                                                                                                                                              |
| <b>Context</b>     | debug>service>id<br>debug>service>id>dhcp<br>debug>service>stp                                                                                                             |
| <b>Description</b> | This command enables STP debugging for a specific SAP.<br>The <b>no</b> form of the command disables debugging.                                                            |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax. |

## sdp

|                    |                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] sdp <i>sdp-id:vc-id</i></b>                                                                             |
| <b>Context</b>     | debug>service>id<br>debug>service>id>dhcp<br>debug>service>stp                                                  |
| <b>Description</b> | This command enables STP debugging for a specific SDP.<br>The <b>no</b> form of the command disables debugging. |

## event-type

|                    |                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] event-type {config-change   svc-oper-status-change   sap-oper-status-change   sdpbind-oper-status-change}</b> |
| <b>Context</b>     | debug>service>id                                                                                                      |
| <b>Description</b> | This command enables debugging for a particular event type.<br>The <b>no</b> form of the command disables debugging.  |

## event-type

|                    |                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] event-type {config-change   oper-status-change}</b>                                                          |
| <b>Context</b>     | debug>service>id>sap                                                                                                 |
| <b>Description</b> | This command enables debugging for a particular event type.<br>The <b>no</b> form of the command disables debugging. |

## stp

|                    |                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] stp</b>                                                                                              |
| <b>Context</b>     | debug>service>id                                                                                             |
| <b>Description</b> | This command enables the context for debugging STP.<br>The <b>no</b> form of the command disables debugging. |

## all-events

|                    |                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>all-events</b>                                                                                           |
| <b>Context</b>     | debug>service>id>event-type                                                                                 |
| <b>Description</b> | This command enables STP debugging for all events.<br>The <b>no</b> form of the command disables debugging. |

## bpdu

|                    |                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] bpdu</b>                                                                                                                |
| <b>Context</b>     | debug>service>stp                                                                                                               |
| <b>Description</b> | This command enables STP debugging for received and transmitted BPDUs.<br>The <b>no</b> form of the command disables debugging. |

## core-connectivity

|                    |                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] core-connectivity</b>                                                                                      |
| <b>Context</b>     | debug>service>stp                                                                                                  |
| <b>Description</b> | This command enables STP debugging for core connectivity.<br>The <b>no</b> form of the command disables debugging. |



## exception

|                    |                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] exception</b>                                                                                       |
| <b>Context</b>     | debug>service>stp                                                                                           |
| <b>Description</b> | This command enables STP debugging for exceptions.<br>The <b>no</b> form of the command disables debugging. |

## fsm-state-changes

|                    |                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] fsm-state-changes</b>                                                                                      |
| <b>Context</b>     | debug>service>stp                                                                                                  |
| <b>Description</b> | This command enables STP debugging for FSM state changes.<br>The <b>no</b> form of the command disables debugging. |

## fsm-timers

|                    |                                                                                                                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] fsm-timers</b>                                                                                             |
| <b>Context</b>     | debug>service>stp                                                                                                  |
| <b>Description</b> | This command enables STP debugging for FSM timer changes.<br>The <b>no</b> form of the command disables debugging. |

## port-role

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] port-role</b>                                                                                                  |
| <b>Context</b>     | debug>service>stp                                                                                                      |
| <b>Description</b> | This command enables STP debugging for changes in port roles.<br>The <b>no</b> form of the command disables debugging. |

## port-state

|                    |                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] port-state</b>                                                                                       |
| <b>Context</b>     | debug>service>stp                                                                                            |
| <b>Description</b> | This command enables STP debugging for port states.<br>The <b>no</b> form of the command disables debugging. |

## igmp

|                    |                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] igmp</b>                                                                                  |
| <b>Context</b>     | debug>router                                                                                      |
| <b>Description</b> | This command enables debugging for IGMP.<br>The <b>no</b> form of the command disables debugging. |

## interface

|                    |                                                                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] interface</b> [ <i>ip-int-name</i>   <i>ip-address</i> ]                                                                                                                                   |
| <b>Context</b>     | debug>router>igmp                                                                                                                                                                                  |
| <b>Description</b> | This command enables debugging on the IGMP interface.<br>The <b>no</b> form of the command disables debugging.                                                                                     |
| <b>Parameters</b>  | <i>ip-int-name</i> — Only displays the information associated with the specified IP interface name.<br><i>ip-address</i> — Only displays the information associated with the specified IP address. |

### Sample Output

```
A:FA# debug router 100 igmp interface
A:FA#
A:FA# show debug
debug
 router "100"
 igmp
 interface
 exit
 exit
exit
*A:FA#
38397 2007/02/01 11:46:40.94 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Querier Timer expired on i/f 2"

38398 2007/02/01 11:46:40.94 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Sending query on i/f 2 to 0.0.0.0"

38399 2007/02/01 11:46:40.94 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Interface 2 already UP, ignoring event"

38400 2007/02/01 11:46:41.64 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Process received group rec MODE_IS_EXCL for i/f 2 group 225.1.1.1 in mode EXCLUD
E. Num srcs 0"

38401 2007/02/01 11:46:41.64 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Process received group rec MODE_IS_EXCL for i/f 2 group 225.1.1.2 in mode EXCLUD
```

```

E. Num srcs 0"

38402 2007/02/01 11:46:41.64 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Process received group rec MODE_IS_EXCL for i/f 2 group 225.1.1.3 in mode EXCLUD
E. Num srcs 0"

38403 2007/02/01 11:46:41.64 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Process received group rec MODE_IS_EXCL for i/f 2 group 225.1.1.4 in mode EXCLUD
E. Num srcs 0"

38404 2007/02/01 11:46:41.64 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Process received group rec MODE_IS_EXCL for i/f 2 group 225.1.1.5 in mode EXCLUD
E. Num srcs 0"

38405 2007/02/01 11:46:48.93 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Process received group rec MODE_IS_EXCL for i/f 2 group 225.1.1.1 in mode EXCLUD
E. Num srcs 0"
38408 2007/02/01 11:46:48.93 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Process received group rec MODE_IS_EXCL for i/f 2 group 225.1.1.4 in mode EXCLUD
E. Num srcs 0"

38409 2007/02/01 11:46:48.93 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Process received group rec MODE_IS_EXCL for i/f 2 group 225.1.1.5 in mode EXCLUD
E. Num srcs 0"

38410 2007/02/01 11:46:48.93 UTC MINOR: DEBUG #2001 vprn100 IGMP[85]
"IGMP[85]: INTF
Interface 2 already UP, ignoring event"
A:FA#

```

## mcs

|                    |                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] mcs</b> [ <i>ip-int-name</i> ]                                                                |
| <b>Context</b>     | debug>router>igmp                                                                                     |
| <b>Description</b> | This command enables debugging for IGMP MCS.<br>The <b>no</b> form of the command disables debugging. |
| <b>Parameters</b>  | <i>ip-int-name</i> — Only displays the information associated with the specified IP interface name.   |

### Sample Output

```

A:BA# debug router 100 igmp mcs
A:BA# show debug
debug
 router "100"
 igmp
 mcs
 exit
 exit
exit
A:BA#

```

## misc

|                    |                                                                                                              |
|--------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] misc</b>                                                                                             |
| <b>Context</b>     | debug>router>igmp                                                                                            |
| <b>Description</b> | This command enables debugging for IGMP miscellaneous. The <b>no</b> form of the command disables debugging. |

### Sample Output

```
A:BA# debug router 100 igmp misc

A:BA# show debug
debug
 router "100"
 igmp
 misc
 exit
 exit
exit
A:BA#
```

## packet

|                    |                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>[no] packet</b> [ <i>query</i>   <i>v1-report</i>   <i>v2-report</i>   <i>v3-report</i>   <i>v2-leave</i> ] [ <i>ip-int-name</i>   <i>ip-address</i> ]                                                                                                                          |
| <b>Context</b>     | debug>router>igmp                                                                                                                                                                                                                                                                  |
| <b>Description</b> | This command enables debugging for IGMP packets. The <b>no</b> form of the command disables debugging.                                                                                                                                                                             |
| <b>Parameters</b>  | <i>query v1/v2/v3-report, v2-leave</i> — Select the type of packet to debug.<br><i>ip-int-name</i> — Only displays the information associated with the specified IP interface name.<br><i>ip-address</i> — Only displays the information associated with the specified IP address. |

### Sample Output

```
A:BA# debug router 100 igmp packet
A:BA#
A:BA# show debug
debug
 router "100"
 igmp
 packet
 exit
 exit
exit
5 2006/09/03 22:20:05.73 UTC MINOR: DEBUG #2001 vprn100 IGMP[2]
"IGMP[2]: TX-PKT
[000 18:25:24.480] ifId:2 ifName:IGMP_to_CE IGMP V3 PDU: 11.1.1.1 -> 224.0.0.1 p
duLen 12
Type: QUERY maxrespCode 0xa checksum 0xec78
```

```

GroupAddr: 0.0.0.0
S bit 0, QRV 2, QQIC 125, NumSources 0
Source Address List:
"
6 2006/09/03 22:20:05.96 UTC MINOR: DEBUG #2001 vprn100 IGMP[2]
"IGMP[2]: RX-PKT
[000 18:25:24.710] ifId:2 ifName:IGMP_to_CE IGMP V3 PDU: 11.1.1.20 -> 224.0.0.22
pduLen 48
Type: V3 REPORT maxrespCode 0x0 checksum 0x5fe2
Num Group Records: 4
Group Record 0
Type: CHG_TO_EXCL, AuxDataLen 0, Num Sources 0
Mcast Addr: 225.1.1.1
Source Address List
Group Record 1
Type: CHG_TO_EXCL, AuxDataLen 0, Num Sources 0
Mcast Addr: 225.1.1.2
Source Address List
Group Record 2
Type: CHG_TO_EXCL, AuxDataLen 0, Num Sources 0
Mcast Addr: 225.1.1.3
Source Address List
Group Record 3
Type: CHG_TO_EXCL, AuxDataLen 0, Num Sources 0
Mcast Addr: 225.1.1.4
Source Address List
A:BA#
*A:BA# no debug
Trace disabled for all existing and future clients
*A:BA# show debug
debug
exit

