# Alcatel-Lucent

## Service Access Switch| Release 6.0 Rev.05

**7210 SAS M, T, and X OS**
**Interface Configuration Guide**

**93-0492-01-05**

Alcatel-Lucent Proprietary
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# Preface

## About This Guide

This guide describes system concepts and provides configuration examples to provision input/output modules (IOMs), also referred to as cards, Media Dependent Adapters (MDAs), and ports provided by 7210 SAS-M (access-uplink mode and Network mode), 7210 SAS-T, 7210 SAS-X. All the variants of 7210 SAS-M can be configured in two modes, that is, in network mode and in access-uplink mode. In network mode configuration, 7210 SAS-M and 7210 SAS-T in access-uplink mode only uses IP/MPLS to provide service transport. In access-uplink mode configuration, 7210 SAS-M uses Ethernet QinQ technology to provide service transport. The mode can be selected by configuring the BOF appropriately.

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.

Notes:

- This user guide is applicable to all 7210 SAS-M, 7210 SAS-T, 7210 SAS-X platforms unless specified otherwise.
- In access-uplink and network mode, it is expected that the user will only configure the required CLI parameters appropriate for the mode he intends to use. Unless otherwise noted, most of the configuration is similar in both the network mode and access uplink mode.
- Only 7210 SAS-M, 7210 SAS-T supports access-uplink mode and 7210 SAS-X does not support access-uplink mode.
- On 7210 SAS devices, not all the CLI commands are supported on all the platforms and in all the modes. In many cases, it is mentioned explicitly in this document. In other cases, it is implied and easy to know the CLIs that are not supported on a particular platform.

# Audience

This manual is intended for network administrators who are responsible for configuring the 7210 SAS-Series routers. It is assumed that the network administrators have an understanding of networking principles and configurations, routing processes, and protocols and standards, including:

- CLI concepts
- MDA, and port configuration
- QoS policies
- Services

# List of Technical Publications

The 7210 SAS-M, T, X OS documentation set is composed of the following books:

- 7210 SAS-M, T, X OS Basic System Configuration Guide

  This guide describes basic system configurations and operations.

- 7210 SAS-M, T, X OS System Management Guide

  This guide describes system security and access configurations as well as event logging and accounting logs.

- 7210 SAS-M, T, X OS Interface Configuration Guide

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

- 7210 SAS-M, T, X 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.

- 7210 SAS-M and SAS-T and 7210 SAS-X Services Guide

  This guide describes how to configure service parameters such as customer information and user services.

- 7210 SAS-M, T, X OAM and Diagnostic Guide

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

- 7210 SAS-M and SAS-T and 7210 SAS-X Quality of Service Guide

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

- 7210 SAS-M, T, X OS MPLS Guide

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

- 7210 SAS-M, X OS Routing Protocols Guide

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

## Technical Support

If you purchased a service agreement for your 7210 SAS M-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 chapter provides process flow information to configure cards and ports.

## Alcatel-Lucent 7210 SAS-M, T, X, Router Configuration Process

Table 1 lists the tasks necessary to provision cards, Media Dependent Adapters (MDAs), and ports.

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 |
|---|---|---|
| Provisioning | Chassis slots and cards | Chassis Slots and Cards on page 16 |
| | MDAs | MDAs on page 18 |
| | Ports | Ports on page 24 |
| Reference | List of IEEE, IETF, and other proprietary entities. | Standards and Protocol Support (for 7210 SAS-M, 7210 SAS-X, and 7210 SAS-T) on page 291 |

# 7210 SAS-Series Interfaces

## In This Chapter

This chapter provides information about configuring chassis slots, cards, and ports. Topics in this chapter include:


- Configuration Overview on page 16
  - → Chassis Slots and Cards on page 16
  - → MDAs on page 18
  - → Digital Diagnostics Monitoring on page 20
  - → Ports on page 24
    - – Port Types on page 24
  - → LAG on page 36
    - – 802.1x Network Access Control on page 64
  - → MTU Configuration Guidelines on page 72
  - → Deploying Preprovisioned Components for 7210 SAS-M, 7210 SAS-X, and 7210 SAS-T on page 75
- Configuration Notes on page 76

# Configuration Overview

NOTE: This document uses the term *preprovisioning* in the context of preparing or preconfiguring entities such as chassis slots, and media dependent adapters (MDAs), ports, and interfaces, prior to initialization. These entities can be installed but not enabled. When the entity is in a **no shutdown** state (administratively enabled), then the entity is considered to be *provisioned*.

The 7210 SAS-M and its variants (that is, 7210 SAS-M 24F, 7210 SAS-M 24F 2XFP, 7210 SAS-M 24F 2XFP ETR), is a platform with a fixed port configuration and an additional expansion slot that accepts supported MDAs. 7210 software inherits the concept for CPM, IOM and MDA from 7x50 to represent the hardware logically. The software creates 2 logical cards, to represent the CPM and IOM and these are pre-provisioned on bootup. The IOM card, is modelled with 2 MDAs. One of the MDA, a non-removable logical entity, represents the fixed ports available on the platform, and it is pre-provisioned on bootup. The second MDA, represents the physical removable MDA that can be plugged into the available expansion slot and it must be provisioned by the user depending on the MDA they plan to use (see below for more information on provisioning MDA for the expansion slot on 7210 SAS-M). Ports and interfaces can also be pre-provisioned.

The 7210 SAS-X and 7210 SAS-T and its variants, is a platform with a fixed port configuration, and no expansion slots. 7210 software inherits the concept of CPM, IOM and MDA from 7x50 to represent the hardware logically. These are fixed and are not removable. The software creates 2 logical cards, to represent the CPM and IOM and these are pre-provisioned on bootup. The IOM card, is modelled with a single MDA, a logical entity to represent the fixed ports on the system. This MDA is auto-provisioned on bootup and user does not need to provision them. Ports and interfaces can also be pre-provisioned.

The following sections are discussed.


- Chassis Slots and Cards on page 16
- MDAs on page 18
- Ports on page 24


## Chassis Slots and Cards

The 7210 SAS-M is a platform which has a set of fixed ports and supports one expansion slot. Software pre-provisions the cards on bootup. The expansion slot is represented as a MDA and supported MDAs can be plugged into the expansion slot. The list of MDAs supported on 7210 SAS-M is available in the 7210 SAS-M release notes.

The following display output of show card command lists the cards auto-provisioned on 7210 SAS-M chassis:

Sample output for 7210 SAS-M:

```
A:7210#  show card state

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sas          iom-sas          up    up                  2
1/1    m24-1gb+2-10gb   m24-1gb+2-10gb   up    up            24
1/2    m4-ds1-ces       m4-ds1-ces       up    up            4
A      sfm-sas          sfm-sas          up    up                        Active
```

---

The 7210 SAS-T and 7210 SAS-X is a platform which has a set of fixed port. Software pre-provisions the cards on bootup. No expansion slots are supported on these platforms.

The following display output of show card command lists the cards auto-provisioned on 7210 SAS-X and 7210 SAS-T chassis:

Sample output for 7210 SAS-X:

```
A:7210-SAS-X>show# card

===============================================================================
Card Summary
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-sas             iom-sas             up         up
A         sfm-sas             sfm-sas             up         up/active
===============================================================================
A:7210-SAS-X>show#
```

---

Sample output for 7210 SAS-T:

```
A:7210SAST>show# card

===============================================================================
Card Summary
===============================================================================
Slot   Provisioned Type                          Admin Operational   Comments
           Equipped Type (if different)          State State
-------------------------------------------------------------------------------
1      iom-sas                                   up    up
A      sfm-sas                                   up    up/active
===============================================================================
```

```
A:7210SAST>show#
```

# MDAs

The 7210 SAS-R6, 7210 SAS-X and 7210 SAS-T platforms, as explained in the previous section, do not support any physical removable MDAs. Software uses the concept of MDA internally (as a logical entity) to represent the ports and the MDA type is either auto-provisioned on bootup or auto-provisioned automatically based on the configured IMM type.

Sample output for 7210 SAS-M:

Sample output for 7210 SAS-X:

Sample output for 7210 SAS-T:

Sample output for 7210 SAS-R6

On 7210 SAS-M, as explained in the previous section, in addition to the fixed ports, a expansion slot is available. It is represented as a physical MDA and needs to be provisioned. The section belows below talks about provisioning of MDAs and is applicable only to those platforms where physical MDAs are supported.

A chassis slot and card type must be specified and provisioned before an MDA can be preprovisioned. An MDA is provisioned when a type designated from the allowed MDA types is inserted. A preprovisioned MDA slot can remain empty without conflicting with populated slots. Once installed and enabled, the system verifies that the installed MDA type matches the configured parameters. If the parameters do not match, the MDA remains offline. An MDA is provisioned when a type designated from the allowed MDA type is inserted. A preprovisioned MDA slot can remain empty without conflicting with the populated slots.

## Provisioning of MDA on 7210 SAS-M

### Provisioning guidelines for MDA used with 7210 SAS-M:

- The device rejects the insertion of a CES card if the slot is provisioned for a 2* 10G MDA and vice versa.
- If a 2*10G MDA provisioned, it ensures that the BOF parameter "**no-service-ports**" is configured to specify two ethernet ports.
- Only on 7210 SAS-M 24F variant, the no-service-ports BOF parameter is not available for use.

- Change of value assigned to 'use-expansion-card-type' BOF parameter, requires a reboot so that a different MDA type can be used.

---

### Provisioning 2 x 10G MDA and 4 x T1/E1 CES MDA on 7210 SAS-M

For 7210 SAS-M devices currently deployed or new deployments, to insert 2*10 MDA perform the following steps:

1. Configure the BOF parameter "use-expansion-card-type" to m2-xfp. This provisions the system to expect a 2 x 10G MDA for use in the expansion slot.
2. Configure the BOF parameter "no-service-ports", if using a 7210 SAS-M 24F 2XFP and 7210 SAS-M 24F 2XFP ETR variants.
3. Re-boot the device.
4. The above steps are required for first-time use of 2 x 10G MDA or when changing the MDA type in use. It is not needed, if a MDA is being replaced with a MDA of the same type.

In 7210 devices using 2 x 10G MDA, to insert CES MDA perform the following steps:

1. Configure the BOF parameter "use-expansion-card-type" to m4-ds1-ces. This will provision the system to expect a 4 x T1/E1 CES MDA for use in the expansion slot.
2. Configure the BOF parameter "no-service-ports" to default, if using a 7210 SAS-M 24F 2XFP and 7210 SAS-M 24F 2XFP ETR variants.
3. Re-boot the device.
4. The above steps are required when changing the MDA type in use. It is not needed, if a MDA is being replaced with a MDA of the same type.

---

**NOTE**: Insertion and removal of the CES MDA at any point of time into the system is supported, if the BOF parameter configuration is set to default.

---

# Digital Diagnostics Monitoring

Some Alcatel-Lucent SFP and XFP transponders have Digital Diagnostics Monitoring (DDM) capability. With DDM the transceiver module maintains information about its working status in device registers, such as:

- Temperature
- Supply voltage
- Transmit (TX) bias current
- TX output power
- Received (RX) optical power

The transceiver is also programmed with warning and alarm thresholds for low and high conditions that can generate system events. These thresholds are programmed by the transceiver manufacturer.

There are no CLI commands required for DDM operations, however, the **show>port** ***port-id*** **detail** command displays DDM information in the Transceiver Digital Diagnostics Monitoring output section.

The Tx and Rx power displayed in the DDM output are average optical power in dBm.

DDM information is populated into the router's MIBs, so the DDM data can be retrieved by Network Management using SNMP. Also, RMON threshold monitoring can be configured for the DDM MIB variables to set custom event thresholds if the factory-programmed thresholds are not at the desired levels.

The following are potential uses of the DDM data:

- Optics degradation monitoring — With the information returned by the DDM-capable optics module, degradation in optical performance can be monitored and trigger events based on custom or the factory-programmed warning and alarm thresholds.
- Link/router fault isolation — With the information returned by the DDM-capable optics module, any optical problem affecting a port can be quickly identified or eliminated as the potential problem source.

Supported real-time DDM features are summarized in Table 2.

**Table 2: Real-Time DDM Information**

| Parameter | User Units | SFP/XFP Units | SFP | XFP |
|---|---|---|---|---|
| Temperature | Celsius | C | Supported | Supported |
| Supply Voltage | Volts | µV | Supported | Supported |
| TX Bias Current | mA | µA | Supported | Supported |
| TX Output Power | dBm (converted from mW) | mW | Supported | Supported |
| RX Received Optical Power4 | dBm (converted from dBm) (Avg Rx Power or OMA) | mW | Supported | Supported |
| AUX1 | parameter dependent (embedded in transceiver) | - | Not supported | Supported |
| AUX2 | parameter dependent (embedded in transceiver) | - | Not supported | Supported |

The factory-programmed DDM alarms and warnings that are supported are summarized in Table 3.

**Table 3: DDM Alarms and Warnings**

| Parameter | SFP/XFP Units | SFP | XFP | Required? |
|---|---|---|---|---|
| Temperature<br>- High Alarm<br>- Low Alarm<br>- High Warning<br>- Low Warning | C | Yes | Yes | Yes |
| Supply Voltage<br>- High Alarm<br>- Low Alarm<br>- High Warning<br>- Low Warning | µV | Yes | Yes | Yes |
| TX Bias Current<br>- High Alarm<br>- Low Alarm<br>- High Warning<br>- Low Warning | µA | Yes | Yes | Yes |
| TX Output Power<br>- High Alarm<br>- Low Alarm<br>- High Warning<br>- Low Warning | mW | Yes | Yes | Yes |
| RX Optical Power<br>- High Alarm<br>- Low Alarm<br>- High Warning<br>- Low Warning | mW | Yes | Yes | Yes |
| AUX1<br>- High Alarm<br>- Low Alarm<br>- High Warning<br>- Low Warning | parameter dependent (embedded in transceiver) | No | Yes | Yes |
| AUX2<br>- High Alarm<br>- Low Alarm<br>- High Warning<br>- Low Warning | parameter dependent (embedded in transceiver) | No | Yes | Yes |

## Alcatel-Lucent SFPs and XFPs

The availability of the DDM real-time information and warning or alarm status is based on the transceiver. It may or may not indicate if DDM is supported, although some Alcatel-Lucent SFPs support DDM. Non-DDM and DDM-supported SFPs are distinguished by a specific ICS value.

For Alcatel-Lucent SFPs that do not indicate DDM support in the ICS value, DDM data is available although the accuracy of the information has not been validated or verified.

For non-Alcatel-Lucent transceivers, DDM information may be displayed, but Alcatel-Lucent is not responsible for formatting, accuracy, etc.

---

## Statistics Collection

The DDM information and warnings/alarms are collected at one minute intervals, so the minimum resolution for any DDM events when correlating with other system events is one minute.

Note that in the Transceiver Digital Diagnostic Monitoring section of the **show port** *port-id* **detail** command output:

- If the present measured value is higher than the either or both High Alarm, High Warn thresholds; an exclamation mark “!” displays along with the threshold value.
- If the present measured value is lower than the either or both Low Alarm, Low Warn thresholds; an exclamation mark “!” displays along with the threshold value.

```
A:Dut-A# show port 2/1/6 detail

.........

===============================================================================
Transceiver Digital Diagnostic Monitoring (DDM), Internally Calibrated
===============================================================================
                             Value High Alarm  High Warn   Low Warn  Low Alarm
-------------------------------------------------------------------------------
Temperature (C)              +39.3     +96.0      +94.0       -7.0      -8.0
Supply Voltage (V)            3.27      3.51       3.49       3.12      3.10
Tx Bias Current (mA)          18.8      77.0       70.0        5.5       4.5
Tx Output Power (dBm)         1.33      5.50       5.00       0.00     -0.50
Rx Optical Power (avg dBm)  -40.00     -8.50      -9.00     -33.98!   -35.23!
===============================================================================
```

# Ports

## Port Types

Supported port types on different 7210 platforms is listed in Table 4 below:

Table 4: Supported Ethernet ports and TDM ports types

| Ports | 7210 SAS-M | 7210 SAS-M 24F 2XFP | 7210 SAS-M 24F 2XFP ETR | 7210 SAS-X | 7210 SAS-T | 7210 SAS-R6 |
|---|---|---|---|---|---|---|
| Fixed Copper ports (10/100/1000 Base-T) | No | No | No | No | Yes | No |
| Fast Ethernet SFP Ports | Yes | Yes | Yes | Yes | Yes | Yes |
| 10 Gigabit XFP Ports | Yes, with 2 x 10G MDA | Yes | Yes | Yes | Yes | Yes |
| TDM ports (DS1/E1) | Yes (only in network mode and with CES MDA) | Yes (only in network mode and with CES MDA) | Yes (only in network mode and with CES MDA) | No | No | No |

NOTE:

- 10/100/1000 Base-T Copper SPFs can be used in the any of the SFP ports. It supports all speeds.
- For TDM ports, only CES services (CESoPSN and SAToP based) are provided for the T1/E1 ports.

## Port Modes

In 7210 SAS devices, port must be configured as either access, access uplink or network.

---

- Access ports — Configured for customer facing traffic on which services are configured. If a Service Access Port (SAP) is to be configured on the port, it must be configured as an access port. When a port is configured for access mode, the appropriate encapsulation type must be configured to distinguish the services on the port. Once a port has been configured for access mode, one or more services can be configured on the port depending on the encapsulation value. Access ports can be configured on all the 7210 platforms.
- Access-uplink ports — Access-uplink ports are used to provide native Ethernet connectivity in service provider transport or infrastructure network. This can be achieved by configuring port mode as access uplink. With this option, the encap-type can be configured to only qinq. Access-uplink SAPs, which are QinQ SAPs, can only be configured on an access uplink port to allow the operator to differentiate multiple services being carried over a single access uplink port. This is the default mode when a node is operating in access-uplink mode.
- Network ports — Configured for network facing traffic. These ports participate in the service provider transport or infrastructure network. Dot1q is supported on network ports. This is default for nodes operating in network mode.
- Hybrid ports — Configured for access and network facing traffic. While the default mode of an Ethernet port remains network, the mode of a port cannot be changed between the access/network/hybrid values unless the port is shut down and the configured SAPs and/or interfaces are deleted. Hybrid ports allow a single port to operate in both access and network modes. MTU of port in hybrid mode is the same as in network mode except for the 10/100 MDA. The default encap for hybrid port mode is dot1q; it also supports QinQ encapsulation on the port level. Null hybrid port mode is not supported.
  Once the port is changed to hybrid, the default MTU of the port is changed to match the value of 9212 bytes currently used in network mode (higher than an access port); this is to ensure that both SAP and network VLANs can be accommodated. The only exception is when the port is a 10/100 fast Ethernet. In those cases, the MTU in hybrid mode is set to 1522 bytes, which corresponds to the default access MTU with QinQ, which is larger than the network dot1q MTU or access dot1q MTU for this type of Ethernet port. The configuration of all parameters in access and network contexts will continue to be done within the port using the same CLI hierarchy as in existing implementation. The difference is that a port configured in mode hybrid allows both ingress and egress contexts to be configured concurrently.
  An Ethernet port configured in hybrid mode can have two values of encapsulation type: dot1q and QinQ. The NULL value is not supported since a single SAP is allowed, and can be achieved by configuring the port in the access mode, or a single network IP interface is allowed, which can be achieved by configuring the port in network mode. Hybrid mode can be enabled on a LAG port when the port is part of a single chassis LAG configuration.

When the port is part of a multi-chassis LAG configuration, it can only be configured to access mode as MC-LAG is not supported on a network port and consequently is not supported on a hybrid port.

The following port modes are supported on each of the 7210 SAS platforms:

**Table 6: 7210 SAS Platforms supporting port modes**

| Port Mode Platforms | Access | Network | Hybrid | Access-uplink |
|---|---|---|---|---|
| 7210 SAS-M | Yes | Yes[a] | Yes[b] | Yes[c] |
| 7210 SAS-X | Yes | Yes | Yes | No |
| 7210 SAS-T | Yes | No | No | Yes |

a. Network ports can be configured only if the BOF is configured to operate the node in network mode (also known as, MPLS mode)
b. Access-uplink ports can be configured only if the BOF is configured to operate the node in access-uplink mode (also known as, L2 mode)
c. Hybrid ports are supported only when the node is operating in network mode.

# Support for Power over Ethernet (PoE)

The 7210 SAS-T supports Power over Ethernet (PoE) as per 802.3af and 802.3at standards. It allows the 7210 SAS-T devices to be used to supply power to connected PoE devices, such as telephones, CCTV cameras, and other PoE standard compliant devices.

The following functionalities are available:

- Supports PoE on four fixed copper ports (identified by Port IDs 1/1/x – 1/1/y). A maximum of up to 60W of power can be utilized by all the PoE devices connected to the node.
- Supports both 802.3af (PoE) and 802.3at (PoE+) on any of the ports. The ports can be used to connect either PoE devices or PoE+ devices or a combination of both simultaneously, as long as the power drawn is within 60W.
- Only Alternative A is supported in the 7210 SAS-T.
- Supports classification of both Type 1 and Type 2 PD using physical layer classification mechanism (using 1-event physical layer classification mechanism for Type 1 PD and 2-event physical layer classification mechanism for Type 2 PD).
- Supports allocation of power based on the identified class (called as class-based power allocation method) using physical layer classification mechanism. The 802.3af and 802.3at standards define the power that can be allocated or requested by a particular class. There are four classes defined - Class 1, Class 2, Class 3 and Class 4 by standards. These are used to allow PoE devices to request power based on their needs. If enough power is not available to supply power based on the identified class, then power is denied to the connected PoE device. 7210 SAS-T can supply a maximum of 60W of power. If the total of power requested by the devices connected to PoE enabled ports exceed this threshold, the 7210 SAS-T denies power to the device. When power is denied to the PD, the port is operationally up, though power is not supplied to the port. If the power is applied successfully or power is denied to the port, the system logs an event.
- The 7210 SAS-T supplies only DC power to connected PoE devices (PDs). It works with PoE devices that use injectors where a AC/DC wall device is used to power a remote PoE device.
- The software monitors the PoE port and detect faults and events and raises traps, along with displaying the same in the status of the port.
  Events and faults detected and notified to the user are:
  - → Supplying power event – This event is generated when power is supplied to a connected PoE device after successful detection and classification.
  - → Denied power event – This event is generated when power is denied to a connected PoE device after successful detection and classification.
  - → Disconnect event – This event is generated when a connected PoE device is disconnected from the port and, stops drawing power from the node.

→ Fault events are generated for events such as overload, short-circuit, and other events. Software clears the fault when the fault no longer exists.

- If a port is enabled for PoE is shutdown, then the power supplied to the port is disabled. It restores when the no shutdown command is executed, if the request does not exceed the power budget.

**NOTE**: PoE is not supported on any other 7210 SAS platform other than 7210 SAS-T.

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# Link Layer Discovery Protocol (LLDP)

The IEEE 802.1ab Link Layer Discovery Protocol (LLDP) standard defines protocol and management elements suitable for advertising information to stations attached to the same IEEE 802 LAN. The protocol facilitates the identification of stations connected by IEEE 802 LANs or MANs, their points of interconnection, and access points for management protocols.

The LLDP helps the network operators to discover topology information. This information is used to detect and resolve network problems and inconsistencies in the configuration.

Listed below is the information included in the protocol defined by the IEEE 802.1ab standard:

- Connectivity and management information about the local station to adjacent stations on the same IEEE 802 LAN is advertised.
- Network management information from adjacent stations on the same IEEE 802 LAN is received.
- Operates with all IEEE 802 access protocols and network media.
- Network management information schema and object definitions that suitable for storing connection information about adjacent stations is established.
- Provides compatibility with a number of MIBs. For more information, see Figure 1.

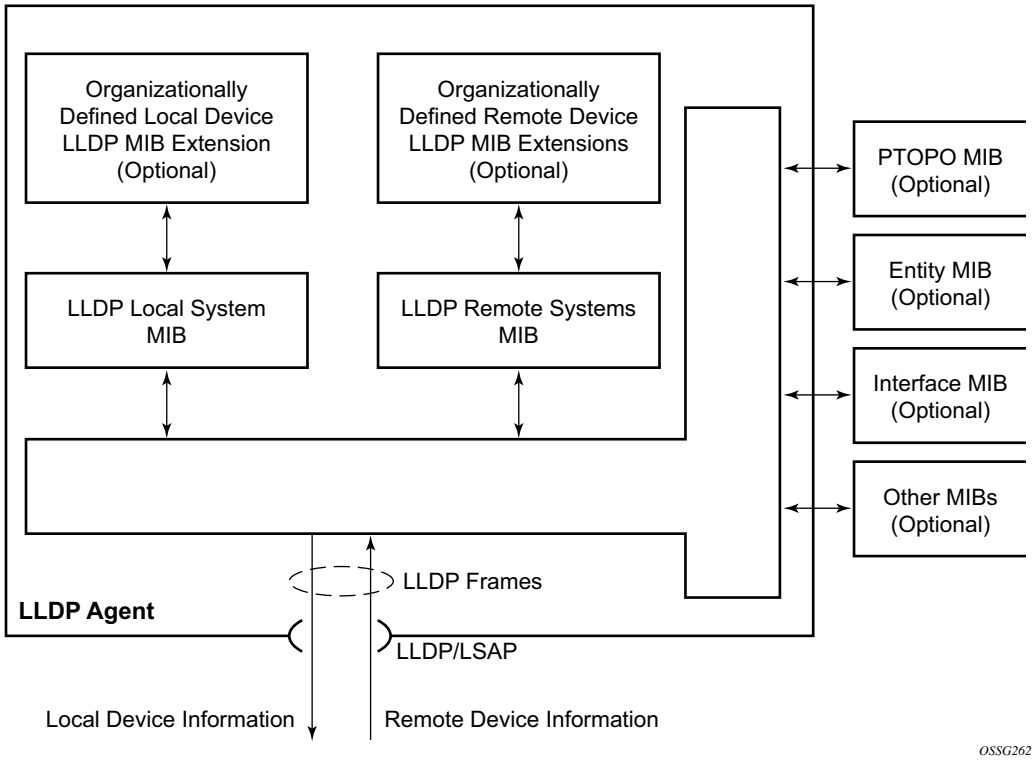


**Figure 1: LLDP Internal Architecture for a Network Node**

In order to detect and address network problems and inconsistencies in the configuration, the network operators can discover the topology information using LLDP. The Standard-based tools address the complex network scenarios where multiple devices from different vendors are interconnected using Ethernet interfaces.

The example displayed in Figure 2 depicts a MPLS network that uses Ethernet interfaces in the core or as an access/handoff interfaces to connect to different kind of Ethernet enabled devices such as service gateway/routers, QinQ switches DSLAMs or customer equipment.

The topology information of the network in Figure 2 can be discovered if, IEEE 802.1ab LLDP is running on each of the Ethernet interfaces in network.

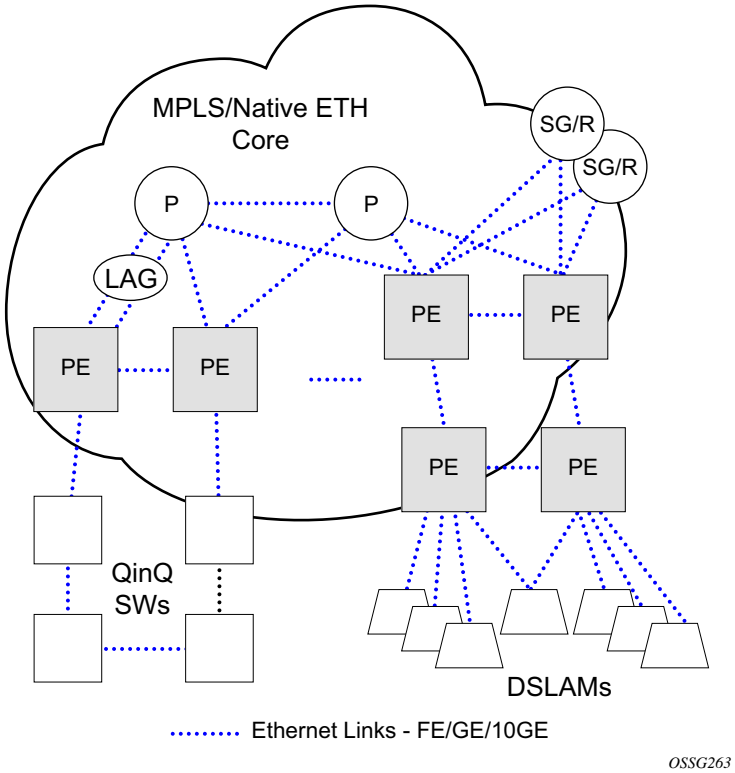


**Figure 2: Generic Customer Use Case For LLDP**

## LLDP Protocol Features

The IEEE 802.1ab Link Layer Discovery Protocol (LLDP) is a uni-directional protocol that uses the MAC layer to transmit specific information related to the capabilities and status of the local device. The LLDP can send as well as receive information from a remote device stored in the related MIB(s).

The LLDP does not contain a mechanism to solicit information received from other LLDP agents. The protocol also does not provide means to confirm the receipt of information. LLDP provides the flexibility of enabling a transmitter and receiver separately, therefore the following LLDP configurations are allowed:

- An LLDP agent can only transmit information.
- An LLDP agent can only receive information.
- An LLDP agent can transmit and receive information.

The information fields in each LLDP frame are contained in an LLDP Data Unit (LLDPDU) as a sequence of variable length information elements. Each information element includes Type, Length, and Value fields (TLVs).

- Type indicates the nature of information being transmitted.
- Length indicates the length of the information string in octets.
- Value is the actual information that is transmitted. (For example, a binary bit map or an alphanumeric string that can contain one or more fields).

Each LLDPDU contains four mandatory TLVs and optional TLVs selected by the Network Management. Below is the format of a LLDPDU:

- Chassis ID TLV
- Port ID TLV
- Time To Live TLV
- Zero or more optional TLVs, depending on the maximum size of the LLDPDU allowed.
- End Of  LLDPDU TLV

An LLDP agent or port is identified by a concatenated string formed by the Chassis ID TLV and the Port ID TLV. This string is used by a recipient to identify an LLDP port or agent. The combination of the Port ID and Chassis ID TLVs remains unchanged until the port or agent is operational.

The TTL (Time To Live) field of an Time-To-Live TLV can be either zero or a non-zero value. A zero value in the TTL field notifies the receiving LLDP agent to immediately discard all information related to the sending LLDP agent. A non-zero value in the TTL field indicates the time duration for which the receiving LLDP agent should retain the sending LLDP agent’s

information. The receiving LLDP agent discards all information related to the sending LLDP agent after the time interval indicated in the TTL field is complete.

**Note:** A TTL value of zero can be used to signal that the sending LLDP port has initiated a port shutdown procedure.

The End Of LLDPDU TLV indicates the end of the LLDPDU.

## LLDP Tunneling for Epipe Service

Customers who subscribe to Epipe service consider the Epipe as a wire, and run LLDP between their devices which are located at each end of the Epipe. To facilitate this, the 7210 devices support tunneling of LLDP frames that use the nearest bridge destination MAC address.

If enabled using the command *tunnel-nearest-bridge-dest-mac*, all frames received with the matching LLDP destination mac address are forwarded transparently to the remote end of the Epipe service. To forward these frames transparently, the port on which tunneling is enabled must be configured with NULL SAP and the NULL SAP must be configured in an Epipe service. Tunneling is not supported for any other port encapsulation or other services.

Additionally, before enabling tunneling, admin status for LLDP dest-mac nearest-bridge must be set to disabled or Tx only, using the command admin-status available under configure> port> ethernet> lldp> destmac-nearest-bridge. If *admin-status* for dest-mac nearest-bridge is set to receive and process nearest-bridge LLDPDUs (that is, if either rx or tx-rx is set) then it overrides the *tunnel-nearest-bridge-dest-mac* command.

The following table lists the behavior for LLDP with different values set in use for admin-status and when tunneling is enabled or disabled:

**Table 7:** Behavior for LLDP with different values

| Nearest-bridge-mac Admin status | Tunneling Enabled | Tunneling Disabled |
|---|---|---|
| Rx | Process/Peer | Process/Peer |
| Tx | Tunnel | Drop |
| Rx-Tx | Process/Peer | Process/Peer |
| Disabled | Process/Peer | Drop |

NOTE: Transparent forwarding of LLDP frames can be achieved using the standard defined mechanism when using the either nearest-non-tmpr or the nearest-customer as the destination

MAC address in the LLDP frames. It is recommended that the customers use these MAC address where possible to conform to standards. This command allows legacy LLDP implementations that do not support these additional destinations MAC addresses to tunnel LLDP frames that use the nearest-bridge destination MAC address.

# Port loopback for Ethernet ports

7210 devices support port loopback for ethernet ports. There are two flavors of port loopback commands - port loopback without mac-swap and port loopback with mac-swap. Both these commands are helpful for testing the service configuration and measuring performance parameters such as throughput, delay, and jitter on service turn-up. Typically, a third-party external test device is used to inject packets at desired rate into the service at a central office location.

The following sections describe the port loopback functionality

## Port loopback without MAC swap

When the Port loopback command is enabled, the system enables PHY/MAC loopback on the specified port. All the packets are sent out the port configured for loopback and received back by the system. On ingress to the system after the loopback, the node processes the packets as per the service configuration for the SAP.

This flavor is recommended for use with only VLL services. This command affects all the services configured on the port, therefore the user is advised to ensure all the configuration guidelines mentioned for this feature in the command description are followed.

## Port loop back with MAC swap

The 7210 SAS provides port loop back support with MAC swap. When the Port loopback command is enabled, the system enables PHY/MAC loopback on the specified port. All the packets are sent out the port configured for loopback and received back by the system. On ingress to the system after the loopback, the node swaps the MAC addresses for the specified SAP and the service. It only processes packets that match the specified source MAC address and destination MAC address, while dropping packets that do not match. It processes these packets as per the service configuration for the SAP.

This flavor is recommended for use with only VPLS and VLL services. This command affects all the services configured on the port, therefore the user is advised to ensure all the configuration guidelines mentioned for this feature in the command description are followed.

# LAG

Based on the IEEE 802.3ax standard (formerly 802.3ad), Link Aggregation Groups (LAGs) can be configured to increase the bandwidth available between two network devices, depending on the number of links installed. LAG also provides redundancy in the event that one or more links participating in the LAG fail. All physical links in a given LAG links combine to form one logical interface.

Packet sequencing must be maintained for any given session. The hashing algorithm deployed by Alcatel-Lucent routers is based on the type of traffic transported to ensure that all traffic in a flow remains in sequence while providing effective load sharing across the links in the LAG.

LAGs must be statically configured or formed dynamically with Link Aggregation Control Protocol (LACP). The optional marker protocol described in IEEE 802.3ax is not implemented. LAGs can be configured on network andaccess ports.

## LAG Features

Hardware capabilities:

- The LAG load sharing is executed in hardware, which provides line rate forwarding for all port types.

Software capabilities:

- The Alcatel-Lucent solution conforms to the IEEE LAG implementation including dynamic costing and LAG port threshold features. The dynamic cost and LAG port threshold features can be enabled even if the second node is not an Alcatel-Lucent router.
  - → Dynamic cost

    Dynamic cost can be enabled with the **config>lag** *dynamic-cost* command or by the action specified in the **config>lag>port-threshold** command.

    If dynamic cost is enabled and the number of active links is greater than the port threshold value (0-7 or 0-15), depending on chassis-mode and IOM type), then the path cost is dynamically calculated whenever there is a change in the number of active links regardless of the specified port threshold action. If the port-threshold is met and the action is set to dynamic cost, then the path cost is dynamically recalculated regardless of the global dynamic cost configuration.

    Enabling dynamic costing causes the physical link metrics used by OSPF to be applied based on the operational or aggregate link bandwidth in the LAG that is available at the time, providing the number of links that are up exceeds the configured

LAG port threshold value. If the number of available links falls below the configured threshold, the configured threshold action determines if and at what cost this LAG will be advertised.

For example, assume a single link in OSPF has an associated cost of 100 and the LAG consists of four physical links. The cost associated with the logical link is 25. If one link fails then the cost would automatically be adjusted to 33.

If dynamic cost is not configured then costing is applied based on the total number of links configured. The cost would be calculated at 25. This will remain static provided the number of links that are up exceeds the configured LAG threshold.

→ LAG port threshold

The LAG port threshold feature allows configuration of the behavior, once the number of available links in a LAG falls below or is equal to the specified threshold. Two options are available:

1. If the number of links available (up) in a LAG is less than the configured threshold, then the LAG is regarded as operationally down.
   For example, assume a LAG consists of four physical links. The threshold is set to twoand dynamic costing is not configured. If the operational links is equal to or drops below two, the link is regarded as operationally down until the number of operational links is two or more.
2. When the number of links available in a LAG is less than the configured threshold, the LAG starts using the dynamic-cost allowing other nodes to adjust their routing tables according to the revised costs. In this case, when the threshold is not crossed, a fixed metric (all links operational) is advertised.

# Configuring LAGs

LAG configuration guidelines include:

- Ports can be added or removed from the LAG while the LAG and its ports (other than the port being removed) remain operational. When ports to and/or from the LAG are added or removed, the hashing algorithm is adjusted for the new port count.
- The **show** commands display physical port statistics on a port-by-port basis or the entire LAG can be displayed.
- LAG is supported on Ethernet ports.
- Ports of a particular LAG can be of different types but they must be the same speed and duplex. To guarantee the same port speed is used for all ports in a LAG, auto-negotiation must be disabled or in limited mode to ensure only a specific speed is advertised.

Figure 3 displays traffic routed between ALA-1 and ALA-2 as a LAG consisting of four ports.

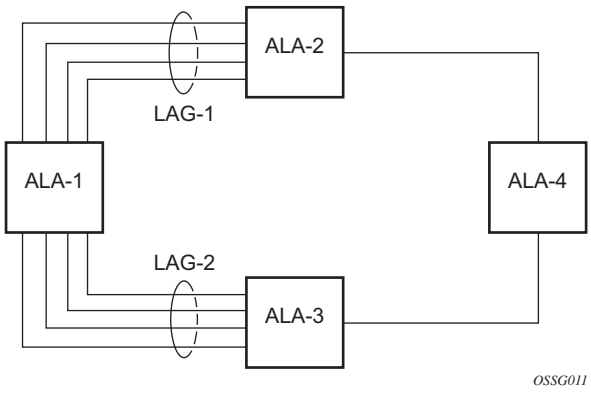


**Figure 3: LAG Configuration**

# LAG and ECMP Hashing

Note: ECMP Hashing is not supported on 7210 SAS-T  devices. ECMP hashing is supported only on 7210 SAS-X and 7210 SAS-M (in network mode).

When a requirement exists to increase the available bandwidth for a logical link that exceeds the physical bandwidth or add redundancy for a physical link, typically one of the methods is applied; equal cost multi-path (ECMP) or Link Aggregation (LAG). A 7210 SAS can deploy both at the same time, meaning, using ECMP of two or more Link Aggregation Groups (LAG) and/or single links.

The Alcatel-Lucent implementation supports per flow hashing used to achieve uniform loadspreading and per service hashing designed to provide consistent per service forwarding. Depending on the type of traffic that needs to be distributed into an ECMP and/or a LAG, different variables are used as input to the hashing algorithm.

The tables below provides the packet fields used for hashing for different services and different traffic types for different platforms.

# LAG Hashing Fields used for 7210 SAS-M (Network mode)

**Table 8: LAG Hashing mechanism for services configured in Network Mode on 7210 SAS-M devices**

| Service and Traffic direction (For example: SAP to SDP) | Packet fields used for Hashing for different traffic types |
|---|---|
| VPLS service:<br><br>SAP to SAP | IP traffic (Learnt): Source and Destination IP, Source and Destination L4 ports<br><br>IP traffic (Unlearnt): Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id.<br><br>PBB traffic (Learnt): BDA, BSA, VLAN.<br>PBB traffic (Unlearnt): BDA, BSA, ISID, Ingress Port-Id.<br><br>MPLS traffic (Learnt): Source and Destination MAC (Outer MACs of the ethernet packet that encapsulates MPLS packet), VLAN.<br><br>MPLS traffic (Unlearnt): MPLS label stack (Two labels deep), Ingress Port-Id.<br><br>Non-IP traffic (Learnt): Source and Destination MAC, EtherType, VLAN.<br><br>Non-IP traffic (Unlearnt): Source and Destination MAC, EtherType, VLAN, Ingress Port-Id. |
| Epipe service:<br><br>SAP to SAP | IP traffic: Source and Destination IP, Source and Destination L4 ports.<br><br>PBB traffic: BDA, BSA, VLAN.<br><br>MPLS traffic: Source and Destination MAC (Outer MACs of the ethernet packet that encapsulates MPLS packet)), VLAN<br><br>Non-IP traffic: Source and Destination MAC, EtherType, VLAN. |

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|---|---|
| VPLS service:<br><br>SAP to SDP | IP traffic (learnt and unlearnt): Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id.<br><br>PBB traffic: BDA, BSA, ISID, Ingress Port-ID.<br><br>MPLS traffic: MPLS label stack (Two labels deep), Ingress Port-Id.<br><br>Non-IP traffic (learnt and unlearnt): Source and Destination MAC, EtherType, VLAN, Ingress Port-Id. |
| Epipe service:<br><br>SAP to SDP | IP traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id.<br><br>PBB traffic: BDA, BSA, ISID, Ingress Port-Id.<br><br>MPLS traffic: MPLS label stack (Two labels deep), Ingress Port-Id.<br><br>Non-IP traffic: Source and Destination MAC, EtherType, VLAN, Ingress Port-Id. |

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**Table 8: LAG Hashing mechanism for services configured in Network Mode on 7210 SAS-M devices**

| Service and Traffic direction (For example: SAP to SDP) | Packet fields used for Hashing for different traffic types |
|---|---|
| VPLS service:<br><br>SDP to SAP | Non-IP traffic (Learnt): Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header), EtherType.<br><br>All other traffic (Learnt): Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header).<br><br>All traffic (Unlearnt): Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header), Ingress Port-Id. |
| Epipe service:<br><br>SDP to SAP | Non-IP traffic: Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header), EtherType<br><br>All other traffic: Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header) |
| VPLS service:<br><br>SDP to SDP | Non-IP Traffic (Learnt): Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header), Ingress Port-Id, EtherType.<br><br>All other traffic: Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header), Ingress Port-Id. |
| MPLS – LSR | All traffic: MPLS label stack (Two labels deep), Ingress Port-Id. |

# LAG Hashing Fields used for 7210 SAS-M (Network mode)

**Table 8: LAG Hashing mechanism for services configured in Network Mode on 7210 SAS-M devices**

| Service and Traffic direction (For example: SAP to SDP) | Packet fields used for Hashing for different traffic types |
|---|---|
| PBB VPLS service:<br><br>PBB BCB Traffic (that is, B-SAP to B-SAP) | IP traffic (learnt): Source and Destination IP, Source and Destination L4 ports<br><br>IP traffic (unlearnt): Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id.<br><br>L2/non-IP traffic (learnt): BDA, BSA<br><br>L2/non-IP traffic (unlearnt): BDA, BSA, ISID, Ingress Port-Id |
| PBB VPLS service:<br><br>Originating PBB BEB traffic (that is, I-SAP to B-SAP) | IP traffic (learnt): Source and Destination IP, Source and Destination L4 ports<br><br>IP traffic (unlearnt): Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id<br><br>L2/non-IP traffic (learnt): CSA, CDA, EtherType, VLAN<br><br>L2/non-IP traffic (unlearnt): CSA, CDA, EtherType, VLAN, Ingress Port-Id. |
| PBB VPLS service:<br><br>Terminating PBB BEB traffic (that is, B-SAP to I-SAP) | IP traffic (learnt): CSA, CDA<br><br>IP traffic (unlearnt): CSA, CDA, Ingress Port-Id<br><br>L2/non-IP traffic (learnt): CSA, CDA, EtherType<br><br>L2/non-IP traffic (unlearnt): CSA, CDA, EtherType, Ingress Port-Id. |

# LAG Hashing Fields used for 7210 SAS-M (Network mode)

**Table 8: LAG Hashing mechanism for services configured in Network Mode on 7210 SAS-M devices**

| Service and Traffic direction (For example: SAP to SDP) | Packet fields used for Hashing for different traffic types |
|---|---|
| PBB Epipe service:<br><br>Originating PBB BEB traffic (that is, PBB Epipe I-SAP to B-SAP) | IP traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id<br><br>L2/non-IP traffic: CSA, CDA, EtherType, VLAN, Ingress Port-Id |
| PBB Epipe service:<br><br>Terminating PBB BEB traffic (PBB Epipe SAP to B-SAP) | IP traffic: CSA, CDA<br><br>L2/non-IP traffic: CSA, CDA, EtherType |
| VPRN service:<br><br>SAP to SAP<br>SDP to SAP | IP traffic: Source and Destination IP, Source and Destination L4 ports |
| VPRN service:<br><br>SAP to SDP | IP traffic: Source and Destination IP, Source and Destination L4 ports, Ingress port-Id |
| IES service (IPv4):<br><br>IES SAP to IES SAP | IPv4 unicast traffic: Source and Destination IP, Source and Destination L4 ports |
| IES service (IPv4):<br><br>IES SAP to IPv4 network port interface | IPv4 unicast traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id. |
| Network port IPv4 interface:<br><br>IPv4 network interface to IPv4 network interface | IPv4 unicast traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id. |
| Network port IPv6 interface:<br><br>IPv6 network interface to IPv6 network interface | IPv6 unicast traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id. |

**Notes**:

1. VPLS service, SDP to SDP: Test has been performed only for VC label variation with the same Tunnel label.
2. In the LSR case, incoming labels are used for hashing.
3. 'Learnt' wherever mentioned corresponds to Destination MAC.
4. Source/Destination MAC refer to 'Customer Source/Destination MACs' unless otherwise specified.