```

Show, Clear, Debug Commands

---

# Circuit Emulation (CEM) Show Commands

## egress-label

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>egress-label</b> <i>egress-label1</i> [ <i>egress-label2</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b> | <p>This command displays services using the range of egress labels. If only the mandatory <i>egress-label1</i> parameter is specified, only services using the specified label are displayed.</p> <p>If both <i>egress-label1</i> and <i>egress-label2</i> parameters are specified, the services using the range of labels X where <i>egress-label1</i> &lt;= X &lt;= <i>egress-label2</i> are displayed.</p> <p>Use the <b>show router ldp bindings</b> command to display dynamic labels.</p> |
| <b>Parameters</b>  | <p><i>egress-label1</i> — The starting egress label value for which to display services using the label range. If only <i>egress-label1</i> is specified, services only using <i>egress-label1</i> are displayed.</p> <p><b>Values</b> 0, 2049 — 131071</p> <p><i>egress-label2</i> — The ending egress label value for which to display services using the label range.</p> <p><b>Default</b> The <i>egress-label1</i> value.</p> <p><b>Values</b> 2049 — 131071</p>                            |
| <b>Output</b>      | <b>Show Service Egress Command Output</b> — The following table describes show service egress label output fields.                                                                                                                                                                                                                                                                                                                                                                               |

| Label                    | Description                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------|
| Svc Id                   | The ID that identifies a service.                                                                  |
| Sdp I                    | The ID that identifies an SDP.                                                                     |
| Type                     | Indicates whether the SDP binding is a spoke or a mesh.                                            |
| I. Lbl                   | The VC label used by the far-end device to send packets to this device in this service by the SDP. |
| E. Lbl                   | The VC label used by this device to send packets to the far-end device in this service by the SDP. |
| Number of bindings found | The total number of SDP bindings that exist within the specified egress label range.               |

### Sample Output

```
*A:ALA-48# show service egress-label 3000 10000
=====
Martini Service Labels
=====
Svc Id Sdp Binding Type I.Lbl E.Lbl
```

```

6 2:6 Spok 6300 6298
1000 2:1000 Spok n/a 7000

Number of Bindings Found : 2
=====
*A:ALA-48#
```

ingress-label

- Syntax** **ingress-label** *start-label* [*end-label*]
- Context** show>service
- Description**

This command displays services using the range of ingress labels. If only the mandatory *start-label* parameter is specified, only services using the specified label are displayed.

If both *start-label* and *end-label* parameters are specified, the services using the range of labels X where *start-label* <= X <= *end-label* are displayed.

Use the **show router vprn-service-id ldp bindings** command to display dynamic labels.
- Parameters**

*start-label* — The starting ingress label value for which to display services using the label range. If only *start-label* is specified, services only using *start-label* are displayed.

**Values** 0, 2048 — 131071

*end-label* — The ending ingress label value for which to display services using the label range.

**Default** The *start-label* value.

**Values** 2049 — 131071
- Output** **Show Service Ingress-Label** — The following table describes show service ingress-label output fields:

| Label                    | Description                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------|
| Svc Id                   | The ID that identifies a service.                                                                  |
| Sdp I                    | The ID that identifies an SDP.                                                                     |
| Type                     | Indicates whether the SDP binding is a spoke or a mesh.                                            |
| I. Lbl                   | The VC label used by the far-end device to send packets to this device in this service by the SDP. |
| E. Lbl                   | The VC label used by this device to send packets to the far-end device in this service by the SDP. |
| Number of bindings found | The total number of SDP bindings that exist within the specified egress label range.               |

Sample Output

```
*A:ALA-48# show service ingress-label 2500 15000
=====
```



```

Martini Service Labels
=====
Svc Id Sdp Binding Type I.Lbl E.Lbl

6 2:6 Spok 6300 6298
88 3:3 Spok 10000 0

Number of Bindings Found : 2

*A:ALA-48#

```

## sap-using

**Syntax** **sap-using** [**sap** *sap-id*]  
**sap-using** **interface** [*ip-address* | *ip-int-name*]  
**sap-using** [**ingress** | **egress**] **filter** *filter-id*  
**sap-using** [**ingress** | **egress**] **qos-policy** *qos-policy-id*  
**sap-using** **encap-type** *encap-type*

**Context** show>service

**Description** This command displays specified SAP information.  
If no optional parameters are specified, the command displays a summary of all defined SAPs.  
The optional parameters restrict output to only SAPs matching the specified properties.

**Parameters** **ingress** — Specifies matching an ingress policy.  
**egress** — Specifies matching an egress policy.  
**qos-policy** *qos-policy-id* — The ingress or egress QoS Policy ID for which to display matching SAPs.  
**Values** 1 — 65535  
**filter** *filter-id* — The ingress or egress filter policy ID for which to display matching SAPs.  
**Values** 1 — 65535  
**sap** *sap-id* — Specifies the physical port identifier portion of the SAP definition. See [Common CLI Command Descriptions on page 1933](#) for command syntax.  
*ip-addr* — The IP address of the interface for which to display matching SAPs.  
**Values** 1.0.0.0 — 223.255.255.255  
*ip-int-name* — The IP interface name for which to display matching SAPs.  
**encap-type** *encap-type* — Displays the CEM encapsulation type.  
**Values** cem

**Output** **Show Service SAP** — The following table describes show service SAP output fields:

| Label   | Description                                         |
|---------|-----------------------------------------------------|
| Port ID | The ID of the access port where the SAP is defined. |

| Label    | Description (Continued)                                         |
|----------|-----------------------------------------------------------------|
| Svc ID   | The service identifier.                                         |
| Sap MTU  | The SAP MTU value.                                              |
| I.QoS    | The SAP ingress QoS policy number specified on the ingress SAP. |
| I.MAC/IP | The MAC or IP filter policy ID applied to the ingress SAP.      |
| E.QoS    | The SAP egress QoS policy number specified on the egress SAP.   |
| E.Mac/IP | The MAC or IP filter policy ID applied to the egress SAP.       |
| A.Pol    | The accounting policy ID assigned to the SAP.                   |
| Adm      | The administrative state of the SAP.                            |
| Opr      | The operational state of the SAP.                               |
| Alarm    | Specifies if alarms are enabled.                                |

**Sample Output**

```
*A:ALA-48# show service sap-using sap 1/1/21:0
=====
Service Access Points Using Port 1/1/21:0
=====
PortId SvcId Ing. Ing. Egr. Egr. Anti Adm Opr
 QoS Fltr QoS Fltr Spoof

1/1/21:0 1 1 none 1 none none Up Down

Number of SAPs : 1
=====
*A:ALA-48#

*A:sim213# show service sap-using encap-type cem
=====
Service Access Points Using Encap Type 'cem'
=====
PortId SvcId Adm Opr Alarm

1/5/1.1.1.1 100 Up Up No
1/5/1.2.1.1 200 Up Up No
1/5/1.2.2.1 200 Up Up No
1/5/1.1.3.1 210 Up Up No
1/5/1.1.2.1 220 Up Down No
1/5/1.3.4.1 300 Up Up No
1/5/1.3.6.1 300 Up Up No
1/5/1.2.3.1 400 Up Up No
1/5/1.3.1.1 500 Up Up No
1/5/1.3.2.1 500 Up Up No
1/5/1.1.1.7 501 Up Up No
1/5/1.3.1.2 10100 Up Down No

Number of SAPS : 12

*A:sim213#
```

# sdp

- Syntax** **sdp** [*sdp-id* | **far-end** *ip-address*] [**detail** | **keep-alive-history**]
- Context** show>service
- Description** This command displays SDP information.  
If no optional parameters are specified, a summary SDP output for all SDPs is displayed.
- Parameters** *sdp-id* — The SDP ID for which to display information.

**Default** All SDPs.  
**Values** 1 — 17407

*far-end ip-address* — Displays only SDPs matching with the specified far-end IP address.