# LAG Hashing Fields used for 7210 SAS-X

**Table 9: LAG Hashing mechanism for services configured on 7210 SAS-X devices**

| Service and Traffic direction (For example: SAP to SDP) | Packet fields used for Hashing for different traffic types |
|---|---|
| VPLS service:<br><br>SAP to SAP<br>SAP to SDP | IP traffic (learnt and unlearnt) : Source and Destination IP, Source and Destination L4 ports, VLAN, Ingress Port-Id.<br><br>PBB traffic: BDA, BSA, ISID, Ingress Port-Id.<br><br>MPLS traffic: MPLS label stack (Two labels deep), Ingress Port-Id.<br><br>Non-IP traffic (learnt and unlearnt): Source and Destination MAC, EtherType, Ingress Port-Id. |
| Epipe service:<br><br>SAP to SAP<br>SAP to SDP | IP traffic : Source and Destination IP, Source and Destination L4 ports, VLAN, Ingress Port-Id.<br><br>PBB traffic: BDA, BSA, ISID, Ingress Port-Id.<br><br>MPLS traffic: MPLS label stack (Two labels deep), Ingress Port-Id.<br><br>Non-IP traffic: Source and Destination MAC, EtherType, Ingress Port-Id. |
| VPLS and Epipe service:<br><br>SDP to SAP | All traffic: Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header), Ingress Port-Id. |

# LAG Hashing Fields used for 7210 SAS-X

**Table 9: LAG Hashing mechanism for services configured on 7210 SAS-X devices**

| Service and Traffic direction (For example: SAP to SDP) | Packet fields used for Hashing for different traffic types |
|---|---|
| VPLS service:<br><br>SDP to SDP | All traffic: Source and Destination MAC (Outer MACs inside the payload, just after the MPLS header), Ingress Port-Id. |
| MPLS – LSR | All traffic: MPLS label stack (Two labels deep), Ingress Port-Id. |
| PBB VPLS service:<br><br>PBB BCB Traffic (that is, B-SAP to B-SAP) | IP traffic (learnt and unlearnt): Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id.<br><br>L2/non-IP traffic (learnt and unlearnt): BDA, BSA, ISID, Ingress Port-Id. |
| PBB VPLS service:<br><br>Originating PBB BEB traffic (that is, I-SAP to B-SAP) | IP traffic (learnt and unlearnt): Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id, VLAN.<br><br>L2/non-IP traffic (learnt and unlearnt): CSA, CDA, EtherType, Ingress Port-Id. |
| PBB VPLS service:<br><br>Terminating PBB BEB traffic (that is, B-SAP to I-SAP) | IP traffic (learnt and unlearnt): CSA, CDA, Ingress Port-Id.<br><br>L2/non-IP traffic (learnt and unlearnt): CSA, CDA, EtherType, Ingress Port-Id. |
| PBB Epipe service:<br><br>Originating PBB BEB traffic (that is, PBB Epipe I-SAP to B-SAP) | IP traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id, VLAN.<br><br>L2/non-IP traffic: CSA, CDA, EtherType, Ingress Port-Id. |
| PBB Epipe service:<br><br>Terminating PBB BEB traffic (PBB Epipe SAP to B-SAP) | IP traffic: CSA, CDA, Ingress Port-Id.<br><br>L2/non-IP traffic: CSA, CDA, EtherType, Ingress Port-Id. |

# LAG Hashing Fields used for 7210 SAS-X

**Table 9: LAG Hashing mechanism for services configured on 7210 SAS-X devices**

| Service and Traffic direction (For example: SAP to SDP) | Packet fields used for Hashing for different traffic types |
|---|---|
| VPRN service:<br><br>SAP to SAP<br>SAP to SDP | IP traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id, VLAN. |
| VPRN service:<br><br>SDP to SAP | IP traffic: Source and Destination IP, Source and Destination L4 ports, Ingress port-Id. |
| IES service and IPv4 Network port interface:<br><br>IES SAP to IES SAP<br><br>IPv4 network port interface to IPv4 network port interface<br><br>IES SAP to IPv4 network port interface | IPv4 unicast traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id, VLAN. |
| Network port IPv6 interface:<br><br>IPv6 network interface to IPv6 network interface | IPv6 unicast traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id, VLAN. |

**Notes**:

1. VPLS service, SDP to SDP: Test has been performed only for VC label variation with the same Tunnel label.
2. In the LSR case, incoming labels are used for hashing.
3. ‘Learnt’ wherever mentioned corresponds to Destination MAC.
4. Source/Destination MAC always refer to ‘Customer Source/Destination MACs’ unless otherwise specified.

# LAG Hashing Fields used for 7210 SAS-M (Access-Uplink mode)

**Table 10: LAG Hashing mechanism for services configured in Access-Uplink mode on 7210 SAS-M**

| Service and Traffic direction | Packet fields used for Hashing for different traffic types |
|---|---|
| VPLS service:<br><br>SAP to SAP | IP traffic (Learnt): Source and Destination IP, Source and Destination L4 ports.<br>IP traffic (Unlearnt): Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id<br><br>PBB traffic (Learnt): BDA, BSA<br>PBB traffic (Unlearnt): BDA, BSA, ISID, Ingress Port-Id<br><br>MPLS traffic (Learnt): Source and Destination MAC (Outer MACs of the Ethernet packet that encapsulates MPLS packet)<br>MPLS traffic (Unlearnt): MPLS label stack (Two labels deep), Ingress Port-Id<br><br>Non-IP traffic (Learnt): Source and Destination MAC, EtherType<br>Non-IP traffic (Unlearnt): Source and Destination MAC, EtherType, Ingress Port-Id, VLAN |
| Epipe service:<br><br>SAP to SAP | IP traffic: Source and Destination IP, Source and Destination L4 ports, Ingress Port-Id.<br><br>PBB traffic: BDA, BSA, ISID, Ingress Port-Id<br><br>MPLS traffic: MPLS label stack (Two labels deep), Ingress Port-Id<br><br>Non-IP traffic: Source and Destination MAC, EtherType, Ingress Port-Id, VLAN |
| IES service (IPv4):<br><br>IES SAP to IES SAP | IPv4 unicast traffic: Source and Destination IP, Source and Destination L4 ports. |

**NOTE:**

1. The term ‘Learnt’ mentioned corresponds to Destination MAC.
2. Source/Destination MAC refer to ‘Customer Source/Destination MACs’ unless otherwise specified.

# LAG Hashing Fields used for 7210 SAS-T

**Table 11: LAG Hashing mechanism for services configured on 7210 SAS-T**

| Service and Traffic direction | Packet fields used for Hashing for different traffic types |
|---|---|
| VPLS service:<br><br>SAP to SAP | IP traffic (Learnt): Source and Destination IP, Source and Destination L4 ports.<br>IP traffic (Unlearnt): Source and Destination IP, Ingress Port-Id<br><br>PBB traffic (Learnt): BDA, BSA<br>PBB traffic (Unlearnt): Ingress Port-Id<br><br>MPLS traffic (Learnt): Source and Destination MAC (Outer MACs of the Ethernet packet that encapsulates MPLS packet)<br>MPLS traffic (Unlearnt-IP): MPLS label stack (Two labels deep), Source and Destination IP, Ingress Port-Id<br>MPLS traffic (Unlearnt-L2): MPLS label stack (Two labels deep), Ingress Port-Id<br><br>Non-IP traffic (Learnt): Source and Destination MAC, EtherType<br>Non-IP traffic (Unlearnt): Source and Destination MAC, EtherType, Ingress Port-Id, VLAN |

**Table 11: LAG Hashing mechanism for services configured on 7210 SAS-T**

| Service and Traffic direction | Packet fields used for Hashing for different traffic types |
|---|---|
| Epipe service:<br><br>SAP to SAP | IIP traffic: Source and Destination IP, Ingress Port-Id.<br><br>PBB traffic: Ingress Port-Id<br><br>MPLS traffic (IP): MPLS label stack (Two labels deep), Source and Destination IP, Ingress Port-Id<br>MPLS traffic (L2): MPLS label stack (Two labels deep), Ingress Port-Id<br><br>Non-IP traffic: Source and Destination MAC, EtherType, Ingress Port-Id, VLAN |
| IES service (IPv4):<br><br>IES SAP to IES SAP | IPv4 unicast traffic: Source and Destination IP, Source and Destination L4 ports. |

**NOTE:**

1. The term ‘Learnt’ mentioned corresponds to Destination MAC.
2. Source/Destination MAC refer to ‘Customer Source/Destination MACs’ unless otherwise specified.

# ECMP Hashing fields used for 7210 SAS-M and 7210 SAS-X

**Table 12: ECMP Hashing mechanism for services configured on 7210 SAS-M Network mode and 7210 SAS-X.**

| Services | Traffic Type | A | B | ECMP Hashing |
|---|---|---|---|---|
| IP (For routed traffic) | Unicast traffic | Network Port IP Interface | Network Port IP Interface | • Source and Destination IP<br>• Source and Destination L4 ports<br>• Ingress Port-Id |
| IES | IPv4 traffic | SAP or Network Port IP interface | SAP or Network Port IP interface | • Source and Destination IP<br>• Source and Destination L4 ports<br>• Ingress Port-Id |

## LAG on Access

Link Aggregation Groups (LAG) is supported on access ports and access-uplink ports. This is treated the same as LAG on network ports which provides a standard method to aggregate Ethernet links. The difference lies in how QoS is handled.

## LAG and QoS Policies for 7210 SAS-M, 7210 SAS-T and 7210 SAS-X

In the 7210 SAS-M and 7210 SAS-T, an ingress QoS policy is applied to the aggregate traffic that enters the traffic through all the ports of the system. For example, if an ingress policy is configured with a policier of PIR 100Mbps, for a SAP configured on a LAG with two ports, then the policer limits the traffic entering the system through the two ports to a maximum of 100Mbps.

In the 7210 SAS-M and 7210 SAS-T, egress QoS policy shaper parameters are applied to all the ports that are members of the LAG (all ports get the full SLA). For example, if an egress policy is configured with a policer of PIR 100Mbps, each port would get a PIR of 100 Mbps. The advantage of this method over a scheme where the PIR is divided equally among all the member ports of the LAG is that, a single flow can use the entire SLA. The disadvantage is that, the overall SLA can be exceeded if the flows span multiple ports.

In 7210 SAS-X, a SAP ingress QoS policy or network port ingress QoS policy or network IP interface ingress QoS policy is applied to the aggregate traffic that enters the traffic through all the

ports of the system. For example, if an ingress policy is configured with a policier of PIR 100Mbps, for a SAP configured on a LAG with two ports, then the policer limits the traffic entering the system through the two ports to a maximum of 100Mbps.

In 7210 SAS-X, SAP egress QoS policy shaper parameters are applied to all the ports that are members of the LAG (all ports get the full SLA). For example, if an SAP egress policy is configured with a shaper of PIR 100Mbps, each port would get a PIR of 100 Mbps. The advantage of this method over a scheme where the PIR is divided equally among all the member ports of the LAG is that, a single flow can uses the entire SLA. The disadvantage is that the overall SLA can be exceeded if the flows span multiple ports.

In 7210 SAS-X, network port egress QoS policy shaper parameters are applied to all the ports that are members of the LAG (all ports get the full SLA). For example, if an network port egress policy is configured with a shaper of PIR 100Mbps, each port would get a PIR of 100 Mbps. The advantage of this method over a scheme where the PIR is divided equally among all the member ports of the LAG is that, a single flow can uses the entire SLA. The disadvantage is that the overall SLA can be exceeded if the flows span multiple ports.

## Port Link Damping

Hold time controls enable port link damping timers that reduce the number of link transitions reported to upper layer protocols.

The 7210 SAS OS port link damping feature guards against excessive port transitions. Any initial port transition is immediately advertised to upper layer protocols, but any subsequent port transitions are not advertised to upper layer protocols until a configured timer has expired.

An “up” timer controls the dampening timer for link up transitions, and a “down” timer controls the dampening timer for link down transitions.

## LACP

Generally, link aggregation is used for two purposes: provide an increase in bandwidth and/or provide redundancy. Both aspects are addressed by aggregating several Ethernet links in a single LAG.

Under normal operation, all non-failing links in a given LAG will become active and traffic is load balanced across all active links. In some circumstances, however, this is not desirable. Instead, it desired that only some of the links are active and the other links be kept in stand-by condition.

LACP enhancements allow active lag-member selection based on particular constrains. The mechanism is based on the IEEE 802.3ax standard so interoperability is ensured.

## LAG Subgroups

LACP is used to make selection of active links predictable and compatible with any vendor equipment. Refer to the IEEE STD 802.3-2002, Section 3, Clause 43.6.1 standard which describes how LACP allows stand-by and active signalling.

The 7210 SAS OS implementation of LACP supports the following:

- A given LAG member can be assigned to sub-groups. The selection algorithm then assures that only members of a single sub-group are selected as active links.
- The selection algorithm is effective only if LACP is enabled on a given LAG. At the same time, it is assumed that connected system has also LACP enabled (active or passive mode).
- The algorithm will select active links based on following criteria:
  - → Depending on selection-criteria setting either the sub-group with the highest number of eligible links or the sub-group with the highest aggregate weight of all eligible members is selected first.
  - → If multiple groups satisfy the selection criteria, the sub-group being currently active remains active. Initially, the sub-group containing the highest priority eligible link is selected.
  - → Only links pertaining to a single sub-group are active at any time.
  - → An eligible member refers to a LAG member link which can potentially become active. This means it is operationally up, and if the slave-to-partner flag is set, the remote system did not disable its use (by signalling stand-by).
- The selection algorithm works in a reverting mode. This means that every time the configuration or status of any link in a LAG changes, the selection algorithm is re-run. In case of a tie between two groups (one of them being currently active) the active group remains active (no reverting).

# Multi-Chassis LAG

This section describes the Multi-Chassis LAG (MC-LAG) concept. MC-LAG is an extension of a LAG concept that provides node-level redundancy in addition to link-level redundancy provided by “regular LAG”.

Note: This feature is supported only on 7210 SAS-X and 7210 SAS-M network mode. It is not supported in 7210 SAS-T and 7210 SAS-M access-uplink mode.

Typically, MC-LAG is deployed in a network-wide scenario providing redundant connection between different end points. The whole scenario is then built by combination of different mechanisms (for example, MC-LAG and redundant pseudowire to provide e2e redundant p2p connection or dual homing of DSLAMs in Layer 2/3 TPSDA).

## Overview

Multi-chassis LAG is a method of providing redundant Layer 2/3 access connectivity that extends beyond link level protection by allowing two systems to share a common LAG end point.

The multi-service access node (MSAN) node is connected with multiple links towards a redundant pair of Layer 2/3 aggregation nodes such that both link and node level redundancy, are provided. By using a multi-chassis LAG protocol, the paired Layer 2/3 aggregation nodes (referred to as redundant-pair) appears to be a single node utilizing LACP towards the access node. The multi-chassis LAG protocol between redundant-pair ensures a synchronized forwarding plane to/from the access node and is used to synchronize the link state information between the redundant-pair nodes such that proper LACP messaging is provided to the access node from both redundant-pair nodes.

In order to ensure SLAs and deterministic forwarding characteristics between the access and the redundant-pair node, the multi-chassis LAG function provides an active/standby operation towards/from the access node. LACP is used to manage the available LAG links into active and standby states such that only links from 1 aggregation node are active at a time to/from the access node.

Characteristics related to MC are:

- Selection of the common system ID, system-priority and administrative-key are used in LACP messages so partner systems consider all links as the part of the same LAG.
- Extension of selection algorithm in order to allow selection of active sub-group.
  - → The sub-group definition in LAG context is still local to the single box, meaning that even if sub-groups configured on two different systems have the same sub-group-id they are still considered as two separate subgroups within given LAG.
  - → Multiple sub-groups per PE in a MC-LAG is supported.
  - → In case there is a tie in the selection algorithm, for example, two sub-groups with identical aggregate weight (or number of active links) the group which is local to the system with lower system LACP priority and LAG system ID is taken.
- Providing inter-chassis communication channel allows inter-chassis communication to support LACP on both system. This communication channel enables the following:
  - → Supports connections at the IP level which do not require a direct link between two nodes. The IP address configured at the neighbor system is one of the addresses of the system (interface or loop-back IP address).

→ The communication protocol provides heartbeat mechanism to enhance robustness of the MC-LAG operation and detecting node failures.

→ Support for operator actions on any node that force an operational change.

→ The LAG group-ids do not have to match between neighbor systems. At the same time, there can be multiple LAG groups between the same pair of neighbors.

→ Verification that the physical characteristics, such as speed and auto-negotiation is configured and initiates operator notifications (traps) if errors exist. Consistency of MC-LAG configuration (system-id, administrative-key and system-priority) is provided. Similarly, load-balancing mode of operation must be consistently configured on both nodes.

→ Traffic over the signalling link is encrypted using a user configurable message digest key.

- MC-LAG function provides active/stand-by status to other software applications in order to built a reliable solutions.

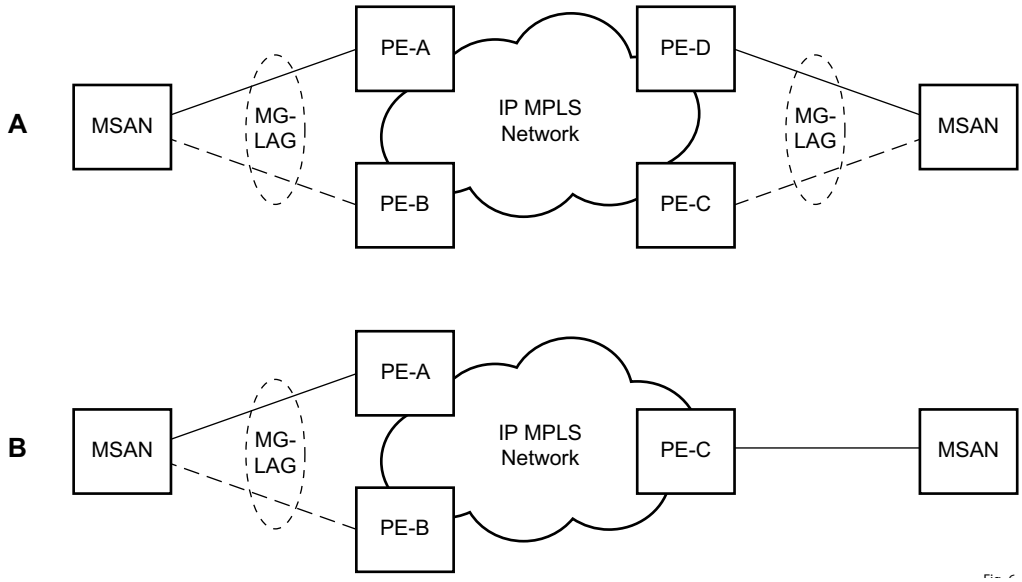


**Figure 4: MC-LAG L2 Dual Homing to Remote PE Pairs**

Figure 4 depicts different combinations of MC-LAG attachments supported. The supported configurations can be sub-divided into following sub-groups:

- Dual-homing to remote PE pairs
  → both end-points attached with MC-LAG
  → one end-point attached
- Dual-homing to local PE pair
  → both end-points attached with MC-LAG
  → one end-point attached with MC-LAG
  → both end-points attached with MC-LAG to two overlapping pairs

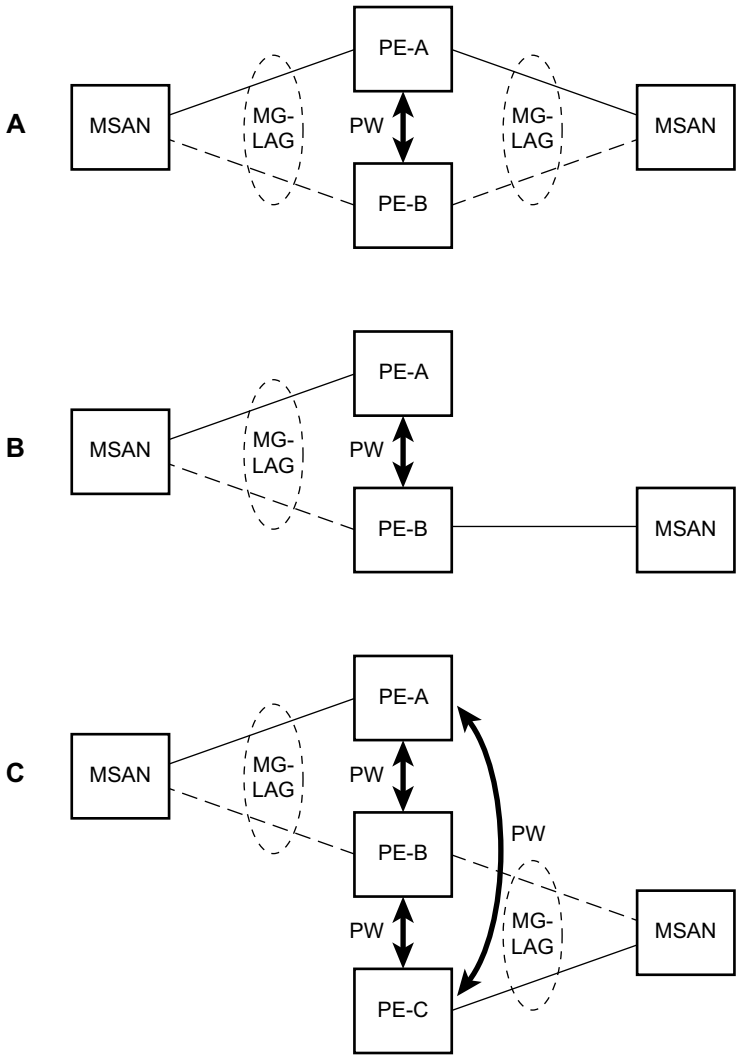


**Figure 5: MC-LAG L2 Dual Homing to Local PE-Pairs**

The forwarding behavior of the nodes abide by the following principles. Note that logical destination (actual forwarding decision) is primarily determined by the service (VPLS or VLL) and then principle below applies only if destination or source is based on MC-LAG:

- Packets received from the network will be forwarded to all local active links of the given destination-sap based on conversation hashing. In case there are no local active links, the packets will be cross-connected to inter-chassis pseudowire.
- Packets received from the MC-LAG sap will be forwarded to active destination pseudo-wire or active local links of destination-sap. In case there are no such objects available at the local node, the packets will be cross-connected to inter-chassis pseudowire.

## Point-to-Point (p2p) Redundant Connection Across  Layer 2/3 VPN Network

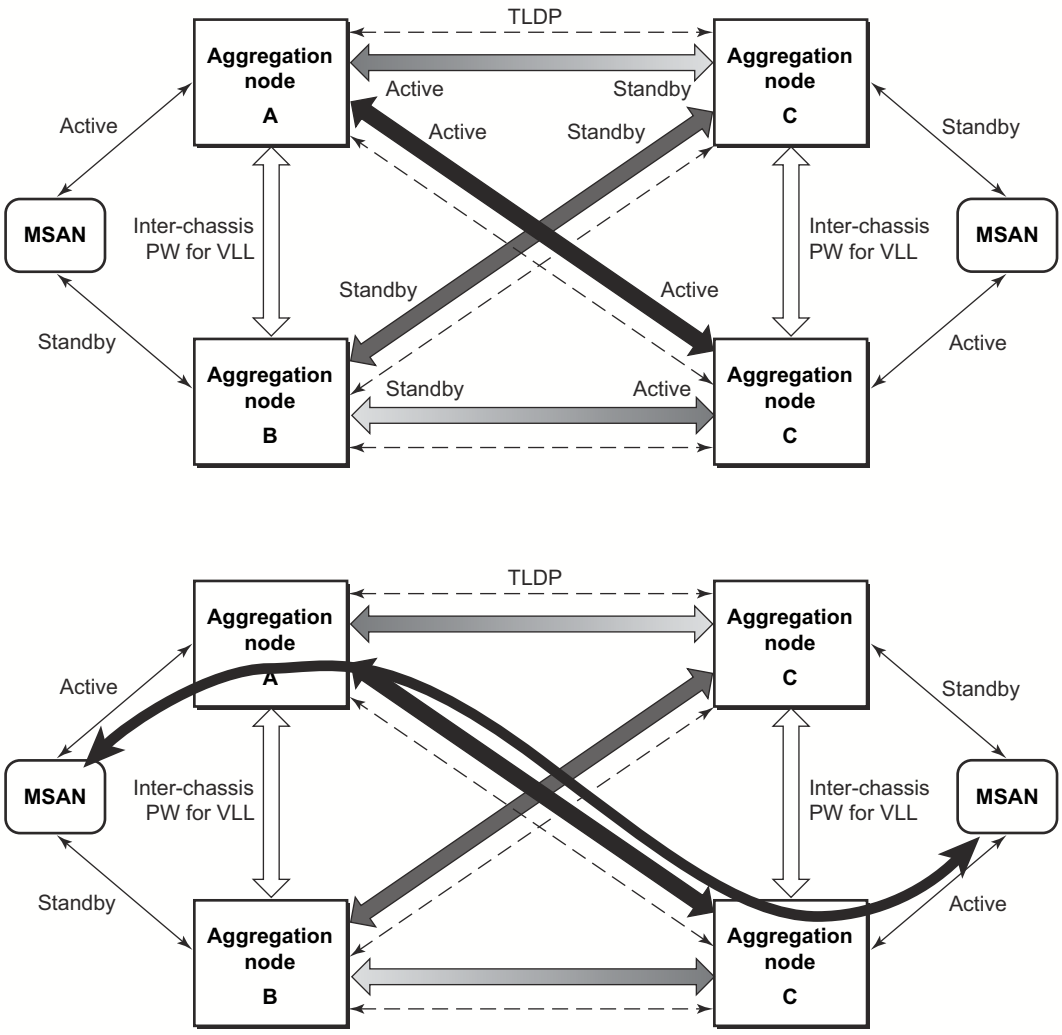


**Figure 6: P2P Redundant Connection Through a  Layer 2 VPN Network**

Figure 6 shows the connection between two multi-service access nodes (MSANs) across network based on  Layer 2/3 VPN pseudo-wires. The connection between MSAN and a pair of PE routers is realized by MC-LAG. From MSAN perspective, redundant pair of PE routers acts as a single partner in LACP negotiation. At any point in time, only one of the routers has an active link(s) in a given LAG. The status of LAG links is reflected in status signaling of pseudo-wires set between all participating PEs. The combination of active and stand-by states across LAG links as well and pseudo-wires give only 1 unique path between pair of MSANs.

Note that the configuration in Figure 6 depicts one particular configuration of VLL connections based on MC-LAG, particularly the VLL connection where two ends (SAPs) are on two different redundant-pairs. In addition to this, other configurations are possible, such as:

- Both ends of the same VLL connections are local to the same redundant-pair.
- One end VLL endpoint is on a redundant-pair the other on single (local or remote) node.

## DSLAM Dual Homing in Layer 2 Network

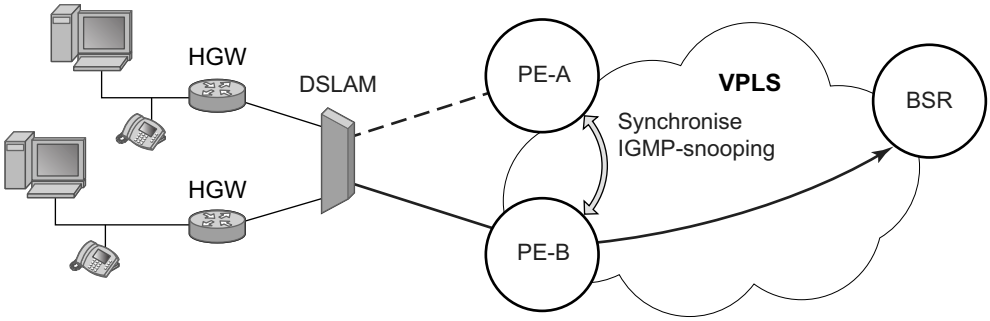


**Figure 7: DSLAM Dual-Homing Using MC-LAG**

Figure 7 illustrates a network configuration where DSLAM is dual homed to pair of redundant PEs by using MC-LAG. Inside the aggregation network redundant-pair of PEs is connecting to VPLS service which provides reliable connection to single or pair of Broadband Service Routers (BSRs).

PE-A and PE-B implement MC-LAG towards access.The active node synchronises the IGMP snooping state with the standby node, allowing the standby node to forward multicast streams to recievers on the access side, if the active node fails.

---

### Configuration Guideline

- MC-LAG peer nodes have to be the same platform. That is the 7210 SAS-M can be a MC-LAG peer with another 7210 SAS-M, but cannot be a peer of a 7210 SAS-X. The converse is also true.
- MC-LAG is supported only in network mode on 7210 SAS-M. In other words, if two MC-LAG peers are setup using 7210 SAS-M then both need to configured in network mode.
- 7210 SAS-M and 7210 SAS-T access-uplink mode supports active/standby LAG, which allows it to be used as client in an MC-LAG solution.

## Configuring Multi-Chassis Redundancy

Note: When configuring associated LAG ID parameters, the LAG must be in access mode and LACP must be enabled.

Use the CLI syntax displayed below to configure multi-chassis redundancy features.

CLI Syntax:

```
config>redundancy
  multi-chassis
     peer ip-address
        authentication-key [authentication-key | hash-key][hash | hash2]
        description description-string
        mc-lag
           hold-on-neighbor-failure duration
           keep-alive-interval interval
          lag lag-id lacp-key admin-key system-id system-id [remotelag lag-id] system-pri-
ority system-priority
           no shutdown
        no shutdown
        source-address ip-address
        sync
           igmp-snooping
           port [port-id | lag-id] [sync-tag]range encap-range sync-tag
           no shutdown
```

Example:

```
config>redundancy# multi-chassis
config>redundancy>multi-chassis# peer 10.10.10.2 create
config>redundancy>multi-chassis>peer# description "Mc-Lag peer 10.10.10.2"
config>redundancy>multi-chassis>peer# mc-lag
config>redundancy>mc>peer>mc-lag# lag 1 lacp-key 32666 system-id 00:00:00:33:33:33 system-
priority 32888
config>redundancy>mc>peer>mc-lag# no shutdown
config>redundancy>mc>peer>mc-lag# exit
config>redundancy>multi-chassis>peer# no shutdown
config>redundancy>multi-chassis>peer# exit
config>redundancy>multi-chassis# exit
config>redundancy#
```

The following displays the configuration:

```
*7210-SAS>config>redundancy# info
----------------------------------------------
        multi-chassis
            peer 1.1.1.1 create
                shutdown
                sync
                    shutdown
                    port 1/1/1 create
```

```
                    exit
                exit
            peer 10.20.1.3 create
                mc-lag
                    lag 3 lacp-key 1 system-id 00:00:00:aa:bb:cc remote-lag 1 system-pri-
ority 1
                    no shutdown
                exit
                no shutdown
            exit
        exit
-------------------------------------------
*7210-SAS>config>redundancy#
```

## G.8032 Protected Ethernet Rings

Ethernet ring protection switching offers ITU-T G.8032 specification compliance to achieve resiliency for Ethernet Layer 2 networks. G.8032 (Eth-ring) is built on Ethernet OAM and often referred to as Ring Automatic Protection Switching (R-APS).

For further information on Ethernet rings, see G.8032 Protected Ethernet Rings section in the Services Guide.

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### 802.1x Network Access Control

The Alcatel-Lucent 7210 SAS supports network access control of client devices (PCs, STBs, etc.) on an Ethernet network using the IEEE. 802.1x standard. 802.1x is known as Extensible Authentication Protocol (EAP) over a LAN network or EAPOL.

---

### 802.1x Modes

The Alcatel-Lucent 7210 SAS supports port-based network access control for Ethernet ports only. Every Ethernet port can be configured to operate in one of three different operation modes, controlled by the port-control parameter:

- **force-auth** — Disables 802.1x authentication and causes the port to transition to the authorized state without requiring any authentication exchange. The port transmits and receives normal traffic without requiring 802.1x-based host authentication. This is the default setting.
- **force-unauth** — Causes the port to remain in the unauthorized state, ignoring all attempts by the hosts to authenticate. The switch cannot provide authentication services to the host through the interface.
- **auto** — Enables 802.1x authentication. The port starts in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. Both the router and the host can initiate an authentication procedure as described below. The port will remain in un-authorized state (no traffic except EAPOL frames is allowed) until the first client is authenticated successfully. After this, traffic is allowed on the port for all connected hosts.

## 802.1x Basics

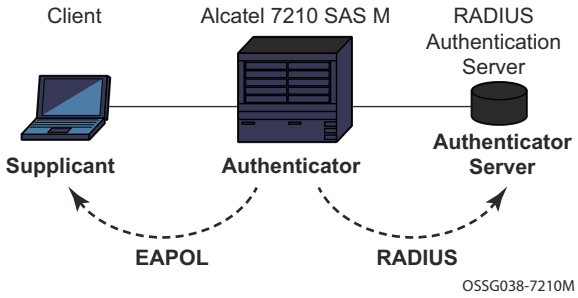


**Figure 8: 802.1x Architecture**

The IEEE 802.1x standard defines three participants in an authentication conversation (see Figure 8).

- The supplicant — This is the end-user device that requests access to the network.
- The authenticator — Controls access to the network. Both the supplicant and the authenticator are referred to as Port Authentication Entities (PAEs).
- The authentication server — Performs the actual processing of the user information.

The authentication exchange is carried out between the supplicant and the authentication server, the authenticator acts only as a bridge. The communication between the supplicant and the authenticator is done via the Extended Authentication Protocol (EAP) over LANs (EAPOL). On the back end, the communication between the authenticator and the authentication server is done with the RADIUS protocol. The authenticator is thus a RADIUS client, and the authentication server a RADIUS server.

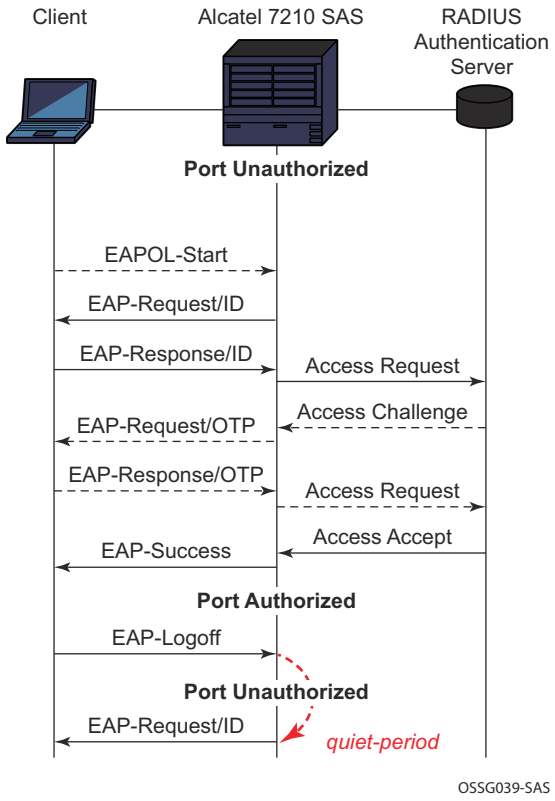


**Figure 9: 802.1x Authentication Scenario**

The messages involved in the authentication procedure are illustrated in Figure 9.The router will initiate the procedure when the Ethernet port becomes operationally up, by sending a special PDU called EAP-Request/ID to the client. The client can also initiate the exchange by sending an EAPOL-start PDU, if it doesn't receive the EAP-Request/ID frame during bootup. The client responds on the EAP-Request/ID with a EAP-Response/ID frame, containing its identity (typically username + password).

After receiving the EAP-Response/ID frame, the router will encapsulate the identity information into a RADIUS AccessRequest packet, and send it off to the configured RADIUS server.

The RADIUS server checks the supplied credentials, and if approved will return an Access Accept message to the router. The router notifies the client with an EAP-Success PDU and puts the port in authorized state.

### 802.1x Timers

The 802.1x authentication procedure is controlled by a number of configurable timers and scalars. There are two separate sets, one for the EAPOL message exchange and one for the RADIUS message exchange. See Figure 40 for an example of the timers.

EAPOL timers:

- transit-period — Indicates how many seconds the Authenticator will listen for an EAP-Response/ID frame. If the timer expires, a new EAP-Request/ID frame will be sent and the timer restarted. The default value is 60. The range is 1-3600 seconds.
- supplicant-timeout — This timer is started at the beginning of a new authentication procedure (transmission of first EAP-Request/ID frame). If the timer expires before an EAP-Response/ID frame is received, the 802.1x authentication session is considered as having failed. The default value is 30. The range is 1 — 300.
- quiet-period — Indicates number of seconds between authentication sessions It is started after logoff, after sending an EAP-Failure message or after expiry of the supplicant-timeout timer. The default value is 60. The range is 1 — 3600.

RADIUS timer and scaler:

- max-auth-req — Indicates the maximum number of times that the router will send an authentication request to the RADIUS server before the procedure is considered as having failed. The default value is value 2. The range is 1 — 10.
- server-timeout — Indicates how many seconds the authenticator will wait for a RADIUS response message. If the timer expires, the access request message is sent again, up to *max-auth-req* times. The default value is 60. The range is 1 — 3600 seconds.

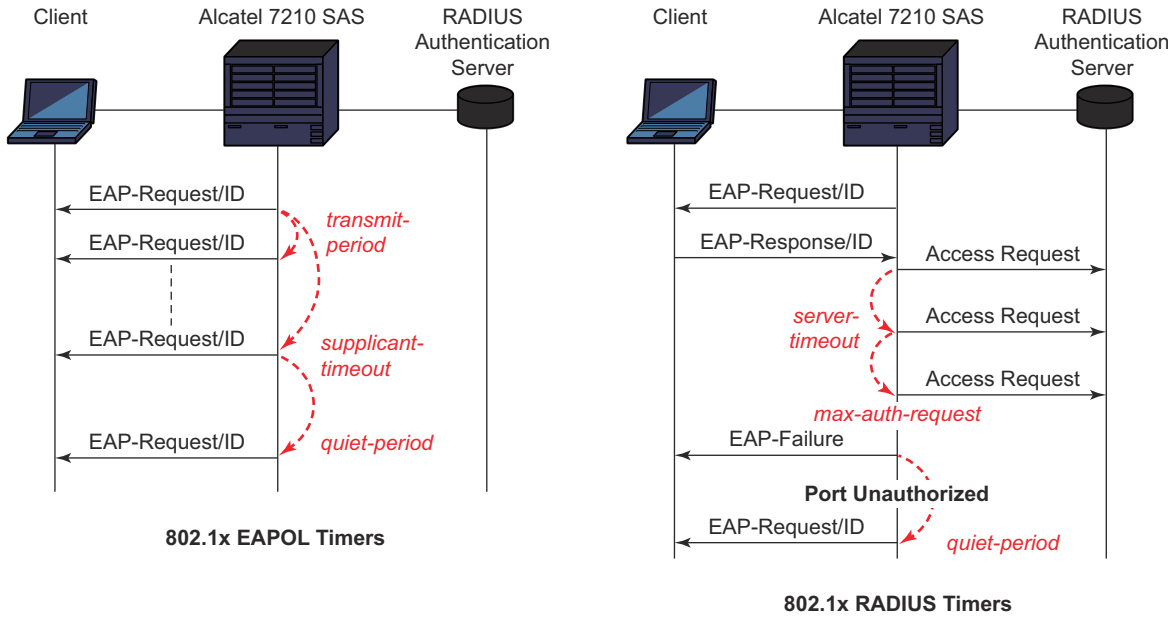


**Figure 10: 802.1x EAPOL Timers (left) and RADIUS Timers (right)**

The router can also be configured to periodically trigger the authentication procedure automatically. This is controlled by the enable re-authentication and reauth-period parameters. Reauth-period indicates the period in seconds (since the last time that the authorization state was confirmed) before a new authentication procedure is started. The range of reauth-period is 1 — 9000 seconds (the default is 3600 seconds, one hour). Note that the port stays in an authorized state during the re-authentication procedure.

### 802.1x Configuration and Limitations

Configuration of 802.1x network access control on the router consists of two parts:

- Generic parameters, which are configured under **config>security>dot1x**
- Port-specific parameters, which are configured under **config>port>ethernet>dot1x**

801.x authentication:

- Provides access to the port for any device, even if only a single client has been authenticated.
- Can only be used to gain access to a pre-defined Service Access Point (SAP). It is not possible to dynamically select a service (such as a VPLS service) depending on the 802.1x authentication information.
-

### 802.1x Tunneling for Epipe Service

Customers who subscribe to Epipe service considers the Epipe as a wire, and run 802.1x between their devices which are located at each end of the Epipe.

Note: This feature only applies to port-based Epipe SAPs because 802.1x runs at port level not VLAN level. Therefore such ports must be configured as null encapsulated SAPs.

When 802.1x tunneling is enabled, the 802.1x messages received at one end of an Epipe are forwarded through the Epipe. When 802.1x tunneling is disabled (by default), 802.1x messages are dropped or processed locally according to the 802.1x configuration (shutdown or no shutdown).

Note that enabling 802.1x tunneling requires the 802.1x mode to be set to force-auth. Enforcement is performed on the CLI level.