**Default** SDPs with any far-end IP address.

**detail** — Displays detailed SDP information.

**Default** SDP summary output.

**keep-alive-history** — Displays the last fifty SDP keepalive events for the SDP.

**Default** SDP summary output.
- Output** **Show Service SDP** — The following table describes show service SDP output fields:

| Label               | Description                                                                                                                                                                 |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDP Id              | The SDP identifier.                                                                                                                                                         |
| Adm MTU             | Specifies the desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Opr MTU             | Specifies the actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.  |
| IP address          | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                   |
| Adm<br>Admin State  | Specifies the desired state of the SDP.                                                                                                                                     |
| Opr<br>Oper State   | Specifies the operating state of the SDP.                                                                                                                                   |
| Deliver<br>Delivery | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                |
| Flags               | Specifies all the conditions that affect the operating status of this SDP.                                                                                                  |
| Signal<br>Signaling | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                           |
| Last Status Change  | Specifies the time of the most recent operating status change to this SDP.                                                                                                  |

| Label               | Description (Continued)                                                                                                                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last Mgmt Change    | Specifies the time of the most recent management-initiated change to this SDP.                                                                                                                                                                                                       |
| Number of SDPs      | Specifies the total number of SDPs displayed according to the criteria specified.                                                                                                                                                                                                    |
| Hello Time          | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                       |
| Number of SDPs      | Specifies the total number of SDPs displayed according to the criteria specified.                                                                                                                                                                                                    |
| Hello Time          | Specifies how often the SDP echo request messages are transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Msg Len       | Specifies the length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Timeout       | Specifies the number of seconds to wait for an SDP echo response message before declaring a timeout.                                                                                                                                                                                 |
| Unmatched Replies   | Specifies the number of SDP unmatched message replies.                                                                                                                                                                                                                               |
| Max Drop Count      | Specifies the maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                      |
| Hold Down Time      | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                     |
| TX Hello Msgs       | Specifies the number of SDP echo request messages transmitted since the keepalive was administratively enabled or the counter was cleared.                                                                                                                                           |
| Rx Hello Msgs       | Specifies the number of SDP echo request messages received since the keepalive was administratively enabled or the counter was cleared.                                                                                                                                              |
| Associated LSP List | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far end field.<br>If the SDP type is GRE, then the following message displays:<br>SDP Delivery Mechanism is not MPLS |

### Sample Output

```
*A:ALA-12# show service sdp
```

## sdp-using

|                    |                                                                        |
|--------------------|------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp-using</b> [ <i>sdp-id[:vc-id]</i>   far-end <i>ip-address</i> ] |
| <b>Context</b>     | show>service                                                           |
| <b>Description</b> | Display services using SDP or far-end address options.                 |

**Parameters** *sdp-id* — Displays only services bound to the specified SDP ID.

**Values** 1 — 17407

*vc-id* — The virtual circuit identifier.

**Values** 1 — 4294967295

**far-end ip-address** — Displays only services matching with the specified far-end IP address.

**Default** Services with any far-end IP address.

**Output** **Show Service SDP Using X** — The following table describes show service sdp-using output fields.

| Label         | Description                                                                                      |
|---------------|--------------------------------------------------------------------------------------------------|
| Svc ID        | The service identifier.                                                                          |
| Sdp ID        | The SDP identifier.                                                                              |
| Type          | Type of SDP: spoke or mesh.                                                                      |
| Far End       | The far-end address of the SDP.                                                                  |
| Oper State    | The operational state of the service.                                                            |
| Ingress Label | The label used by the far-end device to send packets to this device in this service by this SDP. |
| Egress Label  | The label used by this device to send packets to the far-end device in this service by this SDP. |

### Sample Output

```
*A:ALA-1# show service sdp-using 300
=====
Service Destination Point (Sdp Id : 300)
=====
SvcId SdpId Type Far End Opr State I.Label E.Label

1 300:1 Mesh 10.0.0.13 Up 131071 131071
2 300:2 Spok 10.0.0.13 Up 131070 131070
100 300:100 Mesh 10.0.0.13 Up 131069 131069
101 300:101 Mesh 10.0.0.13 Up 131068 131068
102 300:102 Mesh 10.0.0.13 Up 131067 131067

Number of SDPs : 5

*A:ALA-1#
```

## service-using

**Syntax** **service-using** [**epipe**] [**ies**] [**vpls**] [**vprn**] [**mirror**] [**apipe**] [**fpipe**] [**ipipe**] [**cpipe**] [**b-vpls**] [**i-vpls**] [**m-vpls**] [**sdp sdp-id**] [**customer customer-id**]

- Context** show>service
- Description** Displays the services matching certain usage properties.  
If no optional parameters are specified, all services defined on the system are displayed.
- Parameters**
- [service]** — Displays specified service information.
  - b-vpls** — Specifies the B-component instance of the Provider Backbone Bridging (PBB/IEEE 802.1ah) feature. It represents the multi-point tunneling component that multiplexes multiple customer VPNs (ISIDs) together. It is similar to a regular VPLS instance that operates on the backbone MAC addresses.
  - i-vpls** — Specifies the I-component instance of the Provider Backbone Bridging (PBB/IEEE 802.1ah) feature. It identifies the specific VPN entity associated to a customer multipoint (ELAN) service. It is similar to a regular VPLS instance that operates on the customer MAC addresses.
  - m-vpls** — Specifies the M-component (managed VPLS) instance of the Provider Backbone Bridging (PBB/IEEE 802.1ah) feature.
  - sdp sdp-id** — Displays only services bound to the specified SDP ID.
    - Default** Services bound to any SDP ID.
    - Values** 1 — 17407
  - customer customer-id** — Displays services only associated with the specified customer ID.
    - Default** Services associated with any customer.
    - Values** 1 — 2147483647
- Output** **Show Service Service-Using** — The following table describes show service service-using output fields:

| Label            | Description                                                                       |
|------------------|-----------------------------------------------------------------------------------|
| Service Id       | The service identifier.                                                           |
| Type             | Specifies the service type configured for the service ID.                         |
| Adm              | The administrative state of the service.                                          |
| Opr              | The operational state of the service.                                             |
| CustomerId       | The ID of the customer who owns this service.                                     |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this service. |

### Sample Output

```
A:sim216# show service service-using cpipe
=====
Services
=====
ServiceId Type Adm Opr CustomerId Last Mgmt Change

100 Cpipe Up Up 1 10/31/2006 14:22:51
```

```

300 Cpipe Up Up 1 10/31/2006 14:22:51

Matching Services : 2

A:sim216#

```

## id

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i> { <b>all</b>   <b>arp</b>   <b>base</b>   <b>endpoint</b>   <b>fdb</b>   <b>interface</b>   <b>labels</b>   <b>sap</b>   <b>sdp</b>   <b>split-horizon-group</b>   <b>stp</b> }                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | show>service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | Display information for a particular service-id.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Parameters</b>  | <i>service-id</i> — The service identification number that identifies the service in the domain.<br><b>all</b> — Display detailed information about the service.<br><b>arp</b> — Display ARP entries for the service.<br><b>base</b> — Display basic service information.<br><b>endpoint</b> — Display service endpoint information.<br><b>fdb</b> — Display FDB entries.<br><b>interface</b> — Display service interfaces.<br><b>labels</b> — Display labels being used by this service.<br><b>sap</b> — Display SAPs associated to the service.<br><b>sdp</b> — Display SDPs associated with the service.<br><b>split-horizon-group</b> — Display split horizon group information.<br><b>stp</b> — Display STP information. |

## authentication

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | authentication                                                                     |
| <b>Context</b>     | show>service>id                                                                    |
| <b>Description</b> | This command enables the context to display subscriber authentication information. |

## statistics

|                    |                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b> [ <i>policy name</i> ] [ <b>sap</b> <i>sap-id</i> ]                      |
| <b>Context</b>     | show>service>id>authentication                                                             |
| <b>Description</b> | Displays session authentication statistics for this service.                               |
| <b>Parameters</b>  | <i>policy name</i> — Specifies the subscriber authentication policy statistics to display. |

**sap sap-id** — Specifies the SAP ID statistics to display. See [Common CLI Command Descriptions on page 1933](#) for command syntax.

all

|                    |                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>all</b>                                                                                                       |
| <b>Context</b>     | show>service>id                                                                                                  |
| <b>Description</b> | Displays detailed information for all aspects of the service.                                                    |
| <b>Output</b>      | <b>Show All Service-ID Output</b> — The following table describes the show all service-id command output fields: |

| Label               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id          | The service identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| VPN Id              | The number which identifies the VPN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Service Type        | Specifies the type of service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| VLL Type            | Specifies the VLL type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| SDP Id              | The SDP identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Description         | Generic information about the service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Customer Id         | The customer identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Last Mgmt Change    | The date and time of the most recent management-initiated change                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Flags               | Specifies the conditions that affect the operating status of this SAP. Display output includes: ServiceAdminDown, SapAdminDown, InterfaceAdminDown, PortOperDown, PortMTUTooSmall, L2OperDown, SapIngressQoSMismatch, SapEgressQoSMismatch,RelearnLimitExceeded, RxProtSrcMac, ParentIfAdminDown, NoSapIpipeCelpAddr, TodResourceUnavail, TodMssResourceUnavail, SapParamMismatch, CemSapNoEcidOrMacAddr, StandByForMcRing, ServiceMTUTooSmall, SapIngressNamedPoolMismatch, SapEgressNamedPoolMismatch, NoSapEpipeRingNode. |
| SAP Count           | The number of SAPs specified for this service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| SDP Bind Count      | The number of SDPs bound to this service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Split Horizon Group | Name of the split horizon group for this service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Description         | Description of the split horizon group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Last Changed        | The date and time of the most recent management-initiated change to this split horizon group.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SDP Id              | The SDP identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



| Label                  | Description (Continued)                                                                                                                                                                                                                                                              |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                   | Indicates whether this Service SDP binding is a spoke or a mesh.                                                                                                                                                                                                                     |
| Admin Path MTU         | The desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.                                                                                                                    |
| Oper Path MTU          | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.                                                                                                                     |
| Delivery               | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                                                                                                                         |
| Admin State            | The administrative state of this SDP.                                                                                                                                                                                                                                                |
| Oper State             | The operational state of this SDP.                                                                                                                                                                                                                                                   |
| Ingress Label          | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                                                                                                                                     |
| Egress Label           | The label used by this device to send packets to the far-end device in this service by this SDP.                                                                                                                                                                                     |
| Ingress Filter         | The ID of the ingress filter policy.                                                                                                                                                                                                                                                 |
| Egress Filter          | The ID of the egress filter policy.                                                                                                                                                                                                                                                  |
| Far End                | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                                                                                                                            |
| Last Changed           | The date and time of the most recent change to this customer.                                                                                                                                                                                                                        |
| Signaling              | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on this SDP.                                                                                                                                                   |
| Admin State            | Specifies the admin. state of the keepalive protocol.                                                                                                                                                                                                                                |
| Oper State             | Specifies the operational state of the keepalive protocol.                                                                                                                                                                                                                           |
| Hello Time             | Specifies how often the SDP Echo Request messages are transmitted on this SDP.                                                                                                                                                                                                       |
| Hello Msg Len          | Specifies the length of the SDP Echo Request messages transmitted on this SDP.                                                                                                                                                                                                       |
| Max Drop Count         | Specifies the maximum number of consecutive SDP Echo Request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                      |
| Hold Down Time         | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                     |
| SDP Delivery Mechanism | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the Far End field.<br>If the SDP type is GRE, then the following message displays:<br>SDP Delivery Mechanism is not MPLS |

| Label                 | Description (Continued)                                                                                                                                           |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of SDPs        | The total number SDPs applied to this service ID.                                                                                                                 |
| Service Id            | The service identifier.                                                                                                                                           |
| Port Id               | The ID of the access port where this SAP is defined.                                                                                                              |
| Description           | Generic information about the SAP.                                                                                                                                |
| Encap Value           | The value of the label used to identify this SAP on the access port.                                                                                              |
| Admin State           | The desired state of the SAP.                                                                                                                                     |
| Oper State            | The operating state of the SAP.                                                                                                                                   |
| Last Changed          | The date and time of the last change.                                                                                                                             |
| Admin MTU             | The desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented. |
| Oper MTU              | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.  |
| Ingress qos-policy    | The SAP ingress QoS policy ID.                                                                                                                                    |
| Egress qos-policy     | The SAP egress QoS policy ID.                                                                                                                                     |
| Ingress Filter-Id     | The SAP ingress filter policy ID.                                                                                                                                 |
| Egress Filter-Id      | The SAP egress filter policy ID.                                                                                                                                  |
| Multi Svc Site        | Indicates the multi-service site that the SAP is a member of.                                                                                                     |
| Ingress sched-policy  | Indicates the ingress QoS scheduler for the SAP.                                                                                                                  |
| Egress sched-policy   | Indicates the egress QoS scheduler for the SAP.                                                                                                                   |
| Acct. Pol             | Indicates the accounting policy applied to the SAP.                                                                                                               |
| Collect Stats         | Specifies whether accounting statistics are collected on the SAP.                                                                                                 |
| Dropped               | The number of packets or octets dropped.                                                                                                                          |
| Offered Hi Priority   | The number of high priority packets, as determined by the SAP ingress QoS policy.                                                                                 |
| Offered Low Priority  | The number of low priority packets, as determined by the SAP ingress QoS policy.                                                                                  |
| Forwarded In Profile  | The number of in-profile packets or octets (rate below CIR) forwarded.                                                                                            |
| Forwarded Out Profile | The number of out-of-profile packets or octets (rate above CIR) forwarded.                                                                                        |

| Label                 | Description (Continued)                                                                    |
|-----------------------|--------------------------------------------------------------------------------------------|
| Dropped In Profile    | The number of in-profile packets or octets discarded.                                      |
| Dropped Out Profile   | The number of out-of-profile packets or octets discarded.                                  |
| Forwarded In Profile  | The number of in-profile packets or octets (rate below CIR) forwarded.                     |
| Forwarded Out Profile | The number of out-of-profile packets or octets (rate above CIR) forwarded.                 |
| Ingress Queue 1       | The index of the ingress QoS queue of this SAP.                                            |
| High priority offered | The packets or octets count of the high priority traffic for the SAP.                      |
| High priority dropped | The number of high priority traffic packets/octets dropped.                                |
| Low priority offered  | The packets or octets count of the low priority traffic.                                   |
| Low priority dropped  | The number of low priority traffic packets/octets dropped.                                 |
| In profile forwarded  | The number of in-profile packets or octets (rate below CIR) forwarded.                     |
| Out profile forwarded | The number of out-of-profile octets (rate above CIR) forwarded.                            |
| Egress Queue 1        | The index of the egress QoS queue of the SAP.                                              |
| In profile forwarded  | The number of in-profile packets or octets (rate below CIR) forwarded.                     |
| In profile dropped    | The number of in-profile packets or octets dropped for the SAP.                            |
| Out profile forwarded | The number of out-of-profile packets or octets (rate above CIR) forwarded.                 |
| Out profile dropped   | The number of out-of-profile packets or octets discarded.                                  |
| State                 | Specifies whether DHCP relay is enabled on this SAP.                                       |
| Info Option           | Specifies whether Option 82 processing is enabled on this SAP.                             |
| Action                | Specifies the Option 82 processing on this SAP or interface: keep, replace or drop.        |
| Circuit ID            | Specifies whether the If Index is inserted in Circuit ID sub-option of Option 82.          |
| Remote ID             | Specifies whether the far-end MAC address is inserted in Remote ID sub-option of Option 82 |
| Managed by Service    | Specifies the service-id of the management VPLS managing this SAP.                         |
| Managed by SAP        | Specifies the sap-id inside the management VPLS managing this SAP.                         |

| Label              | Description (Continued)                                                  |
|--------------------|--------------------------------------------------------------------------|
| Prune state        | Specifies the STP state inherited from the management VPLS.              |
| Managed by Service | Specifies the service-id of the management VPLS managing this spoke SDP. |
| Managed by Spoke   | Specifies the sap-id inside the management VPLS managing this spoke SDP. |
| Prune state        | Specifies the STP state inherited from the management VPLS.              |

### Sample Output

This example shows a remote Cpipe configuration (1 local SAP and SDP).

```
A:sim216# show service id 100 all
=====
Service Detailed Information
=====
Service Id : 100 Vpn Id : 0
Service Type : Cpipe VLL Type : CESoPSN
Customer Id : 1
Last Status Change: 10/31/2006 14:23:25
Last Mgmt Change : 10/31/2006 14:22:51
Admin State : Up Oper State : Up
MTU : 4108
SAP Count : 1 SDP Bind Count : 1

Service Destination Points (SDPs)

Sdp Id 1:100 - (2.2.2.2)

SDP Id : 1:100 Type : Spoke
VC Type : CESoPSN VC Tag : 0
Admin Path MTU : 0 Oper Path MTU : 4490
Far End : 2.2.2.2 Delivery : MPLS

Admin State : Up Oper State : Up
Acct. Pol : None Collect Stats : Disabled
Ingress Label : 131070 Egress Label : 131069
Ing mac Fltr : n/a Egr mac Fltr : n/a
Ing ip Fltr : n/a Egr ip Fltr : n/a
Admin ControlWord : Preferred Oper ControlWord : True
Last Status Change : 10/31/2006 14:23:25
Last Mgmt Change : 10/31/2006 14:22:51
Flags : None
Peer Pw Bits : lacIngressFault lacEgressFault
Peer Vccv CV Bits : lspPing
Peer Vccv CC Bits : pwe3ControlWord mplsRouterAlertLabel
MAC Pinning : Disabled

KeepAlive Information :
Admin State : Disabled Oper State : Disabled
Hello Time : 10 Hello Msg Len : 0
Max Drop Count : 3 Hold Down Time : 10

Statistics :
I. Fwd. Pkts. : 0 I. Dro. Pkts. : 0
I. Fwd. Octs. : 0 I. Dro. Octs. : 0
```

```

E. Fwd. Pkts. : 0 E. Fwd. Octets : 0

Associated LSP LIST :
Lsp Name : lsp-1
Admin State : Up Oper State : Up
Time Since Last Tr*: 00h06m42s

Class-based forwarding :

Class forwarding : disabled

CPIPE Service Destination Point specifics

Local Speed : 768 Peer Speed : 768
Local Payload Size : 96 Peer Payload Size : 96
Local Sig Pkts : No Sig. Peer Sig Pkts : No Sig.
Local CAS Framing : No CAS Peer CAS Framing : No CAS
Local RTP Header : No Peer RTP Header : No

Number of SDPs : 1

Service Access Points

SAP 1/5/1.1.1.1

Service Id : 100
SAP : 1/5/1.1.1.1 Encap : cem
Admin State : Up Oper State : Up
Flags : None
Last Status Change : 10/31/2006 14:23:12
Last Mgmt Change : 10/31/2006 14:22:51
Admin MTU : 4112
Ingress qos-policy : 1 Oper MTU : 4112
Shared Q plcy : n/a Egress qos-policy : 1
Ingr IP Fltr-Id : n/a Multipoint shared : Disabled
Ingr Mac Fltr-Id : n/a Egr IP Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a Egr Mac Fltr-Id : n/a
tod-suite : None Egr IPv6 Fltr-Id : n/a
Egr Agg Rate Limit : max qinq-pbit-marking : both

Multi Svc Site : None
Acct. Pol : None Collect Stats : Disabled

Sap Statistics

Last Cleared Time : N/A
 Packets Octets
Forwarding Engine Stats
Dropped : 1 36
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0
Queueing Stats(Ingress QoS Policy 1)
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

```

```

Sap per Queue stats

 Packets Octets
Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Ingress Queue 11 (Multipoint) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0
Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0

CEM SAP Configuration Information

Endpoint Type : NxDS0 Bit-rate : 12
Payload Size : 96 Jitter Buffer : 5
Use RTP Header : No CAS Trunk Framing : No CAS
Payload Fill Type : All Ones Payload Pattern : n/a

Cfg Alarm : stray malformed pktloss overrun rpktloss rfault rrdr
Alarm Status :
=====
A:sim216#

```

This example shows a local Cpipe configuration (2 SAPs).

```

A:sim216# show service id 300 all
=====
Service Detailed Information
=====
Service Id : 300 Vpn Id : 0
Service Type : Cpipe VLL Type : CESoPSN
Customer Id : 1
Last Status Change: 10/31/2006 14:23:12
Last Mgmt Change : 10/31/2006 14:22:51
Admin State : Up Oper State : Up
MTU : 4000
SAP Count : 2 SDP Bind Count : 0

Service Destination Points(SDPs)

No Matching Entries

Service Access Points

SAP 1/5/1.1.2.1

Service Id : 300
SAP : 1/5/1.1.2.1 Encap : cem