# 802.3ah OAM

802.3ah Clause 57 (EFM OAM) defines the Operations, Administration, and Maintenance (OAM) sub-layer, which provides mechanisms useful for monitoring link operation such as remote fault indication and remote loopback control. In general, OAM provides network operators the ability to monitor the health of the network and quickly determine the location of failing links or fault conditions. EFM OAM described in this clause provides data link layer mechanisms that complement applications that may reside in higher layers.

OAM information is conveyed in slow protocol frames called OAM protocol data units (OAMPDUs). OAMPDUs contain the appropriate control and status information used to monitor, test and troubleshoot OAM-enabled links. OAMPDUs traverse a single link, being passed between peer OAM entities, and as such, are not forwarded by MAC clients (like bridges or switches).

The following EFM OAM functions are supported:

- EFM OAM capability discovery.
- Active and passive modes.
- Remote failure indication — Handling of critical link events (for example, link fault, dying gasp)
- Loopback — A mechanism is provided to support a data link layer frame-level loopback mode. Both remote and local loopback modes are supported.
- Dying Gasp support on 7210 SAS platforms:
  - → 7210 SAS-X, 7210 SAS-M and 7210 SAS-T, generate EFM OAM dying gasp messages on loss of power. EFM OAM dying gasp messages are generated on either Network ports or Access uplink ports based on the mode in which the device is operating. They are not generated on access ports. These platforms also support generation of SNMP dying gasp messages on power failure and it is mutually exclusive to generation of EFM OAM dying gasp messages. Please see the System Management guide for more information about support for SNMP dying gasp.
  - → All 7210 SAS platforms, process the received EFM OAM dying gasp, on a port enabled for EFM and generate a SNMP trap.
- EFM OAMPDU tunneling.
- High resolution timer for EFM OAM in 500ms interval (minimum).

## OAM Events

EFM OAM defines a set of events that may impact link operation. The following events are supported:

- Critical link events (defined in 802.3ah clause 57.2.10.1)
  - → Link fault: the PHY has determined a fault has occurred in the receive direction of the local DTE.
  - → Dying gasp: an unrecoverable local failure condition has occurred.
  - → Critical event: an unspecified critical event has occurred.

These critical link events are signaled to the remote DTE by the flag field in OAM PDUs.

The 7210 does not generate EFM OAM PDUs with these flags except for the dying gasp flag. However, it supports processing of these flags in EFM OAM PDUs received from the peer.

## Remote Loopback

EFM OAM provides a link-layer frame loopback mode that can be remotely controlled.

To initiate remote loopback, the local EFM OAM client sends a loopback control OAM PDU by enabling the OAM remote-loopback command. After receiving the loopback control OAM PDU, the remote OAM client puts the remote port into local loopback mode.

To exit remote loopback, the local EFM OAM client sends a loopback control OAM PDU by disabling the OAM remote-loopback command. After receiving the loopback control OAM PDU, the remote OAM client puts the port back into normal forwarding mode.

Note that during remote loopback test operation, all frames except EFM OAM PDUs are dropped at the local port for the receive direction, where remote loopback is enabled. If local loopback is enabled, then all frames except EFM OAM PDUs are dropped at the local port for both the receive and transmit directions. This behavior may result in many protocols (such as STP or LAG) resetting their state machines.

---

## 802.3ah OAM PDU Tunneling for Epipe Service

The 7210 SAS routers support 802.3ah. Customers who subscribe to Epipe service treat the Epipe as a wire, so they demand the ability to run 802.3ah between their devices which are located at each end of the Epipe.

Note: This feature only applies to port-based Epipe SAPs because 802.3ah runs at port level not VLAN level. Hence, such ports must be configured as null encapsulated SAPs.

When OAM PDU tunneling is enabled, 802.3ah OAM PDUs received at one end of an Epipe are forwarded through the Epipe. 802.3ah can run between devices that are located at each end of the Epipe. When OAM PDU tunneling is disabled (by default), OAM PDUs are dropped or processed locally according to the **efm-oam** configuration (**shutdown** or **no shutdown**).

Note that by enabling 802.3ah for a specific port and enabling OAM PDU tunneling for the same port are mutually exclusive.

## MTU Configuration Guidelines

- The 7210 SAS devices provides an option to configure the MTU limitations at many service points. The physical (access and network) port, service, and SDP MTU values must be individually defined.
- MTU values must conform to both of the following conditions:

→ The service MTU must be less than or equal to the SDP path MTU.
→ The service MTU must be less than or equal to the access port (SAP) MTU.

---

### Default MTU Values

Table 13 displays the default MTU values which are dependent upon the (sub-) port type, mode, and encapsulation.

**Table 13: MTU Default Values**

| Port Type | Mode | Encap Type | Default (bytes) |
|---|---|---|---|
| Ethernet | access | null | 1514 |
| Ethernet | access | dot1q | 1518 |
| Port mode | access | qinq | 1522 |
| Fast Ethernet | network | — | 1514 |
| Other Ethernet | network | — | 9212* |
| Ethernet | hybrid | — | 9212 |

*The default MTU for Ethernet ports other than Fast Ethernet is actually the lesser of 9212 and any MTU limitations imposed by hardware which is typically 16K.

**Notes:**

1. The **no service-mtu-check** command disables service mtu check. Disabling the service MTU check allows packets to pass to the egress if the packet length is less than or equal to the MTU configured on the port. The length of the packet sent from a SAP is limited only by the access port MTU. In case of a pseudowire, the length of the packet is limited by the network port MTU (including the MPLS encapsulation).
2. In 7210 SAS, length of the SAP tag (or service-delimiting tag, for a packet received over a pseudowire) is included in the computation of the packet length before comparing it with the service-MTU configured for the service.
   Packet length= Length of IP packet + L2 header + length of SAP tag

   For example, if the IP packet received over a dot1q SAP is 1500 and the service-MTU configured is 1514, the service MTU validation check fails as:

   Packet length=1500 (Length of IP packet) +14 (L2 header) +4 (length of SAP tag) =1518. The packet is dropped as packet length is greater than the service MTU configured.

---

Note: Please check the 7210 platform release notes for other restrictions with regards to MTU checking and processing on each of the platforms.

# Deploying Preprovisioned Components for 7210 SAS-M, 7210 SAS-X, and 7210 SAS-T

Appropriate MDAs are auto-provisioned in 7210 SAS-M, 7210 SAS-X and 7210 SAS-T devices. User is not required to provisions the slots or MDA on these platforms.

---

**Notes**:

1. This step is not needed for platforms such as a 7210 SAS-M, 7210 SAS-T, 7210 SAS-X that do not support removable cards. It is typically used only on platforms that are chassis based and support slots for inserting cards, like the 7210 SAS-R6.
2. This step is not needed for platforms such as a 7210 SAS-M, 7210 SAS-T, 7210 SAS-X that do not support removable cards. On platforms with fixed cards, the card type is auto-provisioned. It is typically used only on platforms that are chassis based and support slots for inserting cards, like the 7210 SAS-R6.
3. This step is required only if the platform supports use of physical MDAs, like the 7210 SAS-M. It is not required on platforms that do not support an MDA, like 7210 SAS-X, 7210 SAS-T, and 7210 SAS-R6.

# Configuration Notes

The following information describes provisioning caveats:

- On 7210 SAS systems that require provisioning of the card type , if a card or MDA type is installed in a slot provisioned for a different type, the card will not initialize.
- On 7210 SAS systems that require provisioning of a card and MDA (For example, 7210 SAS-M) installed in an un-provisioned slot remain administratively and operationally down until the card type and MDA is specified.
- Ports cannot be provisioned until the slot, card and MDA type are specified, on systems that require provisioning of the card and MDA (For example, 7210 SAS-M). Port can be provisioned on bootup on systems that auto-provision the cards and MDAs (For example:

  7210 SAS-X, 7210 SAS-T, fixed ports on 7210 SAS-M).

# Configuring Physical Ports with CLI

This section provides information to configure ports.

Topics in this section include:


- Preprovisioning Guidelines on page 78
  - → Preprovisioning a Port on page 79
- Basic Configuration on page 80
- Common Configuration Tasks on page 82
  - → Configuring Cards on 7210 SAS-R6 on page 90
  - → Configuring Ports on page 83
- Common Configuration Tasks on page 82
  - → Configuring Ports on page 83
    - – Configuring Ethernet Port Parameters on page 84
  - → Configuring LAG Parameters on page 89
- Service Management Tasks on page 90
  - → Modifying a Card Type on page 91
  - → Deleting a Card on page 92
  - → Deleting Port Parameters on page 92

# Preprovisioning Guidelines

7210 SAS platforms provides a console port to connect terminals to the device. The Ethernet management port is supported.

Configure parameters from a system console connected to a  console port, using Telnet to access a the device remotely or SSH to open a secure shell connection.

## Predefining Entities

On 7210 SAS platforms, where cards/MDAs are not auto-provisioned, in order to initialize a card, the chassis slot, line card type, and MDA type must match the preprovisioned parameters. In this context, *preprovisioning* means to configure the entity type (such as the line card type, MDA type, port, and interface) that is planned for a chassis slot, line card, or MDA. Preprovisioned entities can be installed but not enabled or the slots can be configured but remain empty until populated. *Provisioning* means that the preprovisioned entity is installed and enabled.

You can:

- Pre-provision ports and interfaces after the line card and MDA types are specified.
- Install line cards in slots with no pre-configuration parameters specified. Once the card is installed, the card and MDA types must be specified. This is required on 7210 SAS chassis based platforms  or those platforms that support expansion slots (for example, 7210 SAS-M). Typically on 7210 platforms that do not support any removable cards and/or MDAs, the cards are pre-provisioned for fixed ports.
- Install a line card in a slot provisioned for a different card type (the card will not initialize). The existing card and MDA configuration must be deleted and replaced with the current information. This is required on 7210 SAS chassis based platforms  or those platforms that support expansion slots (for example, 7210 SAS-M). Typically on 7210 platforms that do not support any removable cards and/or MDAs, the MDAs are pre-provisioned for all fixed ports.

# Preprovisioning a Port

On 7210 SAS chassis based platforms  or those that provide an expansion slot (for example, 7210 SAS-M), before a port can be configured, the slot must be preprovisoned with an allowed card type and/or the MDA must be preprovisioned with an allowed MDA type.

Some recommendations to configure a port include:

- Ethernet
  - → Configure an access port for customer facing traffic on which services are configured.

    An encapsulation type may be specified in order to distinguish services on the port or channel. Encapsulation types are not required for network ports.

    To configure an Ethernet access port, refer to on page 84.
  - → Configure a network port to participate in the service provider transport or infrastructure network.

    To configure an Ethernet network port, refer to on page 84.

    Accounting policies can only be associated with network ports and Service Access Ports (SAPs). Accounting policies are configured in the *config>log>accountingpolicy* context.

Once ports are preprovisioned, Link Aggregation Groups (LAGs) can be configured to increase the bandwidth available between two nodes. Up to four links can be grouped. All physical links in a given LAG combine to form one logical connection. A LAG also provides redundancy in case one or more links that participate in the LAG fail. For command syntax, see Configuring LAG Parameters on page 89.

# Basic Configuration

On 7210 SAS platforms that do not support any removable cards and/or MDAs (for example, 7210 SAS-M, 7210 SAS-X, and 7210 SAS-T), the card and MDA is auto-provisioned and operators can directly start with identifying and configuring the ports as given below. If the operators intends to use the expansion slot on 7210 SAS-M, then they must start with the step in identifying and configuring the MDA slot.

On 7210 SAS chassis based platforms,  the card type must be provisioned and operators need to start from the identifying the chassis slot and configuration of the slot and card type, as given below.

The most basic configuration must have the following:

- Identify chassis slot (if applicable)
- Specify line card type (must be an allowed card type).
- Identify MDA slot (if applicable)
- Specify MDA (must be an allowed MDA type) - if applicable
- Identify specific port to configure.

# Configuring Cards and MDAs

Card configurations include a chassis slot designation.

The following example displays some MDA configurations for 7210 SAS-M:

```
A:ALA-B>config>card# info
----------------------------------------------
     card-type iom-20g
          mda 1
               mda-type m10-1gb-sfp
          exit
          mda 2
               mda-type m10-1gb-sfp
          exit
----------------------
A:ALA-B>config>card#
```

# Common Configuration Tasks

The following sections are basic system tasks that must be performed.


- Configuring Ports on page 83
  → Configuring Ethernet Port Parameters on page 84
- Configuring LAG Parameters on page 89
- Modifying a Card Type on page 91
- Deleting a Card on page 92
- Deleting Port Parameters on page 92

# Configuring Ports


- Configuring Ethernet Port Parameters on page 84

# Configuring Ethernet Port Parameters

## Ethernet Network Port

A network port is network facing and participates in the service provider transport or infrastructure network processes. The following example displays a network port configuration:

```
A:ALA-B>config>port# info
----------------------------------------------
description "Ethernet network port"
ethernet
     mode network
exit
no shutdown
----------------------------------------------
A:ALA-B>config>port#
```

## Ethernet Access uplink Port

Access-uplink port are network facing and transport customer service. It allows only QinQ encapsulation to be used.

```
A:ALA-B>config>port# info
----------------------------------------------
description "Ethernet network port"
ethernet
     mode access uplink
exit
no shutdown
----------------------------------------------
A:ALA-B>config>port#
```

## Ethernet Access Port

Services are configured on access ports used for customer-facing traffic. If a Service Access Port (SAP) is to be configured on a port, it must be configured as access mode. When a port is configured for access mode, the appropriate encapsulation type can be specified to distinguish the services on the port. Once a port has been configured for access mode, multiple services may be configured on the port.

The following example displays an Ethernet access port configuration :

```
*A:7210-SAS>config>port# info
----------------------------------------------
        ethernet
            mode access
```

```
            access
                egress
                exit
            exit
            encap-type dot1q
            mtu 9212
        exit
        no shutdown
----------------------------------------------
*A:7210-SAS>
```

## Configuring 802.1x Authentication Port Parameters

The following example displays an 802.1x port configuration:

```
A:ALA-A>config>port>ethernet>dot1x# info detail
----------------------------------------------
                port-control auto
                radius-plcy dot1xpolicy
                re-authentication
                re-auth-period 3600
                max-auth-req 2
                transmit-period 30
                quiet-period 60
                supplicant-timeout 30
                server-timeout 30
----------------------------------------------
```

# Configuring Channelized Ports

This section is applicable only when using the CES MDA that supports 4 x T1/E1 ports. CES MDA is available for use only on the 7210 SAS-M platform in network mode (it cannot be used in access-uplink mode). It cannot be used on any other 7210 SAS platform.

When configuring channelized ports, the port ID is specified in different ways depending on the MDA type and level of channelization. Ethernet ports cannot be channelized.

---

# Configuring a Channelized DS1 Card

7210 SAS-M support CES MDA that support 4 port channelized DS-1 cards. The channelization is as follows:

- N*DS0 in DS1 port.{1..24}
- N*DS0 in E1 port.{1..32}

To make sure you have a channel-capable MDA, verify the MDA-type you are configuring by entering a show mda slot-id command.

In the following example, MDA 2 shows a channelized DS1 MDA:

In the TDM E1 context, configure DS0 channel groups and their parameters. For a DS1 channelgroup, up to 24 timeslots can be assigned (numbered 1..24). For an E1 channel-group, up to 31 timeslots can be assigned (numbered 2..32). Only CES services (i.e. CESoPSN and SAToP) are supported with CES MDA on 7210 SAS-M in network mode.

Configuration Examples follows:

```
ALA-A>config>port>tdm# e1 1.1
ALA-A>config>port>tdm>e1# channel-group 1
ALA-A>config>port>tdm>e1>channel-group# timeslots 2
ALA-A>config>port>tdm>e1>channel-group# no shutdown
ALA-A>config>port>tdm>e1>channel-group#
ALA-A>config>port>tdm>e1# no shutdown
ALA-A>config>port>tdm>e1# channel-group 2
ALA-A>config>port>tdm>e1>channel-group# timeslots 3
ALA-A>config>port>tdm>e1>channel-group# no shutdown
ALA-A>config>port>tdm>e1>channel-group# exit
ALA-A>config>port>tdm>e1# channel-group 3
ALA-A>config>port>tdm>e1>channel-group# timeslots 11,12
ALA-A>config>port>tdm>e1>channel-group# no shutdown
```

```
ALA-A>config>port>tdm>e1>channel-group# exit
ALA-A>config>port>tdm>e1# no shutdown
ALA-A>config>port>tdm>e1# exit
ALA-A>config>port>tdm# e1 1.2
ALA-A>config>port>tdm>e1# no shutdown
ALA-A>config>port>tdm>e1# channel-group 1
ALA-A>config>port>tdm>e1>channel-group# no shutdown
ALA-A>config>port>tdm>e1>channel-group# exit
ALA-A>config>port>tdm>e1# no shutdown
ALA-A>config>port>tdm# info
----------------------------------------------------------------------------------------------
ALA-A>config>port>tdm#
```

Services can now be applied to the configured channelized ports.

# Configuring LAG Parameters

LAG configurations should include at least two ports. Other considerations include:

- A maximum of four ports can be included in a LAG. All ports in the LAG must share the same characteristics (speed, duplex, hold-timer, etc.). The port characteristics are inherited from the primary port.
- Autonegotiation must be disabled or set limited mode for ports that are part of a LAG to guarantee a specific port speed.
- Ports in a LAG must be configured as full duplex.

The following example displays LAG configuration output:

```
A:ALA-A>config>lag# info detail
----------------------------------------------
     description "LAG2"
     mac 04:68:ff:00:00:01
     port 1/1/1
     port 1/1/2
     port 1/1/3
     dynamic-cost
     port-threshold 2 action down
----------------------------------------------
A:ALA-A>config>lag#
```

# Service Management Tasks

This section discusses basic procedures of the following service management tasks:

- Modifying a Card Type on page 91
- Deleting a Card on page 92
- Deleting Port Parameters on page 92

To change an MDA type already provisioned for a specific slot/card, first you must shut down the slot/MDA/port configuration and then delete the MDA from the configuration. Modify and delete operations can be performed only on the MDAs that are not auto equipped or auto provisioned.Use the following CLI syntax to modify an MDA:

**CLI Syntax:**
```
config> port port-id
 shutdown
```

**CLI Syntax:**
```
config> card slot-number
    shutdown
  [no] mda mda-number
    [no] mda-type mda-type
    shutdown
```

## Modifying a Card Type

The modify operation cannot be performed on an IOM card that is auto equipped and auto provisioned during bootup and is fixed.

**CLI Syntax:**
```
config> port port-id
         [no] shutdown
```

**CLI Syntax:**
```
config> card slot-number
         mda mda-number
            [no] mda-type mda-type
            [no] shutdown
```

## Deleting a Card

The delete operation cannot be performed on an IOM card that is auto equipped and auto provisioned during bootup and is fixed.

**CLI Syntax:**
```
config> port port-id
        shutdown
```

**CLI Syntax:**
```
config> card slot-number
        card-type card-type
        mda mda-number
           no mda-type mda-type
           no shutdown
```

---

## Deleting Port Parameters

Use the following CLI syntax to delete a port provisioned for a specific card:

**CLI Syntax:**
```
config>port port-id
        shutdown
        no port port-id
```

# Card, MDA, and Port Command Reference

## Command Hierarchies

### Card and MDA Configuration Commands


- Hardware Commands on page 94
- Card Commands on page 94
- Port Configuration Commands on page 95
- Port Loopback Commands on page 98
- Ethernet Commands on page 99
- TDM Commands on page 101 (applicable only for 7210 SAS-M)
- LAG Commands on page 103
- Ethernet Ring Commands on page 105
- Show Commands on page 106
- Clear Commands on page 107
- Debug Commands on page 107

## Hardware Commands

**config**
— [**no**] **card** *slot-number*
— **card-type** *card-type*

## MDA Commands

**config**
— [**no**] **card** *slot-number*
— [**no**] **mda** *mda-slot*
— **mda-type** *mda-type*
— **no mda-type**
— [**no**] **shutdown**
— [**no**] **sync-e**
— [**no**] **shutdown**

## Port Configuration Commands for access-uplink mode

Note: Listed below are the port configuration commands supported on 7210 SAS-M and 7210 SAS-T in access-uplink mode. On 7210 SAS-M and 7210 SAS-T, the CLI context "configure> port> access> uplink> egress" must be used for configuring network policies.

```
config
    — port {port-id}
    — no port
        — access
            — egress
                — [no] pool [name]
                    — slope-policy name
                    — no slope-policy
            — uplink
                — egress
                    — [no] pool [name]
                        — slope-policy name
                        — no slope-policy
        — description long-description-string
        — no description
        — dwdm
            — channel channel
        — ethernet
        — network
            — egress
                — [no] pool [name]
                    — slope-policy name
                    — no slope-policy
        — [no] shutdown
```

## Port-based Split Horizon Group Configuration Commands

This feature and commands are available only on 7210 SAS-X, 7210 SAS-M (both access-uplink and network mode) and 7210 SAS-T.

**config**
- **port** {*port-id*}
- **no port**
  - **split-horizon-group** **g***roup-name*
  - **no split-horizon-group**

**config**
- [**no**] **lag** [*lag-id*]
  - **[no] split-horizon-group** *group-name*

## Port Configuration Commands for network mode

Note: Listed below are the port configuration commands supported on 7210 SAS X, and 7210 SAS-M network mode.