```

|                    |                       |                   |            |
|--------------------|-----------------------|-------------------|------------|
| Admin State        | : Up                  | Oper State        | : Up       |
| Flags              | : None                |                   |            |
| Last Status Change | : 10/31/2006 14:23:12 |                   |            |
| Last Mgmt Change   | : 10/31/2006 14:22:51 |                   |            |
| Admin MTU          | : 4112                | Oper MTU          | : 4112     |
| Ingress qos-policy | : 1                   | Egress qos-policy | : 1        |
| Shared Q plcy      | : n/a                 | Multipoint shared | : Disabled |
| Ingr IP Fltr-Id    | : n/a                 | Egr IP Fltr-Id    | : n/a      |
| Ingr Mac Fltr-Id   | : n/a                 | Egr Mac Fltr-Id   | : n/a      |
| Ingr IPv6 Fltr-Id  | : n/a                 | Egr IPv6 Fltr-Id  | : n/a      |
| tod-suite          | : None                | qinq-pbit-marking | : both     |
| Egr Agg Rate Limit | : max                 |                   |            |
| Multi Svc Site     | : None                |                   |            |
| Acct. Pol          | : None                | Collect Stats     | : Disabled |

#### Sap Statistics

|                                      |         |  |        |
|--------------------------------------|---------|--|--------|
| Last Cleared Time                    | : N/A   |  |        |
|                                      | Packets |  | Octets |
| Forwarding Engine Stats              |         |  |        |
| Dropped                              | : 0     |  | 0      |
| Off. HiPrio                          | : 0     |  | 0      |
| Off. LowPrio                         | : 0     |  | 0      |
| Off. Uncolor                         | : 0     |  | 0      |
| Queueing Stats(Ingress QoS Policy 1) |         |  |        |
| Dro. HiPrio                          | : 0     |  | 0      |
| Dro. LowPrio                         | : 0     |  | 0      |
| For. InProf                          | : 0     |  | 0      |
| For. OutProf                         | : 0     |  | 0      |
| Queueing Stats(Egress QoS Policy 1)  |         |  |        |
| Dro. InProf                          | : 0     |  | 0      |
| Dro. OutProf                         | : 0     |  | 0      |
| For. InProf                          | : 0     |  | 0      |
| For. OutProf                         | : 0     |  | 0      |

#### Sap per Queue stats

|                                          |         |  |        |
|------------------------------------------|---------|--|--------|
|                                          | Packets |  | Octets |
| Ingress Queue 1 (Unicast) (Priority)     |         |  |        |
| Off. HiPrio                              | : 0     |  | 0      |
| Off. LoPrio                              | : 0     |  | 0      |
| Dro. HiPrio                              | : 0     |  | 0      |
| Dro. LoPrio                              | : 0     |  | 0      |
| For. InProf                              | : 0     |  | 0      |
| For. OutProf                             | : 0     |  | 0      |
| Ingress Queue 11 (Multipoint) (Priority) |         |  |        |
| Off. HiPrio                              | : 0     |  | 0      |
| Off. LoPrio                              | : 0     |  | 0      |
| Dro. HiPrio                              | : 0     |  | 0      |
| Dro. LoPrio                              | : 0     |  | 0      |
| For. InProf                              | : 0     |  | 0      |
| For. OutProf                             | : 0     |  | 0      |
| Egress Queue 1                           |         |  |        |
| For. InProf                              | : 0     |  | 0      |
| For. OutProf                             | : 0     |  | 0      |
| Dro. InProf                              | : 0     |  | 0      |
| Dro. OutProf                             | : 0     |  | 0      |

CEM SAP Configuration Information

```

Endpoint Type : NxDS0 Speed : 768
Payload Size : 96 Jitter Buffer : 5
Use RTP Header : No CAS Trunk Framing : No CAS
Idle Fill Type : All Ones Idle Pattern : n/a

SAP 1/5/1.1.3.1

Service Id : 300
SAP : 1/5/1.1.3.1 Encap : cem

Admin State : Up Oper State : Up
Flags : None
Last Status Change : 10/31/2006 14:23:12
Last Mgmt Change : 10/31/2006 14:22:51
Admin MTU : 4112 Oper MTU : 4112
Ingress qos-policy : 1 Egress qos-policy : 1
Shared Q plcy : n/a Multipoint shared : Disabled
Ingr IP Fltr-Id : n/a Egr IP Fltr-Id : n/a
Ingr Mac Fltr-Id : n/a Egr Mac Fltr-Id : n/a
Ingr IPv6 Fltr-Id : n/a Egr IPv6 Fltr-Id : n/a
tod-suite : None qinq-pbit-marking : both
Egr Agg Rate Limit : max

Multi Svc Site : None
Acct. Pol : None Collect Stats : Disabled

Sap Statistics

Last Cleared Time : N/A
 Packets Octets

Forwarding Engine Stats
Dropped : 0 0
Off. HiPrio : 0 0
Off. LowPrio : 0 0
Off. Uncolor : 0 0

Queueing Stats(Ingress QoS Policy 1)
Dro. HiPrio : 0 0
Dro. LowPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Queueing Stats(Egress QoS Policy 1)
Dro. InProf : 0 0
Dro. OutProf : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Sap per Queue stats

 Packets Octets

Ingress Queue 1 (Unicast) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0
Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Ingress Queue 11 (Multipoint) (Priority)
Off. HiPrio : 0 0
Off. LoPrio : 0 0

```



```

Dro. HiPrio : 0 0
Dro. LoPrio : 0 0
For. InProf : 0 0
For. OutProf : 0 0

Egress Queue 1
For. InProf : 0 0
For. OutProf : 0 0
Dro. InProf : 0 0
Dro. OutProf : 0 0

CEM SAP Configuration Information

Endpoint Type : NxDS0 Speed : 768
Payload Size : 96 Jitter Buffer : 5
Use RTP Header : No CAS Trunk Framing : No CAS
Idle Fill Type : All Ones Idle Pattern : n/a
=====
A:sim216#

```

## base

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>base</b>                                                                                         |
| <b>Context</b>     | show>service>id                                                                                     |
| <b>Description</b> | Displays basic information about the service ID including service type, description, SAPs and SDPs. |
| <b>Output</b>      | <b>Show Service-ID Base</b> — The following table describes show service-id base output fields:     |

| Label            | Description                                                                                                                                                    |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id       | The service identifier.                                                                                                                                        |
| Vpn Id           | Specifies the VPN ID assigned to the service.                                                                                                                  |
| Service Type     | Specifies the type of service.                                                                                                                                 |
| Description      | Generic information about the service.                                                                                                                         |
| Customer Id      | The customer identifier.                                                                                                                                       |
| Last Mgmt Change | The date and time of the most recent management-initiated change to this customer.                                                                             |
| Adm              | The administrative state of the service.                                                                                                                       |
| Oper             | The operational state of the service.                                                                                                                          |
| Mtu              | The largest frame size (in octets) that the service can handle.                                                                                                |
| Def. Mesh VC Id  | This object is only valid in services that accept mesh SDP bindings. It is used to validate the VC ID portion of each mesh SDP binding defined in the service. |
| SAP Count        | The number of SAPs defined on the service.                                                                                                                     |

| Label          | Description (Continued)                                                                                                                                                  |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDP Bind Count | The number of SDPs bound to the service.                                                                                                                                 |
| Identifier     | Specifies the service access (SAP) and destination (SDP) points.                                                                                                         |
| Type           | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on the SDP.                                        |
| AdmMTU         | Specifies the desired largest service frame size (in octets) that can be transmitted through this SDP to the far-end ESR, without requiring the packet to be fragmented. |
| OprMTU         | Specifies the actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end ESR, without requiring the packet to be fragmented.  |
| Opr            | The operating state of the SDP.                                                                                                                                          |

## endpoint

|                    |                                                                                    |
|--------------------|------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>endpoint</b> [ <i>endpoint-name</i> ]                                           |
| <b>Context</b>     | show>service>id                                                                    |
| <b>Description</b> | This command displays service endpoint information.                                |
| <b>Parameters</b>  | <i>endpoint-name</i> — Specifies the name of an existing endpoint for the service. |

## labels

|                    |                                                                                                     |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>labels</b>                                                                                       |
| <b>Context</b>     | show>service>id                                                                                     |
| <b>Description</b> | Displays the labels being used by the service.                                                      |
| <b>Output</b>      | <b>Show Service-ID Labels</b> — The following table describes show service-id labels output fields: |

| Label  | Description                                                                                        |
|--------|----------------------------------------------------------------------------------------------------|
| Svc Id | The service identifier.                                                                            |
| Sdp Id | The SDP identifier.                                                                                |
| Type   | Indicates whether the SDP is a spoke or a mesh.                                                    |
| I. Lbl | The VC label used by the far-end device to send packets to this device in this service by the SDP. |

| Label  | Description (Continued)                                                                            |
|--------|----------------------------------------------------------------------------------------------------|
| E. Lbl | The VC label used by this device to send packets to the far-end device in this service by the SDP. |

## sap

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> [ <b>detail</b> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b> | This command displays information for the SAPs associated with the service. If no optional parameters are specified, a summary of all associated SAPs is displayed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Parameters</b>  | <p><i>sap-id</i> — The ID that displays SAPs for the service. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.</p> <p><b>interface</b> <i>interface-name</i> — Displays information for the specified IP interface.</p> <p><b>ip-address</b> <i>ip-address</i> — Displays information associated with the specified IP address.</p> <p><b>detail</b> — Displays detailed information.</p> <p><b>wholesaler</b> <i>service-id</i> — The VPRN service ID of the wholesaler. When specified in this context, SAP, SDP, interface, IP address and MAC parameters are ignored.</p> <p><b>Values</b>      1 — 2147483648</p> <p><b>detail</b> — Displays detailed information for the SAP.</p> |
| <b>Output</b>      | <b>Show Service-ID SAP</b> — The following table describes show service SAP fields:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Label       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Id  | The service identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SAP         | The SAP and qtag.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Encap       | The encapsulation type of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Ethertype   | Specifies an Ethernet type II Ether type value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Admin State | The administrative state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Oper State  | The operating state of the SAP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Flags       | Specifies the conditions that affect the operating status of this SAP. Display output includes: ServiceAdminDown, SapAdminDown, InterfaceAdminDown, PortOperDown, PortMTUTooSmall, L2OperDown, SapIngressQoSMismatch, SapEgressQoSMismatch, RelearnLimitExceeded, RxProtSrcMac, ParentIfAdminDown, NoSapIpipeCeIpAddr, TodResourceUnavail, TodMssResourceUnavail, SapParamMismatch, CemSapNoEcidOrMacAddr, StandByForMcRing, ServiceMTUTooSmall, SapIngressNamedPoolMismatch, SapEgressNamedPoolMismatch, NoSapEpipeRingNode. |

| Label              | Description (Continued)                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last Status Change | The time of the most recent operating status change to this SAP.                                                                                                         |
| Last Mgmt Change   | The time of the most recent management-initiated change to this SAP.                                                                                                     |
| Admin MTU          | The desired largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented.         |
| Oper MTU           | The actual largest service frame size (in octets) that can be transmitted through the SAP to the far-end router, without requiring the packet to be fragmented.          |
| Ingress qos-policy | The ingress QoS policy ID assigned to the SAP.                                                                                                                           |
| Egress qos-policy  | The egress QoS policy ID assigned to the SAP.                                                                                                                            |
| Ingress Filter-Id  | The ingress filter policy ID assigned to the SAP.                                                                                                                        |
| Egress Filter-Id   | The egress filter policy ID assigned to the SAP.                                                                                                                         |
| Acct. Pol          | The accounting policy ID assigned to the SAP.                                                                                                                            |
| Collect Stats      | Specifies whether collect stats is enabled.                                                                                                                              |
| Dropped            | The number of packets and octets dropped due to SAP state, ingress MAC or IP filter, same segment discard, bad checksum, etc.                                            |
| Off. HiPrio        | The number of high priority packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                          |
| Off. LowPrio       | The number of low priority packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                           |
| Off. Uncolor       | The number of uncolored packets and octets, as determined by the SAP ingress QoS policy, offered by the Pchip to the Qchip.                                              |
| Dro. HiPrio        | The number of high priority packets and octets, as determined by the SAP ingress QoS policy, dropped by the Qchip due to: MBS exceeded, buffer pool limit exceeded, etc. |
| Dro LowPrio        | The number of low priority packets and octets, as determined by the SAP ingress QoS policy, dropped by the Qchip due to: MBS exceeded, buffer pool limit exceeded, etc.  |
| For. InProf        | The number of in-profile packets and octets (rate below CIR) forwarded by the ingress Qchip.                                                                             |
| For. OutProf       | The number of out-of-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                      |
| Dro. InProf        | The number of in-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                          |
| Dro. OutProf       | The number of out-of-profile packets and octets discarded by the egress Qchip due to MBS exceeded, buffer pool limit exceeded, etc.                                      |

| Label               | Description (Continued)                                                                         |
|---------------------|-------------------------------------------------------------------------------------------------|
| For. InProf         | The number of in-profile packets and octets (rate below CIR) forwarded by the egress Qchip.     |
| For. OutProf        | The number of out-of-profile packets and octets (rate above CIR) forwarded by the egress Qchip. |
| Ingress TD Profile  | The profile ID applied to the ingress SAP.                                                      |
| Egress TD Profile   | The profile ID applied to the egress SAP.                                                       |
| Alarm Cell Handling | The indication that OAM cells are being processed.                                              |
| AAL-5 Encap         | The AAL-5 encapsulation type.                                                                   |

## sdp

|                    |                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp</b> [ <i>sdp-id</i>   <b>far-end</b> <i>ip-addr</i> ] [ <b>detail</b> ]                                                                                                                                                                                                                                                                                   |
| <b>Context</b>     | show>service>id                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b> | Displays information for the SDPs associated with the service.<br>If no optional parameters are specified, a summary of all associated SDPs is displayed.                                                                                                                                                                                                        |
| <b>Parameters</b>  | <p><i>sdp-id</i> — Displays only information for the specified SDP ID.</p> <p><b>Default</b> All SDPs.</p> <p><b>Values</b> 1 — 17407</p> <p><b>far-end</b> <i>ip-addr</i> — Displays only SDPs matching the specified far-end IP address.</p> <p><b>Default</b> SDPs with any far-end IP address.</p> <p><b>detail</b> — Displays detailed SDP information.</p> |
| <b>Output</b>      | <b>Show Service-ID SDP</b> — The following table describes show service-id SDP output fields:                                                                                                                                                                                                                                                                    |

| Label               | Description                                                                                                                                                                  |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sdp Id              | The SDP identifier.                                                                                                                                                          |
| Type                | Indicates whether the SDP is a spoke or a mesh.                                                                                                                              |
| Split Horizon Group | Name of the split horizon group that the SDP belongs to.                                                                                                                     |
| VC Tag              | The explicit dot1Q value used when encapsulating to the SDP far end.                                                                                                         |
| I. Lbl              | The VC label used by the far-end device to send packets to this device in this service by the SDP.                                                                           |
| Admin Path MTU      | The operating path MTU of the SDP is equal to the admin path MTU (when one is set) or the dynamically computed tunnel MTU, when no admin path MTU is set (the default case.) |

| Label               | Description (Continued)                                                                                                                                                                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oper Path MTU       | The actual largest service frame size (in octets) that can be transmitted through this SDP to the far-end router, without requiring the packet to be fragmented.                                                                                                                      |
| Far End             | Specifies the IP address of the remote end of the GRE or MPLS tunnel defined by this SDP.                                                                                                                                                                                             |
| Delivery            | Specifies the type of delivery used by the SDP: GRE or MPLS.                                                                                                                                                                                                                          |
| Admin State         | The administrative state of this SDP.                                                                                                                                                                                                                                                 |
| Oper State          | The operational state of this SDP.                                                                                                                                                                                                                                                    |
| Ingress Label       | The label used by the far-end device to send packets to this device in this service by this SDP.                                                                                                                                                                                      |
| Egress Label        | The label used by this device to send packets to the far-end device in this service by the SDP.                                                                                                                                                                                       |
| Last Changed        | The date and time of the most recent change to the SDP.                                                                                                                                                                                                                               |
| Signaling           | Specifies the signaling protocol used to obtain the ingress and egress labels used in frames transmitted and received on this SDP.                                                                                                                                                    |
| Admin State         | The administrative state of the Keepalive process.                                                                                                                                                                                                                                    |
| Oper State          | The operational state of the Keepalive process.                                                                                                                                                                                                                                       |
| Hello Time          | Transmission frequency of the SDP echo request messages.                                                                                                                                                                                                                              |
| Max Drop Count      | Specifies the maximum number of consecutive SDP echo request messages that can be unacknowledged before the keepalive protocol reports a fault.                                                                                                                                       |
| Hello Msg Len       | The length of the SDP echo request messages transmitted on this SDP.                                                                                                                                                                                                                  |
| Hold Down Time      | Specifies the amount of time to wait before the keepalive operating status is eligible to enter the alive state.                                                                                                                                                                      |
| I. Fwd. Pkts.       | Specifies the number of forwarded ingress packets.                                                                                                                                                                                                                                    |
| I. Dro. Pkts        | Specifies the number of dropped ingress packets.                                                                                                                                                                                                                                      |
| E. Fwd. Pkts.       | Specifies the number of forwarded egress packets.                                                                                                                                                                                                                                     |
| E. Fwd. Octets      | Specifies the number of forwarded egress octets.                                                                                                                                                                                                                                      |
| Associated LSP List | When the SDP type is MPLS, a list of LSPs used to reach the far-end router displays. All the LSPs in the list must terminate at the IP address specified in the far end field.<br>If the SDP type is GRE, then the following message displays:<br>SDP delivery mechanism is not MPLS. |

---

## CEM Clear Commands

### id

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                                                    |
| <b>Context</b>     | clear>service                                                                                  |
| <b>Description</b> | This command clears commands for a specific service.                                           |
| <b>Parameters</b>  | <i>service-id</i> — The ID that uniquely identifies a service.<br><b>Values</b> 1 — 2147483648 |

### statistics

|                    |                                                                                     |
|--------------------|-------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>statistics</b>                                                                   |
| <b>Context</b>     | clear>service                                                                       |
| <b>Description</b> | This command enables the context to clear statistics for a specific service entity. |

### id

|                    |                                                                                                |
|--------------------|------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>id</b> <i>service-id</i>                                                                    |
| <b>Context</b>     | clear>service<br>clear>service>statistics                                                      |
| <b>Description</b> | This command clears commands for a specific service.                                           |
| <b>Parameters</b>  | <i>service-id</i> — The ID that uniquely identifies a service.<br><b>Values</b> 1 — 2147483648 |

### sap

|                    |                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sap</b> <i>sap-id</i> { <b>all</b>   <b>counters</b>   <b>stp</b> }                                                                                                                                                                                                                                                   |
| <b>Context</b>     | clear>service>statistics                                                                                                                                                                                                                                                                                                 |
| <b>Description</b> | This command clears SAP statistics for a SAP.                                                                                                                                                                                                                                                                            |
| <b>Parameters</b>  | <i>sap-id</i> — Specifies the physical port identifier portion of the SAP definition. See <a href="#">Common CLI Command Descriptions on page 1933</a> for command syntax.<br><b>all</b> — Clears all SAP queue statistics and STP statistics.<br><b>counters</b> — Clears all queue statistics associated with the SAP. |

**stp** — Clears all STP statistics associated with the SAP.

## sdp

|                    |                                                                      |
|--------------------|----------------------------------------------------------------------|
| <b>Syntax</b>      | <b>sdp</b> <i>sdp-id</i> <b>keep-alive</b>                           |
| <b>Context</b>     | clear>service>statistics                                             |
| <b>Description</b> | This command clears keepalive statistics associated with the SDP ID. |
| <b>Parameters</b>  | <i>sdp-id</i> — The SDP ID for which to clear keepalive statistics.  |
| <b>Values</b>      | 1 — 17407                                                            |



# Common CLI Command Descriptions

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## In This Chapter

This section provides information about common Command Line Interface (CLI) syntax and command usage.