**config**
- **port** {*port-id*}
- **no port**
  - **description** *long-description-string*
  - **no description**
  - **dwdm**
    - **channel** *channel*
  - **ethernet**
  - **shutdown**

## Port Loopback Commands

**configure**
— **system**
— **loopback-no-svc-port { mirror | mac-swap| testhead}** *port-id*
— **no loopback-no-svc-port**

# Ethernet Commands

**config**
- [**no**] **port** {*port-id*}
  - **ethernet**
    - **access**
      - **accounting-policy** *acct-policy-id*
      - **no accounting-policy**
      - [**no**] **collect-stats**
      - **egress**
        - **qos** *policy-id*
        - **no qos**
        - **[no] sap-qos-marking {enable|disable}** (Supported on 7210 SAS-X only)
        - **scheduler-mode** [fc-based | sap-based] (Supported on 7210 SAS-X only)
        - **no scheduler-mode**
      - **uplink**
        - **accounting-policy** *acct-policy-id*
        - **no accounting-policy**
        - [**no**] **collect-stats**
        - **qos** *policy-id* (supported only on 7210 SAS-M and 7210 SAS-T)
        - **no qos**
        - **queue-policy** *name*
        - **no queue-policy**
    - **autonegotiate** [**limited**]
    - [**no**] **autonegotiate**
    - **dot1x**
      - **[no] tunneling**
      - **max-auth-req** *max-auth-request*
      - **port-control** {**auto** | **force-auth** | **force-unauth**}
      - **quiet-period** *seconds*
      - **[no] radius-plcy** *name*
      - **re-auth-period** *seconds*
      - [**no**] **re-authentication**
      - **server-timeout** *seconds*
      - **no server-timeout**
      - **supplicant-timeout** *seconds*
      - **no supplicant-timeout**
      - **transmit-period** *seconds*
      - **no transmit-period**
    - **down-when-looped**
      - **keep-alive** *timer*
      - **no keep-alive**
      - **retry-timeout** *timer*
      - **no retry-timeout**
      - [**no**] **shutdown**
    - **duplex** {**full** | **half**}
    - **efm-oam**
      - [**no**] **accept-remote-loopback**
      - **mode** {**active** | **passive**}
      - [**no**] **shutdown**
      - [**no**] **transmit-interval** *interval* [**multiplier** *multiplier*]

— [**no**] **tunneling**
— **egress-rate**
— **no egress-rate**
— **egress-scheduler-policy** *port-scheduler-policy-name* **(applicable only to 7210 SAS-M and 7210 SAS-T)**
— **no egress-scheduler-policy**
— **encap-type** {**dot1q** | **null** | **qinq**}
— **no encap-type**
— **hold-time** {[**up** *hold-time* **up**] [**down** *hold-time* **down**][**seconds**| **centiseconds**]}
— **no hold-time**
— [**no**] **lacp-tunnel**
— **lldp**
— **[no] tunnel-nearest-bridge-dest-mac**
— **dest-mac** {**nearest-bridge** | **nearest-non-tpmr** | **nearest-customer**}
— **admin-status** {**rx** | **tx** | **tx-rx** | **disabled**}
— [**no**] **notification**
— **tx-mgmt-address** [**system**]
— **no tx-mgmt-address**
— **tx-tlvs** [**port-desc**] [**sys-name**] [**sys-desc**] [**sys-cap**]
— **no tx-tlvs**
— **no loopback {internal} [service** *svc-id* **sap** *sap-id* **src-mac** *SA* **dst-mac** *DA***]**
— **mac** *ieee-address*
— **no mac**
— **mode** {**access [uplink]** | **network**| **hybrid**}
— **no mode**
— **mtu** *mtu-bytes*
— **no mtu**
— **network**
— **accounting-policy** *policy-id*
— **no accounting-policy**
— [**no**] **collect-stats**
— **no poe**
— **poe [plus]**
— **no port-clock (supported only on 7210 SAS-T devices)**
— **port-clock {master|slave|automatic}**
— **qos** *policy-id*
— **no qos**
— **queue-policy** *name*
— **no queue-policy**
— **qinq-etype** *0x0600..0xffff*
— [**no**] **report-alarm** [**signal-fail**] [**remote**] [**local**] (7210 SAS- M, T and X. Only for 10 G ports.)
— **speed** {**10** | **100** | **1000**}
— **ssm**
— [**no**] **shutdown**
— **code-type sonet | sdh**
— [**no**] **tx-dus**
— [**no**] **shutdown**

# TDM Commands

Note: TDM commands are applicable only for 7210 SAS-M network mode.

**config**
- — [**no**] **port** {*port-id*}
  - — **tdm**
    - — **buildout short**
    - — [**no**] **ds1**
      - — [**no**] **channel-group** *channel-group*
        - — [**no**] **description** *long description-string*
        - — [**no**] **encap-type** {**cem**}
        - — **idle-cycle-flag** {**flags** | **ones**}
        - — **no idle-cycle-flag**
        - — **idle-payload-fill** {**all-ones**}
        - — **idle-payload-fill pattern** *pattern*
        - — **no idle-payload-fill**
        - — **idle-signal-fill** {**all-ones**}
        - — **idle-signal-fill pattern** *pattern*
        - — **no idle-signal-fill**
        - — [**no**] **mode** {**access**}
        - — [**no**] **shutdown**
        - — **timeslots** *timeslots*
        - — **no timeslots**
      - — **clock-source** {**loop-timed** | **node-timed** | **adaptive**}
      - — **framing (DS-1)** {**esf** | **sf** | **ds1-unframed**}
      - — **loopback** {**line** | **internal**| **fdl-ansi** | **fdl-bellcore** | **payload-ansi**}
      - — **no loopback**
      - — [**no**] **remote-loop-respond**
      - — [**no**] **report-alarm** [**ais**] [**los**] [**oof**] [**rai**] [**looped**]
      - — [**no**] **shutdown**
      - — **signal-mode** {**cas**}
    - — [**no**] **e1** [*e1-id*]
      - — [**no**] **channel-group** *channel-group-id*
        - — **description** *long description-string*
        - — **no description**
        - — [**no**] **encap-type** {**cem**}
        - — **idle-payload-fill** {**all-ones**}
        - — **idle-payload-fill pattern** *pattern*
        - — **no idle-payload-fill**
        - — **idle-signal-fill** {**all-ones**}
        - — **idle-signal-fill pattern** *pattern*
        - — **no idle-signal-fill**
        - — [**no**] **mode** {**access**}
        - — [**no**] **shutdown**
        - — **timeslots** *timeslots*
        - — **no timeslots**
      - — **clock-source** {**loop-timed** | **node-timed** | **adaptive**}
      - — **framing (E-1)** {**no-crc-g704** | **g704** | **e1-unframed**}
      - — **loopback** {**line** | **internal**}
      - — **no loopback**
      - — [**no**] **report-alarm** [**ais**] [**los**] [**oof**] [**rai**] [**looped**]
      - — [**no**] **shutdown**
      - — **no signal-mode** {**cas**}

— **lbo** [**0dB** | **-7.5dB** | **-15.0dB** | **-22.5dB**]
— **length** {**133** | **266** | **399** | **533** | **655**}
— **line-impedance** {*Impedance in ohms*}

# LAG Commands

**config**
- [**no**] **lag** [*lag-id*]
  - **description** *long-description-string*
  - **no description**
  - [**no**] **dynamic-cost**
  - **encap-type** {**dot1q** | **null** | **qinq**}
  - **no encap-type**
  - **hold-time down** *hold-down-time*
  - **no hold-time**
  - **lacp** [*mode*] [**administrative-key** *admin-key*]
  - **lacp-xmit-interval** {**slow** | **fast**}
  - **no lacp-xmit-interval**
  - [**no**] **lacp-xmit-stdby**
  - **mac** *ieee-address*
  - **no mac**
  - **mode**
  - **no mode**
  - **port** *port-id* [*port-id* …up to 164 total] [**priority** *priority*] [**sub-group** *sub-group-id*]
  - **no port** *port-id* [*port-id* …up to 164 total]
  - **port-threshold** *value* [**action** {**dynamic-cost** | **down**}]
  - **selection-criteria** [**highest-count** | **highest-weight**] [**slave-to-partner**]
  - **no selection-criteria**
  - [**no**] **shutdown**

**config**
- **redundancy**
  - **multi-chassis**
    - **[no] peer** *ip-address* **[create]**
      - **authentication-key [***authentication-key* | *hash-key***] [hash** | **hash2]**
      - **no authentication-key**
      - **description** *description-string*
      - **no description**
    - **[no] mc-lag**
      - **hold-on-neighbor-failure** *multiplier*
      - **no hold-on-neighbor-failure**
      - **keep-alive-interval** *interval*
      - **no keep-alive-interval**
      - **lag** *lag-id* **lacp-key** *admin-key* **system-id system-id [remote-lag** *remote-lag-id***] system-priority** *system-priority*
      - **no lag** *lag-id*
      - **[no] shutdown**
    - **peer-name**
    - **no peer-name**
    - **[no] shutdown**
    - **source-address** *ip-address*
    - **no source-address**
    - **[no] sync**
      - **[no] igmp-snooping**
      - **port [***port-id* | *lag-id***] [sync-tag** *sync-tag***] [create]**
      - **no port [***port-id* | *lag-id***]**

— **range** *encap-range* **[sync-tag** *sync-tag***]**
— **no range** *encap-range*
— **[no] shutdown**

# Ethernet Ring Commands

**config**
- — **eth-ring** *ring-id*
- — **no eth-ring**
  - — **description** *description-string*
  - — **no description**
  - — **guard-time** *time*
  - — **revert-time** *time*
  - — **ccm-hold-time** {**down** *down-timeout* | **up** *up-timeout*}
  - — **compatible-version** *version*
  - — [**no**] **rpl-node** {**owner** | **nbr**}
  - — **node-id** *mac*
  - — [**no**] **sub-ring** {**virtual-link** | **non-virtual-link**}
    - — [**no**] **interconnect** **{ring-id** *ring-id* | **vpls}**
      - — [**no**] **propagate-topology-change**
  - — **path** {**a** | **b**} [ { *port-id* | *lag-id* } **raps-tag** *qtag*[*.qtag*] ]
    - — **description** *description-string*
    - — [**no**] **rpl-end**
    - — **eth-cfm**
      - — [**no**] **mep** *mep-id* **domain** *md-index* **association** *ma-index*
        - — [**no**] **ccm-enable**
        - — [**no**] **ccm-ltm-priority** *priority*
        - — [**no**] **control-mep**
        - — **control-sap-tag** *tag-range* **(Supported only on 7210 SAS-X)**
        - — [**no**] **description** *description-string*
        - —
        - — [**no**] **eth-test-enable**
          - — [**no**] **test-pattern** {**all-zeros** | **all-ones**} [**crc-enable**]
          - — **bit-error-threshold** *bit-errors*
        - — **low-priority-defect** **{allDef|macRemErrXcon|remErrX-con|errXcon|xcon|noXcon}**
        - — **mac-address** *mac-address*
        - — **one-way-delay-threshold** *seconds*
        - — [**no**] **shutdown**

# Show Commands

**show**
- **chassis** [**environment**] [**power-supply**]
- **card** [*slot-number*] [**detail**]
- **card state**
- **pools** <*mda-id*[/*port*]> [<**access-app**> *[<pool-name>]*]
- **pools** <*mda-id*[/*port*]> [<**network-app**> *[<pool-name>]*]
- **lag** [*lag-id*] [**detail**] [**statistics**]
- **lag** *lag-id* **associations**
- **port** *port-id* [**detail**]
- **port** *port-id* **description**
- **port** *port-id* **associations**
- **port** *port-id* **dot1x** [**detail**]
- **port** *port-id* **ethernet** [**efm-oam** | **detail**]
- **port [A1] [detail] [statistics] [description]**
- **port** *port-id* **acr** [**detail**] (Not supported on 7210 SAS-X)
- **lldp** [**nearest-bridge** | **nearest-non-tpmr** | **nearest-customer**] [**remote-info**] [**detail**]
- **poe [detail]**
- **redundancy**
  - **multi-chassis all**
    - **mc-lag peer** *ip-address* [**lag** *lag-id*]
    - **mc-lag** [**peer** *ip-address* **[lag** *lag-id*]] **statistics**
    - **sync peer [** *ip-address* **]**
    - **sync peer [** *ip-address* **] detail**
- **sync peer [** *ip-address* **] statistics**
- **system**
  - **internal-loopback-ports** [**detail**]

## Monitor Commands

**Monitor**

— **port** ***port-id*** [*port-id*...(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**] [**multiclass**]

## Clear Commands

**clear**

— **lag** *lag-id* **statistics**
— **mda** *mda-id* [**statistics**]
— **port** *port-id* **statistics**

## Debug Commands

**debug**

— **lag** [**lag-id** *lag-id* **port** *port-id*] [**all**]
— **lag** [**lag-id** *lag-id* **port** *port-id*] [**sm**] [**pkt**] [**cfg**] [**red**] [**iom-upd**] [**port-state**] [**timers**] [**sel-logic**] [**mc**] [**mc-pkt**]
— **no lag** [**lag-id** *lag-id*]

# Configuration Commands


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# Generic Commands

## description

**Syntax** **description** *long description-string*
**no description**

**Context** config>port
config>lag
config>port>tdm>e1>channel-group
config>port>tdm>ds1>channel-group

**Description** This command creates a text description for a configuration context to help identify the content in the configuration file.

The **no** form of this command removes any description string from the context.

**Default** No description is associated with the configuration context.

**Parameters** *long-description-string* — The description character string. Strings can be up to 160 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.

## shutdown

**Syntax** [**no**] **shutdown**

**Context** config>card
config>card>mda
config>port
config>port>ethernet
config>lag
config>port>ethernet>efm-oam
config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group
config>port>ethernet>ssm

**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.

The **no** form of this command administratively enables an entity.

**card —** The default state for a card is **no shutdown**.

**mda —** The default state for a mda is **no shutdown**.

**lag —** The default state for a Link Aggregation Group (LAG) is **shutdown**.

**port —** The default state for a port is **shutdown**.

**path —** The default state for a SONET/SDH path is **shutdown**.

## card

**Syntax** **card** *slot-number*

**Context** config

**Description** This mandatory command enables access to the chassis card Input/Output Module (IOM), slot, and MDA CLI context.

The **no** form of this command cannot be used on fixed IOM and MDA cards that are auto equipped and auto provisioned.

**Default** The IOM card is equipped and provisioned for slot 1.

**Parameters** *slot-number* — The slot number of the card in the chassis.

## card-type

**Syntax** **card-type** *card-type*

**Context** config>card

**Description** This mandatory command adds a to the device configuration for the slot. The card type can be preprovisioned, meaning that the card does not need to be installed in the chassis.

A card must be provisioned before an MDA or port can be configured.

A card can only be provisioned in a slot that is vacant, meaning no other card can be provisioned (configured) for that particular slot.

A card can only be provisioned in a slot if the card type is allowed in the slot. An error message is generated if an attempt is made to provision a card type that is not allowed.

A high severity alarm is raised if an administratively enabled card is removed from the chassis. The alarm is cleared when the correct card type is installed or the configuration is modified. A low severity trap is issued when a card is removed that is administratively disabled.

An appropriate alarm is raised if a partial or complete card failure is detected. The alarm is cleared when the error condition ceases.

The **no** form of this command cannot be used as the IOM card is fixed.

**Default** The IOM card is equipped and preprovisioned for slot 1.

**Parameters** *card-type* — The type of card to be configured and installed in that slot.

# MDA Commands

## mda

**Syntax** **mda** *mda-slot*
**no mda** *mda-slot*

**Context** config>card

**Description** This mandatory command enables access to a card's MDA CLI context to configure MDAs.

**Default** No MDA slots are configured by default.

**Parameters** *mda-slot* — The MDA slot number to be configured. Fixed ports on the panel of the chassis belong to MDA 1.

Cards inserted in expansion slots are numbered 2.

**Values** 1, 2

## mda-type

**Syntax** **mda-type** *mda-type*
**no mda-type**

**Context** config>card>mda

**Description** This mandatory command provisions a specific MDA type to the device configuration for the slot. The MDA can be preprovisioned but an MDA must be provisioned before ports can be configured. Ports can be configured once the MDA is properly provisioned.

7210 SAS-M (all variants of the platform) and 7210 SAS-X platform supports a fixed MDA. The fixed MDA (addressed as mda 1) is auto-equipped and auto-provisioned on bootup. It cannot be deleted. An error message is shown in case the no form of command is performed on fixed MDAs.

All 7210 SAS-M platform variants supports an expansion slot which can accept supported MDA types. The MDA in the expansion slot is addressed as mda 2. Users must use this command to configure the MDA slot appropriately based on the supported MDA cards they plan to use. To modify an MDA slot, shut down all port associations. An alarm is raised if partial or complete MDA failure is detected. The alarm is cleared when the error condition ceases.

NOTE: 7210 SAS-X does not support any expansion slot. It does not support use of this command.

The no form of this command deletes the MDA from the configuration. The MDA must be administratively shut down before it can be deleted from the configuration.

**Default** MDA 1 is auto-equipped and auto-provisioned by default during bootup.

**Parameters** *mda-type* — The type of MDA selected for the slot postion.

**Values** m2-xfp (only for 7210 SAS-M)
m4-ds1-ces (only for 7210 SAS-M)

## sync-e

**Syntax** [**no**] **sync-e**

**Context** config>card>mda

**Description** This command enables Synchronous Ethernet on the Ethernet ports that support Synchronous Ethernet. When Synchronous Ethernet is enabled, the timing information is derived from the Ethernet ports.

Synchronous Ethernet is supported for both Ethernet SFP ports and fixed copper ports. It is highly recommended to use copper port only for distribution of synchronous ethernet and not as a reference.

Refer to the 7210 SAS Basic System Configuration Guide for more information on Synchronous Ethernet.

Default **no sync-e**

# Interface QoS Commands

## access

**Syntax** **access**

**Context** config>port

**Description** This command enables the access context to configure egress and ingress pool policy parameters.

## network

**Syntax** **network**

**Context** config>port

**Description** This command enables the network context to configure egress and ingress pool policy parameters.

## uplink

**Syntax** **uplink**

**Context** config>port>access

**Description** This command enables the context to configure access pool parameters.

## egress

**Syntax** **egress**

**Context** config>port>access
config>port>network
config>port>uplink

**Description** This command enables the context to configure egress buffer pool parameters which define the percentage of the pool buffers that are used for CBS calculations and specify the slope policy that is configured in the **config>qos>slope-policy** context.

## ingress

**Syntax** **ingress**

**Context** config>port>access

**Description** This command enables the context to configure ingress buffer pool parameters which define the percentage of the pool buffers that are used for CBS calculations and specify the slope policy that is configured in the **config>qos>slope-policy** context.

## pool

**Syntax** [**no**] **pool** [*name*]

**Context** config>port>access>egress
config>port>access>ingress
config>port>network>egress
config>port>network>ingress
config>port>access>uplink>egress

**Description** This command configures pool policies.

On the MDA level, access and network egress and access ingress pools are only allocated on channelized MDAs. On the MDA level, access and network egress and access ingress pools are only allocated on channelized MDAs. Network ingress pools are allocated on the MDA level for non-channelized MDAs.

**Default** default

**Parameters** *name* — Specifies the pool name, 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.

## slope-policy

**Syntax** **slope-policy** *name*
**no slope-policy**

**Context** config>port>access>egress>pool
config>port>access>uplink>pool
config>port>network>egress

**Description** This command specifies an existing slope policy which defines high and low priority RED slope parameters and the time average factor. The policy is defined in the **config>qos>slope-policy** context.

## qos

Note: This command is supported only on 7210 SAS-M and 7210 SAS-T.

**Syntax** **qos** *policy-id*
**no qos**

**Context** config>port>ethernet>access>egress

**Description** This command associates a QoS policy to the port.

**Parameters** *policy-id* — Specifies an existing QoS policy to be assigned to the port.

**Values** 1 — 65535

## sap-qos-marking

Note: This command is supported only on 7210 SAS X.

**Syntax** **sap-qos-marking { enable | disable }**
**no sap-qos-marking**

**Context** config>port>ethernet>access>egress

**Description** This command allows the user to enable and disable port based egress marking for all the SAPs configured on an access port and hybrid port.

For SAPs configured on access ports and hybrid ports and associated with an L2 VPN service (example, VPLS, Epipe or PBB I-VPLS or PBB Epipe) user has an option to enable either per SAP marking or per port marking. For SAPs configured on access ports and hybrid ports, associated with an L3 VPRN service only port based marking is available for use. For PBB B-SAPs configured in B-VPLS service only port based marking is available for use.

When enabled on access ports, the system uses the values defined in the remark policy attached to the access port (remark policy is defined in the access-egress policy and associated with a port using the command **config>port>ethernet>access>egress>qos *id***).

When enabled on hybrid ports, the system uses the values defined in the remark policy attached to the hybrid port (remark policy is defined in the network qos policy of type 'port' and associated with the hybrid port using the command **config>port>ethernet>network>egress>qos *id***).

User can enable only dot1p marking, by attaching a remark policy of remark-type 'dot1p' or 'dot1p-lsp-exp-shared'. Similarly only DSCP marking can be used, by use of remark policy of remark-type 'dscp'. If a remark policy of remark-type 'dot1p-dscp' is in use both Dot1p and DSCP values will be marked.

The tables below lists the marking behavior by enabling this command and disabling the command.