Topics in this chapter include:

- [SAP syntax on page 1934](#)

## Common Service Commands

### sap

**Syntax** [no] **sap** *sap-id*

**Description** This command specifies the physical port identifier portion of the SAP definition.

**Parameters** *sap-id* — Specifies the physical port identifier portion of the SAP definition.

The *sap-id* can be configured in one of the following formats:

| Type        | Syntax                                                                       | Example                                                                                                                                                                                                        |
|-------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| port-id     | <i>slot/mda/port[.channel]</i>                                               | 1/1/5                                                                                                                                                                                                          |
| null        | <i>[port-id   bundle-id   bpgrp-id   lag-id   aps-id]</i>                    | <i>port-id:</i> 1/1/3<br><i>bundle-id:</i> bundle-ppp-1/1.1<br><i>bpgrp-id:</i> bpgrp-ima-1<br><i>lag-id:</i> lag-3<br><i>aps-id:</i> aps-1                                                                    |
| dot1q       | <i>[port-id   bundle-id   bpgrp-id   lag-id   aps-id]:qtag1</i>              | <i>port-id:qtag1:</i> 1/1/3:100<br><i>bundle-id:</i> bundle-ppp-1/1.1<br><i>bpgrp-id:</i> bpgrp-ima-1<br><i>lag-id:qtag1:lag-3:</i> 102<br><i>aps-id:qtag1:</i> aps-1:27                                       |
| qinq        | <i>[port-id   bpgrp-id   lag-id]:qtag1.qtag2</i>                             | <i>port-id:qtag1.qtag2:</i> 1/1/3:100.10<br><i>bpgrp-id:</i> bpgrp-ima-1<br><i>lag-id:qtag1.qtag2:</i> lag-10:                                                                                                 |
| atm         | <i>[port-id   aps-id   bundle-id   bpgrp-id][:vpi/vci   vpi   vpi1.vpi2]</i> | <i>port-id:</i> 1/1/1<br><i>aps-id:</i> aps-1<br><i>bundle-id:</i> bundle-ima-1/1.1<br>bundle-ppp-1/1.1<br><i>bpgrp-id:</i> bpgrp-ima-1<br><i>vpi/vci:</i> 16/26<br><i>vpi:</i> 16<br><i>vpi1.vpi2:</i> 16.200 |
| frame-relay | <i>[port-id   aps-id]:dlci</i>                                               | <i>port-id:</i> 1/1/1:100<br><i>bundle-id:</i> bundle-fr-3/1.1:100<br><i>aps-id:</i> aps-1<br><i>dlci:</i> 16                                                                                                  |
| cisco-hdlc  | <i>slot/mda/port.channel</i>                                                 | <i>port-id:</i> 1/1/3.1                                                                                                                                                                                        |

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|                |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Values:</b> | <i>sap-id</i> | null [port-id   bundle-id   bpgrp-id   lag-id   aps-id]<br>dot1q [port-id   bundle-id   bpgrp-id   lag-id   aps-id]:qtag1<br>qinq [port-id   bundle-id   bpgrp-id   lag-id]:qtag1.qtag2<br>atm [port-id   aps-id][:vpi/vci vpi  vpi1.vpi2]<br>frame [port-id   aps-id]:dlci<br>cisco-hdlc slot/mda/port.channel<br>cem slot/mda/port.channel<br>ima-grp [bundle-id][:vpi/vci vpi vpi1.vpi2]<br>port-id slot/mda/port[.channel]<br>bundle-id bundle-type-slot/mda.bundle-num<br>bundle keyword<br>type ima, fr, ppp<br>bundle-num 1 — 336<br>bpgrp-id bpgrp-type-bpgrp-num<br>bpgrp keyword<br>type ima, ppp<br>bpgrp-num 1 — 2000<br>aps-id aps-group-id[.channel]<br>aps keyword<br>group-id 1 — 64<br>ccag-id ccag-id.path-id[cc-type]:cc-id<br>ccag keyword<br>id 1 — 8<br>path-id a, b<br>cc-type .sap-net, .net-sap<br>cc-id 0 — 4094<br>eth-tunnel eth-tunnel-id[:eth-tun-sap-id]<br>id 1 — 1024<br>eth-tun-sap-id 0 — 4094<br>lag-id lag-id<br>lag keyword<br>id 1 — 200<br>qtag1 0 — 4094<br>qtag2 *, 0 — 4094<br>vpi NNI: 0 — 4095<br>UNI: 0 — 255<br>vci 1, 2, 5 — 65535<br>dlci 16 — 1022<br>ipsec-id ipsec-id.[private   public]:tag<br>ipsec keyword<br>id 1 — 4<br>tag 0 — 4094 |
|----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

*bundle-id* — Specifies the multilink bundle to be associated with this IP interface. The **bundle** keyword must be entered at the beginning of the parameter.

The command syntax must be configured as follows:

*bundle-id:* **bundle-type-slot-id/mda-slot.bundle-num**  
*bundle-id* value range: 1 — 336

For example:

```
*A:ALA-12>config# port bundle-ppp-5/1.1
*A:ALA-12>config>port# multilink-bundle
```

*bpgrp-id* — Specifies the bundle protection group ID to be associated with this IP interface. The **bpgrp** keyword must be entered at the beginning of the parameter.

The command syntax must be configured as follows:

```
bpgrp-id: bpgrp-type-bpgrp-num
type: ima
bpgrp-num value range: 1 — 2000
```

For example:

```
*A:ALA-12>config# port bpgrp-ima-1
*A:ALA-12>config>service>vpls$ sap bpgrp-ima-1
```

*qtag1*, *qtag2* — Specifies the encapsulation value used to identify the SAP on the port or sub-port. If this parameter is not specifically defined, the default value is 0.

**Values**      qtag1:            \* | 0 — 4094  
                 qtag2 :        \* | 0 — 4094

The values depends on the encapsulation type configured for the interface. The following table describes the allowed values for the port and encapsulation types.

| Port Type        | Encap-Type  | Allowed Values                                                 | Comments                                                                                                                                    |
|------------------|-------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Ethernet         | Null        | 0                                                              | The SAP is identified by the port.                                                                                                          |
| Ethernet         | Dot1q       | 0 — 4094                                                       | The SAP is identified by the 802.1Q tag on the port. Note that a 0 qtag1 value also accepts untagged packets on the dot1q port.             |
| Ethernet         | QinQ        | qtag1: 0 — 4094<br>qtag2: 0 — 4094                             | The SAP is identified by two 802.1Q tags on the port. Note that a 0 qtag1 value also accepts untagged packets on the Dot1q port.            |
| SONET/SDH        | IPCP        | -                                                              | The SAP is identified by the channel. No BCP is deployed and all traffic is IP.                                                             |
| SONET/SDH<br>TDM | BCP-Null    | 0                                                              | The SAP is identified with a single service on the channel. Tags are assumed to be part of the customer packet and not a service delimiter. |
| SONET/SDH<br>TDM | BCP-Dot1q   | 0 — 4094                                                       | The SAP is identified by the 802.1Q tag on the channel.                                                                                     |
| SONET/SDH<br>TDM | Frame Relay | 16 — 991                                                       | The SAP is identified by the data link connection identifier (DLCI).                                                                        |
| SONET/SDH<br>ATM | ATM         | vpi (NNI) 0 — 4095<br>vpi (UNI) 0 — 255<br>vci 1, 2, 5 — 65535 | The SAP is identified by port or by PVPC or PVCC identifier (vpi, vpi/vci, or vpi range)                                                    |

**sap ipsec-*id*.private|public:*tag*** — This parameter associates an IPsec group SAP with this interface. This is the public side for an IPsec tunnel. Tunnels referencing this IPsec group in the private side may be created if their local IP is in the subnet of the interface subnet and the routing context specified matches with the one of the interface.

This context will provide a SAP to the tunnel. The operator may associate an ingress and egress QoS policies as well as filters and virtual scheduling contexts. Internally this creates an Ethernet SAP that will be used to send and receive encrypted traffic to and from the MDA. Multiple tunnels can be associated with this SAP. The “tag” will be a dot1q value. The operator may see it as an identifier. The range is limited to 1 — 4095.



# Standards and Protocol Support

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## Standards Compliance

IEEE 802.1ab-REV/D3 Station and Media Access Control Connectivity Discovery  
IEEE 802.1d Bridging  
IEEE 802.1p/Q VLAN Tagging  
IEEE 802.1s Multiple Spanning Tree  
IEEE 802.1w Rapid Spanning Tree Protocol  
IEEE 802.1x Port Based Network Access Control  
IEEE 802.1ad Provider Bridges  
IEEE 802.1ah Provider Backbone Bridges  
IEEE 802.1ag Service Layer OAM  
IEEE 802.3ah Ethernet in the First Mile  
IEEE 802.1ak Multiple MAC Registration Protocol  
IEEE 802.3 10BaseT  
IEEE 802.3ad Link Aggregation  
IEEE 802.3ae 10Gbps Ethernet  
IEEE 802.3ah Ethernet OAM  
IEEE 802.3u 100BaseTX  
IEEE 802.3x Flow Control  
IEEE 802.3z 1000BaseSX/LX  
ITU-T Y.1731 OAM functions and mechanisms for Ethernet based networks  
ITU-T G.8031 Ethernet linear protection switching

## Protocol Support

### OSPF

RFC 1765 OSPF Database Overflow  
RFC 2328 OSPF Version 2  
RFC 2370 Opaque LSA Support  
RFC 2740 OSPF for IPv6 (OSPFv3)  
draft-ietf-ospf-ospfv3-update-14.txt  
RFC 3101 OSPF NSSA Option  
RFC 3137 OSPF Stub Router Advertisement  
RFC 3623 Graceful OSPF Restart — GR helper

RFC 3630 Traffic Engineering (TE) Extensions to OSPF Version 2  
RFC 4203 for Shared Risk Link Group (SRLG) sub-TLV

### BGP

RFC 1397 BGP Default Route Advertisement  
RFC 1772 Application of BGP in the Internet  
RFC 1965 Confederations for BGP  
RFC 1997 BGP Communities Attribute  
RFC 2385 Protection of BGP Sessions via MD5  
RFC 2439 BGP Route Flap Dampening  
RFC 2547bis BGP/MPLS VPNs  
RFC 2918 Route Refresh Capability for BGP-4  
RFC 3107 Carrying Label Information in BGP-4  
RFC 3392 Capabilities Advertisement with BGP4  
RFC 4271 BGP-4 (previously RFC 1771)  
RFC 4360 BGP Extended Communities Attribute  
RFC 4364 BGP/MPLS IP Virtual Private Networks (VPNs) (previously RFC 2547bis BGP/MPLS VPNs)  
RFC 4456 BGP Route Reflection: Alternative to Full-mesh IBGP (previously RFC 1966 & 2796)  
RFC 4724 Graceful Restart Mechanism for BGP — GR helper  
RFC 4760 Multi-protocol Extensions for BGP  
RFC 4893 BGP Support for Four-octet AS Number Space  
RFC 5065 Confederations for BGP (obsoletes 3065)

### IS-IS

RFC 1142 OSI IS-IS Intra-domain Routing Protocol (ISO 10589)  
RFC 1195 Use of OSI IS-IS for routing in TCP/IP & dual environments  
RFC 2763 Dynamic Hostname Exchange for IS-IS

RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS  
RFC 2973 IS-IS Mesh Groups  
RFC 3373 Three-Way Handshake for Intermediate System to Intermediate System (IS-IS) Point-to-Point Adjacencies  
RFC 3567 Intermediate System to Intermediate System (ISIS) Cryptographic Authentication  
RFC 3719 Recommendations for Interoperable Networks using IS-IS  
RFC 3784 Intermediate System to Intermediate System (IS-IS) Extensions for Traffic Engineering (TE)  
RFC 3787 Recommendations for Interoperable IP Networks  
RFC 3847 Restart Signaling for IS-IS — GR helper  
RFC 4205 for Shared Risk Link Group (SRLG) TLV  
draft-ietf-isis-igp-p2p-over-lan-05.txt

### LDP

RFC 3036 LDP Specification  
RFC 3037 LDP Applicability  
RFC 3478 Graceful Restart Mechanism for LDP — GR helper  
RFC 5283 LDP extension for Inter-Area LSP  
draft-jork-ldp-igp-sync-03

### IPSec

RFC 2401 Security Architecture for the Internet Protocol  
RFC 2409 The Internet Key Exchange (IKE)  
RFC 3706 IKE Dead Peer Detection  
RFC 3947 Negotiation of NAT-Traversal in the IKE  
RFC 3948 UDP Encapsulation of IPsec ESP Packets  
draft-ietf-ipsec-isakmp-xauth-06.txt — Extended Authentication within ISAKMP/Oakley (XAUTH)

draft-ietf-ipsec-isakmp-modecfg-05.txt  
— The ISAKMP Configuration  
Method

### IPv6

RFC 1981 Path MTU Discovery for IPv6  
RFC 2375 IPv6 Multicast Address  
Assignments  
RFC 2460 Internet Protocol, Version 6  
(IPv6) Specification  
RFC 2461 Neighbor Discovery for IPv6  
RFC 2462 IPv6 Stateless Address Auto  
configuration  
RFC 2463 Internet Control Message  
Protocol (ICMPv6) for the Internet  
Protocol Version 6 Specification  
RFC 2464 Transmission of IPv6 Packets  
over Ethernet Networks  
RFC 2529 Transmission of IPv6 over  
IPv4 Domains without Explicit  
Tunnels  
RFC 2545 Use of BGP-4 Multiprotocol  
Extension for IPv6 Inter-Domain  
Routing  
RFC 2710 Multicast Listener Discovery  
(MLD) for IPv6  
RFC 2740 OSPF for IPv6  
RFC 3306 Unicast-Prefix-based IPv6  
Multicast Addresses  
RFC 3315 Dynamic Host Configuration  
Protocol for IPv6  
RFC 3587 IPv6 Global Unicast Address  
Format  
RFC3590 Source Address Selection for  
the Multicast Listener Discovery  
(MLD) Protocol  
RFC 3810 Multicast Listener Discovery  
Version 2 (MLDv2) for IPv6  
RFC 4007 IPv6 Scoped Address  
Architecture  
RFC 4193 Unique Local IPv6 Unicast  
Addresses  
RFC 4291 IPv6 Addressing Architecture  
RFC 4552 Authentication/Confidentiality  
for OSPFv3  
RFC 4659 BGP-MPLS IP Virtual Private  
Network (VPN) Extension for IPv6  
VPN  
RFC 5072 IP Version 6 over PPP  
RFC 5095 Deprecation of Type 0 Routing  
Headers in IPv6  
draft-ietf-isis-ipv6-05  
draft-ietf-isis-wg-multi-topology-xx.txt

### Multicast

RFC 1112 Host Extensions for IP  
Multicasting (Snooping)  
RFC 2236 Internet Group Management  
Protocol, (Snooping)  
RFC 3376 Internet Group Management  
Protocol, Version 3 (Snooping)  
RFC 2362 Protocol Independent  
Multicast-Sparse Mode (PIMSM)  
RFC 3618 Multicast Source Discovery  
Protocol (MSDP)  
RFC 3446 Anycast Rendezvous Point  
(RP) mechanism using Protocol  
Independent Multicast (PIM) and  
Multicast Source Discovery  
Protocol (MSDP)  
RFC 4601 Protocol Independent  
Multicast - Sparse Mode (PIM-SM):  
Protocol Specification (Revised)  
RFC 4604 Using IGMPv3 and MLDv2  
for Source-Specific Multicast  
RFC 4607 Source-Specific Multicast for  
IP  
RFC 4608 Source-Specific Protocol  
Independent Multicast in 232/8  
RFC 4610 Anycast-RP Using Protocol  
Independent Multicast (PIM)  
draft-ietf-pim-sm-bsr-06.txt  
draft-rosen-vpn-mcast-08.txt  
draft-ietf-mboned-msdp-mib-01.txt  
draft-ietf-l3vpn-2547bis-mcast-07:  
Multicast in MPLS/BGP IP VPNs  
draft-ietf-l3vpn-2547bis-mcast-bgp-05:  
BGP Encodings and Procedures for  
Multicast in MPLS/BGP IP VPNs  
RFC 3956: Embedding the Rendezvous  
Point (RP) Address in an IPv6  
Multicast Address

### MPLS

RFC 3031 MPLS Architecture  
RFC 3032 MPLS Label Stack  
Encoding (REV3443))  
RFC 4379 Detecting Multi-Protocol  
Label Switched (MPLS) Data Plane  
Failures  
RFC 4182 Removing a Restriction on the  
use of MPLS Explicit NULL  
RFC 5332 MPLS Multicast  
Encapsulations

### RIP

RFC 1058 RIP Version 1

RFC 2082 RIP-2 MD5 Authentication  
RFC 2453 RIP Version 2

### RSVP-TE

RFC 2430 A Provider Architecture  
DiffServ & TE  
RFC 2702 Requirements for Traffic  
Engineering over MPLS  
RFC2747 RSVP Cryptographic  
Authentication  
RFC3097 RSVP Cryptographic  
Authentication  
RFC 3209 Extensions to RSVP for  
Tunnels  
RFC 3564 Requirements for Diff-Serv-  
aware TE  
RFC 4090 Fast reroute Extensions to  
RSVP-TE for LSP Tunnels  
RFC 4124 Protocol Extensions for  
Support of Diffserv-aware MPLS  
Traffic Engineering  
RFC 4125 Maximum Allocation  
Bandwidth Constraints Model for  
Diffserv-aware MPLS Traffic  
Engineering  
RFC 4875 Extensions to Resource  
Reservation Protocol - Traffic  
Engineering (RSVP-TE) for Point-  
to-Multipoint TE Label Switched  
Paths (LSPs)  
draft-ietf-mpls-soft-preemption-14  
MPLS Traffic Engineering Soft  
Preemption  
draft-ietf-ccamp-mpls-graceful-  
shutdown-06 Graceful Shutdown in  
GMPLS Traffic Engineering  
Networks  
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