**Table 14: Default values for sap-qos-marking in access and hybrid port modes**

| Mode | Default values |
|---|---|
| Access Mode | sap-qos-marking is enabled |
| Hybrid Mode | sap-qos-marking is disabled |
| Network Mode | CLI not available for use |

**Table 15: Sap-qos-marking default value when port mode is changed**

| Initial port | New port mode | New value of sap-qos-marking |
|---|---|---|
| Access | Network | No change |
| | Hybrid | Sap-qos-marking is disabled |
| Network | Access | No change |
| | Hybrid | Sap-qos-marking is disabled |
| Hybrid | Network | Sap-qos-marking is enabled |
| | Access | Sap-qos-marking is enabled |

**Table 16: Marking behavior on access port and hybrid ports based on sap-qos-marking value**

| Ports | sap-qos-marking value | Marking behavior |
|---|---|---|
| Access Ports | Sap-qos-marking is enabled | Sap-egress policy is used for remarking traffic sent out of SAPs associated with L2 services.<br><br>No remarking of traffic sent out of SAPs associated with L3 services and B-saps configured in PBB B-VPLS service. |
| | Sap-qos-marking is disabled | Access-egress policy is used for remarking for all the traffic, includes SAPs configured on the access ports and associated with L2 VPN services, L3 services, and PBB B-SAPS.. |

| Ports | sap-qos-marking value | Marking behavior |
|---|---|---|
| Hybrid Ports | Sap-qos-marking is enabled | Sap-egress policy is used for remarking traffic sent out of SAP configured in L2 services.<br><br>No remarking of traffic sent out of SAPs configured in L3 services, B-SAPs configured in PBB B-VPLS service, and network IP interface (that is, IP and MPLS traffic sent out of network IP interface). |
| | Sap-qos-marking is disabled | Network port policy is used for remarking for all the traffic, includes traffic sent out of SAPs configured in L2 services, SAPs configured in L3 services, B-SAPs configured in PBB B-VPLS service, and network IP interface (that is, IP and MPLS traffic sent out of network IP interface). For MPLS traffic, the only Dot1p bits are marked. |

**NOTE**: Packets belonging to SAPs configured in a L2 service will also have their DSCP values marked when remarking is enabled on a port. Hence, it is recommended to use only dot1p marking, when SAPs belonging to both L3 VPN service and L2 VPN service are configured on the port.

**Default** Refer to Default values for sap-qos-marking in access and hybrid port modes on page 117 for more information.

**Parameters** **enable —** Keyword used to enable port based marking for all SAPs on an access port and hybrid port.

**disable —** Keyword used to disable port based marking for all SAPs on an access port and hybrid port.

## scheduler-mode

Note: This command is supported only on 7210 SAS-X.

**Syntax** **scheduler-mode** <*fc-based* | *sap-based* >
**no scheduler-mode**

**Context** config>port>ethernet>access>egress

**Description** This command is used to specify the mode of the access egress port scheduler. It operates in the following two modes :

- fc-based
- sap-based

In the "fc-based" mode the priority of all egress queues across all SAPs are considered to determine the next queue to be scheduled.

In the "sap-based" mode the scheduler uses round-robin scheduling mechanism to schedule each of the SAPs configured on a port. The scheduler considers the priority of all the egress queues in a SAP to determine the next queue to be scheduled.

To use the SAP egress **aggregate-rate-limit** command the port scheduler mode must be set to 'sap-based' using this command. For more information on the **aggregate-rate-limit** command, see 7210 SAS-X Services guide.

**Default** fc-based

# General Port Commands

## port

**Syntax** **port** *port-id*
**no port** *port-id*

**Context** config

**Description** This command enables access to the context to configure ports. Before a port can be configured, the chassis slot must be provisioned with a valid card type and the MDA parameter must be provisioned with a valid MDA type. (See **card** and **mda** commands.)

**Default** No ports are configured. All ports must be explicitly configured and enabled.

**Parameters** *port-id* — Specifies the physical port ID in the *slot/mda/port* format.

## dwdm

**Syntax** **dwdm**

**Context** config>port

**Description** This command configures the Dense Wavelength Division Multiplexing (DWDM) parameters.

## channel

**Syntax** **channel** *channel*

**Context** config>port>dwdm

**Description** This command configures the Dense Wavelength Division Multiplexing (DWDM) ITU channel at which a tunable MDA optical interface will be configured to operate. It is expressed in a form that is derived from the laser's operational frequency. For example 193.40 THz corresponds to DWDM ITU channel 34 in the 100 GHz grid and 193.45 THz corresponds to DWDM ITU channel 345 in the 50 GHz grid.Provisioning rules:The provisioned MDA type must have DWDM tunable optics (m1-10gb-dwdm-tun)

The 'dwdm channel' must set to a non zero value before the port is set to 'no shutdown'

The port must be 'shutdown' before changing the dwdm channel.

The port must be a physical port to set the dwdm channel

**Parameters** *channel* — Specifies the channel.

**Values** 0, 17-61, 175-605]
where: 17-61 is used for 100GHz channels

175, 185 — 605 is used for 50GHz channels
0 only valid on disabled (shutdown) ports

## egress-scheduler-policy

**Syntax** **egress-scheduler-policy** *port-scheduler-policy-name*
**no egress-scheduler-policy**

**Context** config>port>ethernet

**Description** **Note**: This command is applicable only to 7210 SAS-M and 7210 SAS-T

This command enables the provisioning of an existing port-scheduler-policy to a port or channel.

The default scheduling done for a port is strict scheduling. When a port-scheduler-policy is applied to the port, the scheduling behavior changes to the one specified in the policy (Strict, RR, WRR, WDRR, WRR/WDRR + Strict).

The **no** form of the command removes the policy from the port and makes the scheduling scheme of the port to strict.

The egress-scheduler-override node allows for the definition of the scheduler overrides for a specific port or channel.

When a port scheduler is active on a port or channel, all queues and intermediate service schedulers on the port are subject to receiving bandwidth from the scheduler. Any queues or schedulers with port-parent associations are mapped to the appropriate port priority levels based on the port-parent command parameters. Any queues or schedulers that do not have a port-parent or valid intermediate scheduler parent defined are treated as orphaned and are handled based on the port scheduler policies default or explicit orphan behavior.

The port scheduler maximum rate and priority level rate parameters may be overridden to allow unique values separate from the port-scheduler-policy-name attached to the port or channel. Use the **egress-scheduler-override** command to specify the port or channel specific scheduling parameters.

The command used to associate an egress scheduler policy on the port is overloaded for HSMDA. HSMDA policies should be associated with HSMDA ports.

The **no** form of this command removes a port scheduler policy from an egress port or channel. Once the scheduler policy is removed, all orphaned queues and schedulers revert to a free running state governed only by the local queue or scheduler parameters. This includes any queues or schedulers with a port-parent association.

**Parameters** *port-scheduler-policy-name* — Specifies an existing port-scheduler-policy configured in the **config>qos** context.

## mode

**Syntax** **mode** {**access [uplink]**| **network | hybrid**}
**no mode**

**Context** config>port>ethernet

config>lag

**Description**

**Access**: An **access** port is used for customer facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port. When a port is configured for access mode, the appropriate **encap-type** must be specified to distinguish the services on the port. Once an Ethernet port has been configured for access mode, multiple services can be configured on the Ethernet port.

**Access-uplink**: Access-uplink ports are used to provide native Ethernet connectivity in service provider transport or infrastructure network. This can be achieved by configuring port mode as access uplink. With this option, the encap-type can be configured to only qinq. Access-uplink SAPs, which are QinQ SAPs, can only be configured on an access uplink port to allow the operator to differentiate multiple services being carried over a single access uplink port. It is supported only on 7210 SAS-M and 7210 SAS-T configured in access-uplink mode.

**Network**: A network port participates in the service provider transport or infrastructure network when a network mode is selected. When the network option is configured, the encap-type can be configured to either null or dot1q.

**Hybrid**: A hybrid Ethernet port allows the combination of network and access modes of operation on a per-VLAN basis and must be configured as either dot1q or QinQ encapsulation. When the hybrid port is configured to the dot1q encapsulation, the user configures a SAP inside a service by providing the SAP ID which must include the port-id value of the hybrid mode port and an unused VLAN tag value. The format is <port-id>:qtag1. A SAP of format <port-id>:* is also supported. The user configures a network IP interface under config>router>interface>port by providing the port name which consists of the port-id of the hybrid mode port and an unused VLAN tag value. The format is <portid>:qtag1.

The user must explicitly enter a valid value for qtag1. The <port-id>:* value is not supported on a network IP interface. The 4096 VLAN tag space on the port is shared among VLAN SAPs and VLAN network IP interfaces. When the hybrid port is configured to QinQ encapsulation, the user configures a SAP inside a service simply by providing the SAP ID which must include the port-id value of the hybrid mode port and the outer and inner VLAN tag values.

The format is <port-id>:qtag1.qtag2. A SAP of format <port-id>: qtag1.* is also supported. The outer VLAN tag value must not have been used to create an IP network interface on this port. In addition, the qtag1.qtag2 value combination must not have been used by another SAP on this port. The user configures a network IP interface under config>router>interface>port by providing the port name which consists of the port-id of the hybrid mode port and a VLAN tag value. The format is <portid>:qtag1.*. An outer VLAN tag qtag2 of * is used to create an IP network interface. In addition, the qtag1.qtag2 value combination must not have been used on another SAP or IP network interface on this port.

The **no** form of this command restores the default.

**Default** **network**

**Parameters**

**network —** Configures the Ethernet port as service access.

**access —** Configures the Ethernet port for transport network use.

**access uplink —** Configures the Ethernet port for transport access uplink use.

**hybrid —** Configures the Ethernet port for hybrid use.

## mac

**Syntax** **mac** *ieee-address*
**no mac**

**Context** config>port>ethernet
config>lag
config>eth-tunnel

**Description** This command assigns a specific MAC address to an Ethernet port, Link Aggregation Group (LAG), Ethernet tunnel.

Only one MAC address can be assigned to a port. When multiple **mac** commands are entered, the last command overwrites the previous command. When the command is issued while the port is operational, IP will issue an ARP, if appropriate, and BPDU's are sent with the new MAC address.

The **no** form of this command returns the MAC address to the default value.

**Default** A default MAC address is assigned by the system from the chassis MAC address pool.

**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. Allowed values are any non-broadcast, non-multicast MAC and non-IEEE reserved MAC addresses.

## mtu

**Syntax** **mtu** *mtu-bytes*
**no mtu**

**Context** config>port>ethernet

**Description** This command configures the maximum payload MTU size for an Ethernet port port. The Ethernet port level MTU parameter indirectly defines the largest physical packet the port can transmit or the far-end Ethernet port can receive. Packets received larger than the MTU will be discarded. Packets that cannot be fragmented at egress and exceed the MTU are discarded.

The value specified for the MTU includes the destination MAC address, source MAC address, the Ethertype or Length field and the complete Ethernet payload. The MTU value does not include the preamble, start of frame delimiter or the trailing CRC.

The **no** form of this command restores the default values.

**Default** The default MTU value depends on the (sub-)port type, mode and encapsulation and are listed in the following table:

| Type | Mode | Encap Type | Default (Bytes) |
|---|---|---|---|
| 10/100, Gig, or 10GigE | Access | null | 1514 |
| 10/100, Gig, or 10GigE | Access | dot1q | 1518 |

| Type | Mode | Encap Type | Default (Bytes) |
|---|---|---|---|
| 10/100, Gig, or 10GigE | Access | q-in-q | 1522 |
| 10/100 or 100FX Ethernet | Network | null | 1514 |
| 10/100 or 100FX Ethernet | Network | dot1q | 1518 |

**Parameters** *mtu-bytes* — Sets the maximum allowable size of the MTU, expressed as an integer.

**Values** 512 — 9212

| | Range |
|---|---|
| config>port>ethernet | 512 — 9212 |

## queue-policy

**Syntax** **queue-policy** *name*
**no queue-policy**

**Context** config>card>mda>network>ingress
config>port>sonet-sdh>path>network

**Description** This command specifies the network-queue policy which defines queue parameters such as CBS, high priority only burst size, MBS, CIR and PIR rates, as well as forwarding-class to queue mappings. The network-queue policy is defined in the **config>qos>network-queue** context.

**Default** default

**Parameters** *name* — Specifies an exisiting network-queue policy name.

# Port Loopback Commands

## loopback-no-svc-port

**Syntax** **[ no ] loopback-no-svc-port** *{mirror | mac-swap | testhead} port-id*

**Context** config>system

**Description** This command specifies the port to assign for system use when using port loopback with mac-swap OAM tool or for the mirroring OAM tool or for the testhead application. The system utilizes the resources of the port and the port is not available for configuring services.

The user cannot share a single port between both these tools/applications, if they intend to use the tools simultaneously. The system displays an error if the user tries to configure the same port for use with multiple OAM tools OR if the user tries to use the tool without first configuring the port resources to be used by the tool.

The user will have to execute the command multiple times, once for each OAM tool with a different port ID, if they intend to use these tools simultaneously. Example: user can dedicate two ports for use, by executing the command loopback-no-svc-port mirror 1/1/1 for use with mirroring, followed by execution of the command loopback-no-svc-port mac-swap 1/1/2 again, for mac-swap OAM tool.

**OR**

The user can dedicate two ports for use, by executing the command loopback-no-svc-port testhead 1/1/1 for use with testhead, followed by execution of the command loopback-no-svc-port mac-swap 1/1/2 again, for mac-swap OAM tool. For more information, see the platform specific note at the end of this CLI description.

The system verifies if any services are configured on the port specified with this command and if services are configured the command fails.

The no form of the command disables the use of this port by the specified OAM tool.

**NOTE**:

- On 7210 SAS-X, this command must be used to dedicate as many front-panel ports as necessary, if they intend to use all the OAM tools simultaneously. A maximum of up to 3 front-panel ports is needed when all the OAM tools are used simultaneously.
- On 7210 SAS-M 24F 2XFP (ETR and non-ETR variants), user can use one of the ports configured under the BOF parameter no-service-ports, for use with either mac-swap or mirroring or testhead OAM tool. If user intends to use the OAM tools simultaneously, then additional front-panel ports need to be configured for use with one of the tools.
- On 7210 SAS-M 24F, user can use the internal port 1/1/25 for use with either mac-swap or mirroring OAM tool. If user intends to use the OAM tools simultaneously, then additional front-panel ports need to be configured for use with one of the tools.
- On 7210 SAS-T, user can use the 2 available internal ports (that is, port 1/1/27 and 1/1/28) for use with either mac-swap or mirroring or testhead OAM tool. If user intends to use all the OAM tools simultaneously, then additional front-panel ports need to be configured for use with one of the tools.

**Default** None

**Parameters** *port-id* — Specifies the physical port ID in the slot/mda/port format.

*mac-swap* — Specifies the port specified by the port-id is dedicated for use by the port loopback with mac-swap application/OAM tool.

*mirror* — Specifies the port specified by the port-id is dedicated for use by the mirroring application/OAM tool.

*testhead* — Specifies the port specified by the port-id dedicated for use by the Testhead application or the OAM tool.

# Ethernet Port Commands

## ethernet

**Syntax** **ethernet**

**Context** config>port

**Description** This command enables access to the context to configure Ethernet port attributes.

This context can only be used when configuring Fast Ethernet, gigabit, or 10Gig Ethernet LAN ports on an appropriate MDA.

## mode

**Syntax** **mode {access | network}**
**no mode**

**Context** config>port>ethernet
config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

**Description** This command configures an Ethernet port for access, network, or hybrid mode of operation. It also configures a TDM channel or SONET/SDH path (sub-port) for access or network mode operation.

An access port or channel is used for customer facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel. When a port is configured for access mode, the appropriate encap-type must be specified to distinguish the services on the port or SONET path. Once an Ethernet port, a TDM channel or a SONET path has been configured for access mode, multiple services can be configured on the Ethernet port, a TDM channel or SONET path. Note that ATM, Frame Relay, and cHDLC port parameters can only be configured in the access mode.

A network port or channel participates in the service provider transport or infrastructure network when a network mode is selected. When the network option is configured, the encap-type cannot be configured for the port/channel.

When network mode is selected on a SONET/SDH path, the appropriate control protocols are activated when the need arises. For example, configuring an IP interface on the SONET path activates IPCP while the removal of the IP interface causes the IPCP to be removed. The same applies for MPLS, MPLSCP, and OSICP. When configuring a SONET/SDH port, the mode command must be entered in the channel context or an error message is generated.

The **no** form of this command restores the default.

**Default** network — for Ethernet ports

access — for TDM channel or SONET paths

**Parameters** **access —** Configures the Ethernet port, TDM channel or SONET path as service access.

**network —** Configures the Ethernet port, TDM channel or SONET path for transport network use.

## access

**Syntax** **access**

**Context** config>port>ethernet

**Description** This command configures Ethernet access port parameters.

## egress

**Syntax** **egress**

**Context** config>port>ethernet>access

**Description** This command configures Ethernet access egress port parameters.

## ingress

**Syntax** **ingress**

**Context** config>port>ethernet>access

**Description** This command configures Ethernet access ingress port parameters.

## autonegotiate

**Syntax** **autonegotiate** [**limited**]
[**no**] **autonegotiate**

**Context** config>port>ethernet

**Description** This command enables speed and duplex autonegotiation on Fast Ethernet ports and enables far-end fault indicator support on gigabit ports.

There are three possible settings for autonegotiation:

- "on" or enabled with full port capabilities advertised
- "off" or disabled where there are no autonegotiation advertisements
- "limited" where a single speed/duplex is advertised.

When autonegotiation is enabled on a port, the link attempts to automatically negotiate the link speed and duplex parameters. If autonegotiation is enabled, the configured duplex and speed parameters are ignored.

When autonegotiation is disabled on a port, the port does not attempt to autonegotiate and will only operate at the **speed** and **duplex** settings configured for the port. Note that disabling autonegotiation on gigabit ports is not allowed as the IEEE 802.3 specification for gigabit Ethernet requires autonegotiation be enabled for far end fault indication.

If the **autonegotiate limited** keyword option is specified the port will autonegotate but will only advertise a specific speed and duplex. The speed and duplex advertised are the **speed** and **duplex** settings configured for the port. One use for limited mode is for multispeed gigabit ports to force gigabit operation while keeping autonegotiation enabled for compliance with IEEE 801.3.

7210 SAS requires that autonegotiation be disabled or limited for ports in a Link Aggregation Group to guarantee a specific port speed.

The **no** form of this command disables autonegotiation on this port.

**Default** autonegotiate

**Parameters** **limited —** The Ethernet interface will automatically negotiate link parameters with the far end, but will only advertise the speed and duplex mode specified by the Ethernet **speed** and **duplex** commands.

## duplex

**Syntax** **duplex** {**full** | **half**}

**Context** config>port>ethernet

**Description** This command configures the duplex of a Fast Ethernet port when autonegotiation is disabled.

This configuration command allows for the configuration of the duplex mode of a Fast Ethernet port. If the port is configured to autonegotiate this parameter is ignored.

**Default** **full**

**Parameters** **full —** Sets the link to full duplex mode.

**half —** Sets the link to half duplex mode.

## efm-oam

**Syntax** **efm-oam**

**Context** config>port>ethernet

**Description** This command configures EFM-OAM attributes.

## accept-remote-loopback

**Syntax** [**no**] **accept-remote-loopback**

**Context** config>port>ethernet>efm-oam

**Description** This command enables reactions to loopback control OAM PDUs from peers.

The **no** form of this command disables reactions to loopback control OAM PDUs.

**Default** no accept-remote-loopback

## mode

**Syntax** **mode** {**active** | **passive**}

**Context** config>port>ethernet>efm-oam

**Description** This command configures the mode of OAM operation for this Ethernet port. These two modes differ in that active mode causes the port to continually send out efm-oam info PDUs while passive mode waits for the peer to initiate the negotiation process. A passive mode port cannot initiate monitoring activites (such as loopback) with the peer.

**Default** active

**Parameters** **active —** Provides capability to initiate negotiation and monitoring activities.

**passive —** Relies on peer to initiate negotiation and monitoring activities.

## transmit-interval

**Syntax** [**no**] **transmit-interval** *interval* [**multiplier** *multiplier*]

**Context** config>port>ethernet>efm-oam

**Description** This command configures the transmit interval of OAM PDUs.

**Default** transmit-interval 10 multiplier 5

**Parameters** *interval* — Specifies the transmit interval.

**Values** 1 — 600 (in 100 milliseconds)

**multiplier** *multiplier* **—** Specifies the multiplier for transmit-interval to set local link down timer.

**Values** 2 — 5

## tunneling

**Syntax** [**no**] **tunneling**

**Context** config>port>ethernet>efm-oam

**Description** This command enables EFM OAM PDU tunneling. Enabling tunneling will allow a port mode Epipe SAP to pass OAM frames through the pipe to the far end.

The **no** form of the command disables tunneling.

**Default** no tunneling

## egress-rate

**Syntax** **egress-rate**
**no egress-rate**

**Context** config>port>ethernet

**Description** This command configures the rate of traffic leaving the network.

The **no** form of this command returns the value to the default.

**Default** no egress-rate

## encap-type

**Syntax** **encap-type** {**dot1q** | **null**| **qinq**}
**no encap-type**

**Context** config>port>ethernet

**Description** This command configures the encapsulation method used to distinguish customer traffic on an Ethernet access port, or different VLANs on a network port.

The **no** form of this command restores the default.

**Default** null

**Parameters** **dot1q —** Ingress frames carry 802.1Q tags where each tag signifies a different service.

**null —** Ingress frames will not use any tags to delineate a service. As a result, only one service can be configured on a port with a null encapsulation type.

**qinq —** This encapsulation type is specified for QinQ access SAPs.

## hold-time

**Syntax** **hold-time** {[**up** *hold-time up*] [**down** *hold-time down*][**seconds** | **centiseconds**]}
**no hold-time**

**Context** config>port>ethernet

**Description** This command configures port link dampening timers which reduce the number of link transitions reported to upper layer protocols. The **hold-time** value is used to dampen interface transitions.

When an interface transitions from an up state to a down state, it is immediately advertised to the rest of the system if the hold-time down interval is zero, but if the hold-time down interval is greater than zero, interface down transitions are not advertised to upper layers until the hold-time down interval has expired. Likewise, an interface is immediately advertised as up to the rest of the system if the hold-time up interval is zero, but if the hold-time up interval is greater than zero, up transitions are not advertised until the hold-time up interval has expired.

The **no** form of this command reverts to the default values.

**Default** **down 0** seconds — No port link down dampening is enabled; link down transitions are immediately reported to upper layer protocols.
**up 0** seconds — No port link up dampening is enabled; link up transitions are immediately reported to upper layer protocols.

**Parameters** **up** *hold-time up* **—** The delay, in seconds or centiseconds, to notify the upper layers after an interface transitions from a down state to an up state.

**Values** 0 — 900 seconds
0, 10 — 90000 centiseconds in 5 centisecond increments

**Values** 0 — 900

**down** *hold-time down* **—** The delay, in seconds or centiseconds, to notify the upper layers after an interface transitions from an up state to a down state.

**Values** 0 — 900 seconds
0, 10 — 90000 centiseconds in 5 centisecond increments

**econds** | **centiseconds** — Specify the units of your hold time in **seconds** or **centiseconds**.

**Values** 0 — 900

## lacp-tunnel

**Syntax** [**no**] **lacp-tunnel**

**Context** config>port>ethernet

**Description** This command enables LACP packet tunneling for the Ethernet port. When tunneling is enabled, the port will not process any LACP packets but will tunnel them instead. The port cannot be added as a member to a LAG group.

The **no** form of the command disables LACP packet tunneling for the Ethernet port.

**Default** no lacp-tunnel

## poe

**Syntax** **poe [plus]**
**no poe**

**Context** config>port>ethernet

**Description** This command enables POE on this port and allows only 802.3af (Type 1) low-power devices to be connected to the port.

Using plus parameter, enabled users to connect Type 2 devices (that is, high-powered devices) compliant to 802.3at standards to the port.

This command must be used to enable PoE on a port before connecting a PoE device to the port. Once a port is enabled for PoE, software attempts to detect the type of PoE device (that is, PoE or PoE+ device) connected to the port and the power it is requesting when a PoE device is connected to the port. If the detection is successful and the power request is within the budget that the platform supports, then power is supplied to the connected device. If not, power is not supplied to the port.

The no form of the command disables PoE and PoE+ on this port. If PoE is disabled, the software does not attempt to detect the characteristics of the PoE device connected to the port and not supply power to the port.

**Parameters** *[plus]* — The user can specify the parameter poe-plus to allow support of 802.3at (Type-2) high power devices to be connected to the port.

## qinq-etype

**Syntax** **qinq-etype** *0x0600..0xffff*
**no qinq-etype**

**Context** config>port>ethernet

**Description** This command configures the Ethertype used for Q-in-Q encapsulation.

Note: The qinq-etype change is not allowed on hybrid port, if there is an interface or a sap configured on the port.

The **no** form of this command reverts the qinq-etype value to the default. The default value is not user configurable.

**Parameters** *0x0600..0xffff* — Specifies the qinq-etype to expect.

**Values** 1536 — 65535 in decimal or hex formats.

**Default** 0x8100

**Description** **0x0600..0xffff —** Specifies QinQ etype values.

**Values** 1536 — 65535, in hexadecimal or decimal notation. Ensure that the values do not match any of the IEEE reserved ethertype values such as 0x8a88, 0x9100, and 0x9200.

## report-alarm

**Syntax** [**no**] **report-alarm** [**signal-fail**]

**Context** config>port>ethernet

**Description** This command specifies when and if to generate alarms and alarm clear notifications for this port.

Note: This command is supported only for 10G ports on 7210 SAS-M, 7210 SAS-X, 7210 SAS-T .

**Parameters** **signal-fail —** Reports an Ethernet signal lost alarm.

## port-clock

**Note:** This command is supported only on 7210 SAS-Tdevices.

**Syntax** **port-clock {master | slave | automatic}**

**Context** config>port>ethernet

**Description** With copper ports using 1G speed, the nodes need to determine who will be the master and slave with respect to clock used for transmission and reception. The master-slave relationship between the two ports of the nodes is determined during auto-negotiation of the link parameters and is automated; there is no management intervention in this process. Once this process is complete, the master port's transmit clock will be used for receiving the packets on the slave port. However, when syncE is in use, to maintain clock distribution hierarchy (for example, master will be synchronized to a stable reference and will distribute this clock to the slave) one needs to make sure that one of the ports behave as a master while the remote port of the ink in question behaves as a slave.

This command allows the user to force the copper port to be a master or slave. Using a value of master, ensures that the local node is the syncE master. A syncE master port, distributes the system timing over the copper port to the remote peer node. Using a value of slave, ensures that the local node is a syncE slave. A syncE slave port uses the incoming timing information.

The no form of the command allows the node to automatically determine the master or slave status for the copper port based on the nodes capabilities exchanged during auto-negotiation. In other words, depending on the peer setting, the local end could end up as either a master or a slave when the no form of the command is used.

**Note:**

The following conditions must be met before using syncE on the fixed port copper ports:

1. Auto-negotiation (or auto-negotiation limited) must be turned on.

2. This command is required only when the copper port speed is set to 1Gbps.

3. This CLI command is not supported for fiber ports or for fiber ports that use Copper SFPs.

**Parameters** **master —** This option ensures that the local node is the synchronous Ethernet master. A synchronous Ethernet master port, distributes the system timing over the copper port to the remote peer node.

**slave —** This option ensures that the local node is a synchronous Ethernet slave. A synchronous Ethernet slave port uses the incoming timing information.

## speed

**Syntax** **speed** {**10** | **100** | **1000**}

**Context** config>port>ethernet

**Description** This command configures the port speed of a Fast Ethernet port when autonegotiation is disabled. If the port is configured to autonegotiate this parameter is ignored. Speed cannot be configured for ports that are part of a Link Aggregation Group (LAG).

**Default** **100**

**Parameters** **10 —** Sets the link to 10 mbps speed.

**100 —** Sets the link to 100 mbps speed.

**1000 —** Sets the link to 1000 mbps speed.

## loopback

**Syntax** **[no] loopback {internal} [service** *svc-id* **sap** *sap-id* **src-mac** *SA* **dst-mac** *DA***]**

**Context** config>port>Ethernet

**Description** This command allows for configuration of simple port loopback and port loopback with MAC swap. The command when the optional parameter 'internal' is specified, provides the port loopback without the mac-swap functionality. It enables physical layer loopback of the packets that egress on theSAPs created on a ethernet port. The packets that egress are looped back into the node instead of being transmitted on to the line. After loopback, the packets ingress the system and are mapped to the same SAP from which they were egressed. The packets that are looped back are processed as per the service configuration of the SAP.

The command when used with service-id and MAC address, provides the port loopback with mac-swap functionality. It enables a physical layer loopback, so that packets which egress on the SAPs created on an ethernet port are looped back into the system. After loopback, on ingress to the system, the MAC addresses in the Ethernet header are swapped (that is,the source MAC address and destination MAC address is exchanged with each other) by the system before being processed as per the service configuration of the SAP.

Use of port loopback with mac-swap, requires another port to be assigned for system use in 7210 SAS-X, 7210 SAS-M 24F 2XFP and 7210 SAS-M 24F 2XFP ETR only . The system uses the resources of the assigned port for providing this feature. The assigned port is specified using the command configure> system> loopback-no-svc-port on 7210 SAS-X. On 7210 SAS-M 24F 2XFP, user can configure the second port specified in the no-service-ports configured in the BOF parameter as the assigned port in the command configure> system> loopback-no-svc-port . Systems ensures that no service entities are configured on the assigned port and fails the command, if a service is using that port.

On 7210 SAS-M 24F, system allocates a virtual port internally and uses the resources associated with it for this feature. No user configuration is needed. This port is associated with the index 1/1/25 on 7210 SAS-M 24F and appears in the show port output. It is shown as a 'loopback' port in the display output, as shown in the sample example below. System ensures that no service entities are configured on this virtual port by failing any attempt to do so.

```
===============================================================================
Ports on Slot 1
===============================================================================
Port      Admin     Link      Port      Cfg       Oper      LAG/ Port Port Port SFP/XFP/
Id        State     State     MTU       MTU       Bndl      Mode Encp Type MDIMDX
-------------------------------------------------------------------------------
1/1/25    Down      NoDown    9212      9212      -         accs null xcme None(loopback)
```

**Note:** Port loopback without mac-swap does not require another port to be assigned for system use on any of the 7210 platforms.

Physical layer loopback is used with external third-party Ethernet test devices to diagnose provisioning issues and test end-to-end performance metrics of a service.

**Note: For Port loopback without mac-swap:**

- Use this command for testing VLL services.
- Enabling this command for testing VPLS services leads to rapid MAC address movement to another port, as source or destination MAC address swap is not performed.
- This command affects all services provisioned on the port.
- Before enabling this command, turn off all layer 2 and IP control protocols (such as LACP, EFM, 802.1x and so on) on the device and its peer to prevent errors such as protocol flaps due to timeout and so on.When port loopback feature is to be used for multicast traffic with IGMP snooping enabled in the service, the corresponding data path has to be statically created using static IGMP groups.
- For loop back to be functional, the following are not required:

  ->SFP or XFPs need not be inserted into the device.

  ->Ethernet cables need not be plugged in for copper ports.
- When the loop back command is enabled, ensure that Ethernet parameters such as, speed, duplex, auto-negotiation and so on are not modified.

**Notes: For port loopback with mac-swap:**

- This command is available for testing VLL services and VPLS services only.
- When enabled, the command affects all services provisioned on the port.
- Before enabling this command, turn off all layer 2 and IP control protocols (such as LACP, EFM, 802.1x and so on) on the device and its peer to prevent errors such as protocol flaps due to timeout and so on.When port loopback feature is to be used for multicast traffic with IGMP snooping enabled in the service, the corresponding data path has to be statically created using static IGMP groups.
- When port loopback with mac-swap enabled, for unicast and unknown-unicast packets, if the packet matches the configured source and destination MAC address it will be swapped and looped back in the service. For broadcast and multicast packets, if the packet matches the configured source MAC address, its source MAC address will be used as the destination MAC address and the system MAC address will be the source MAC address. The packet is looped back in the service as a unicast packet. All other packets sent to the loopback port will be dropped. Since forwarding of these packets after loopback can potentially cause network wide problems.
- For loop back to be functional, the following are not required:

  ->SFP or XFPs need not be inserted into the device.

  ->Ethernet cables need not be plugged in for copper ports.
- When the loop back is enabled, ensure that Ethernet parameters such as, speed, duplex, auto-negotiation and so on are not modified.

- When the loopback is enabled, ensure that service parameter and attributes such as ingress qos policy, accounting records, ingress/egress ACLs, and so on are not modified.

  ->With port loopback in use, the SAP ingress ACLs with IP-criteria is not recommended for use, since only MAC addresses are swapped.

The recommended procedure for using port loopback with mac-swap is:

- Configure the service and SAP on which loopback is to be enabled.
- Configure the assigned loopback port to be used.
- Send bi-directional learning frames on the SAP under test and spoke or uplink from a traffic tester or one can install static MAC for this purpose. Installing a static MAC is highly recommended, since the recommended procedure for enabling port loopback is to shutdown the port –> enable loopback and then execute no shutdown the port.
- Enable port loopback and specify the service, SAP, and the source MAC address (SA) and the destination MAC address (DA). All packets with source Mac matching SA are the only ones processed in the context of the SAP on ingress after the loopback. Any other traffic, is dropped on ingress, to avoid issues due to mac movement and flooding issues in other services/SAPs, since the whole port is in loopback.
- When the port is in loopback, software disable learning and aging on the specified SAP. Once the loopback configuration is removed for the port, then the software enables learning and aging for specified SAP. Hence, port loopback with mac-swap cannot be used for learning or aging.
- It is not recommend to change the service parameters for the SAP and the service when loopback is active. Additionally use of commands which clears the FDB, and so on is highly discouraged.
- Remove the loopback on the sap port to bring the sap out of MAC swap with loopback mode.

The **no** form of the command disables physical layer loopback on the Ethernet port.

**Note:** The loop back command is not saved in the configuration file across a reboot.

Listed below is the recommended sequence of commands to be executed to perform loop back:

1. Disable the port, execute the command config>port> shutdown.
2. Enable loop back, execute the command config >port>ethernet> loopback internal
3. Enable the port, execute the command config>port> no shutdown.
4. Perform the required tests.
5. Disable the port, execute the command config>port> shutdown.
6. Disable loop back, execute the command config >port>ethernet> no loopback internal
7. Enable the port, execute the command config>port> no shutdown.
8. Enable the required services.

Listed below is the recommended sequence of commands to be executed to perform loop back when SFP or XFPs are inserted into the device :

1. Insert SFP or XFPs. SFP or XFPs are not required in case of fixed copper ports.
2. Enable the port and execute the command config>port> [no] shutdown.
3. Disable the port and execute the command config>port> shutdown.
4. Enable loop back and execute the command config >port>ethernet> loopback internal

5. Enable the port and execute the command config>port> no shutdown.
6. Perform the required tests.
7. Disable the port and execute the command config>port> shutdown.
8. Disable loop back and execute the command config >port>ethernet> no loopback internal
9. Enable the port and execute the command config>port> no shutdown.
10. Enable the required services.

Listed below is the sequence of commands to be executed to perform loop back when SFP or XFPs are changed :

1. Disable the port, execute the command config>port> shutdown.
2. Insert the new SFP or XFP.
3. Enable the port and execute the command config>port> no shutdown.
4. Disable the port and execute the command config>port> shutdown.
5. Enable loop back and execute the command config >port>ethernet> loopback internal.
6. Enable the port and execute the command config>port> no shutdown.
7. Perform the required tests.
8. Disable the port and execute the command config>port> shutdown.
9. Disable loop back and execute the command config >port>ethernet> no loopback internal.
10. Enable the port and execute the command config>port> no shutdown.
11. Enable the required services.

**Parameters** **service <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 on which this service is defined.

**Values** service-id 1 — 2147483648

**sap <sap-id> —** Specifies the physical port identifier portion of the SAP.

**Values**
sap-id null - <port-id>
dot1q - <port-id>:qtag1
qinq - <port-id>:qtag1.qtag2
port-id - slot/mda/port[.channel]
qtag1 - [0..4094]
qtag2 - [*|1..4094]

**Values**

**src-mac <SA> —** Specifies the source MAC address.

**Values** SA 6-byte unicast mac-address (xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx).

**dst-mac <DA> —** Specifies the destination MAC address.

**Values** DA 6-byte unicast mac-address (xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx).

## ssm

**Syntax** **ssm**

**Context** config>port>ethernet

**Description** This command enables Ethernet Synchronous Status Message (SSM).

## code-type

**Syntax** **code-type** [**sonet | sdh**]

**Context** config>port>ethernet>ssm

**Description** This command configures the encoding of synchronous status messages, that is, to select either SDH or SONET set of values. Configuring the code-type is only applicable to Synchronous Ethernet ports. It is not configurable on TDM ports. For the code-type, SDH refers to ITU-T G.781 Option-1,while SONET refers to G.781 Option 2 (equivalent to Telcordia GR-253-CORE).

**Default** sdh

**Parameters** **sdh —** Specifies the values used on a G.781 Option 1 compliant network.

**sonet —** Specifies the values used on a G.781 Option 2 compliant network.

## tx-dus

**Syntax** [**no**] **tx-dus**

**Context** config>port>ethernet>ssm
config>port>sonet-sdh

**Description** This command forces the QL value transmitted from the SSM channel of the SONET/SDH port or the Synchronous Ethernet port to be set to QL-DUS/QL-DNU. This capability is provided to block the use of the interface from the SR/ESS for timing purposes.

**Default** no tx-dus

# 802.1x Port Commands

## tunneling

**Syntax** **[no] tunneling**

**Context** config>port>ethernet>dot1x

**Description** This command allows user to enable tunneling of dot1x frames. With dot1x tunneling enabled, dot1x frames received on the port are transparently forwarded to the remote end of the service. To forwards dot1x frames transparently the port on which tunneling is enabled must be configured with NULL SAP and the NULL SAP must be configured in an Epipe service. Tunneling is not supported for any other port encapsulation or when using any other service.

Additionally, dot1x protocol must be disabled on the port (using the command configure> port> ethernet> dot1x> port-control force-auth) before dot1x tunneling can be enabled using this command. If dot1x is configured to use either force-unauath or auto, then dot1x tunneling cannot be enabled. The converse, that is, if dot1x tunneling is enabled, then user cannot configure either force-unauth or auto.

The no form of the command disables dot1x tunneling.

**Default** no tunneling

## max-auth-req

**Syntax** **max-auth-req** *max-auth-request*

**Context** config>port>ethernet>dot1x

**Description** This command configures the maximum number of times that the 7210 SAS will send an access request RADIUS message to the RADIUS server. If a reply is not received from the RADIUS server after the specified *number* attempts, the 802.1x authentication procedure is considered to have failed.

The **no** form of this command returns the value to the default.

**Default** 2

**Parameters** *max-auth-request* — The maximum number of RADIUS retries.

**Values** 1 — 10

## port-control

**Syntax** **port-control** [**auto | force-auth | force-unauth**]

**Context** config>port>ethernet>dot1x

**Description** This command configures the 802.1x authentication mode.

The **no** form of this command returns the value to the default.

**Default** force-auth

**Parameters** **force-auth —** Disables 802.1x authentication and causes the port to transition to the authorized state without requiring any authentication exchange. The port transmits and receives normal traffic without requiring 802.1x-based host authentication.

**force-unauth —** Causes the port to remain in the unauthorized state, ignoring all attempts by the hosts to authenticate. The switch cannot provide authentication services to the host through the interface.

**auto —** Enables 802.1x authentication. The port starts in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. Both the 7210 SAS and the host can initiate an authentication procedure. The port will remain in un-authorized state (no traffic except EAPOL frames is allowed) until the first client is authenticated successfully. After this, traffic is allowed on the port for all connected hosts.

## quiet-period

**Syntax** **quiet-period** *seconds*
**no quiet-period**

**Context** config>port>ethernet>dot1x

**Description** This command configures the period between two authentication sessions during which no EAPOL frames are sent by the 7210 SAS.

The **no** form of this command returns the value to the default.

**Default** 30

**Parameters** *seconds* — Specifies the quiet period in seconds.

**Values** 1 — 3600

## radius-plcy

**Syntax** **radius-plcy** *name*
**no radius-plcy**

**Context** config>port>ethernet>dot1x

**Description** This command configures the RADIUS policy to be used for 802.1x authentication. An 802.1x RADIUS policy must be configured (under config>security>dot1x) before it can be associated to a port. If the RADIUS policy-id does not exist, an error is returned. Only one 802.1x RADIUS policy can be associated with a port at a time.

The **no** form of this command removes the RADIUS policy association.

**Default** no radius-plcy

**Parameters** *name* — Specifies an existing 802.1x RADIUS policy name.

## re-auth-period

**Syntax** **re-auth-period** *seconds*
**no re-auth-period**

**Context** config>port>ethernet>dot1x

**Description** This command configures the period after which re-authentication is performed. This value is only relevant if re-authentication is enabled.

The **no** form of this command returns the value to the default.

**Default** 3600

**Parameters** *seconds* — The re-authentication delay period in seconds.

**Values** 1 — 9000

## re-authentication

**Syntax** [**no**] **re-authentication**

**Context** config>port>ethernet>dot1x

**Description** This command enables / disables periodic 802.1x re-authentication.

When re-authentication is enabled, the 7210 SAS will re-authenticate clients on the port every re-auth-period seconds.

The **no** form of the command returns the value to the default.

**Default** re-authentication

## server-timeout

**Syntax** **server-timeout** *seconds*
**no server-timeout**

**Context** config>port>ethernet>dot1x

**Description** This command configures the period during which the 7210 SAS waits for the RADIUS server to responds to its access request message. When this timer expires, the 7210 SAS will re-send the access request message, up to the specified number times.

The **no** form of this command returns the value to the default.

**Default** 30

**Parameters** *seconds* — The server timeout period in seconds.

**Values** 1 — 300

## supplicant-timeout

**Syntax** **supplicant-timeout** *seconds*
**no supplicant-timeout**

**Context** config>port>ethernet>dot1x

**Description** This command configures the period during which the 7210 SAS waits for a client to respond to its EAPOL messages. When the supplicant-timeout expires, the 802.1x authentication session is considered to have failed.

The **no** form of this command returns the value to the default.

**Default** 30

**Parameters** *seconds* — The server timeout period in seconds.

**Values** 1 — 300

## transmit-period

**Syntax** **transmit-period** *seconds*
**no transmit-period**

**Context** config>port>ethernet>dot1x

**Description** This command configures the period after which the 7210 SAS sends a new EAPOL request message.

The **no** form of this command returns the value to the default.

**Default** 30

**Parameters** *seconds* — The server transmit period in seconds.

**Values** 1 — 3600

## down-when-looped

**Syntax** **down-when-looped**

**Context** config>port>ethernet

**Description** This command configures Ethernet loop detection attributes.

## dot1x

**Syntax** **dot1x**

**Context** config>port>ethernet

**Description** This command enables access to the context to configure port-specific 802.1x authentication attributes. This context can only be used when configuring a Fast Ethernet, gigabit or 10Gig EthernetFast Ethernet, gigabit or 10Gig EthernetFast Ethernet or gigabit Ethernet LAN ports on an appropriate MDA.

# LLDP Ethernet Port Commands

## lldp

**Syntax** **lldp**

**Context** config>port>ethernet

**Description** This command enables the context to configure Link Layer Discovery Protocol (LLDP) parameters on the specified port.

## tunnel-nearest-bridge-dest-mac

**Syntax** **[no] tunnel-nearest-bridge-dest-mac**

**Context** config>port>ethernet>lldp

**Description** This command allows user to configure tunneling for LLDP frames that use the nearest-bridge-dest-mac as destination MAC address. If enabled using the command tunnel-nearest-bridge-dest-mac, all frames received with the appropriate destination mac address are forwarded transparently to the remote end of the service. To forward these frames transparently the port on which tunneling is enabled must be configured with NULL SAP and the NULL SAP must be configured in an Epipe service. Tunneling is not supported for any other port encapsulation or when using any other service.

Additionally, before enabling tunneling, admin status for LLDP dest-mac nearest-bridge must be set to disabled or Tx only, using the command admin-status available under configure> port> ethernet> lldp> dest-mac nearest-bridge. If admin-status for dest-mac nearest-bridge is set to receive and process nearest-bridge LLDPDUs (that is, if either rx or tx-rx is set) then it overrides the tunnel-nearest-bridge-dest-mac command. The following table lists the behavior for LLDP with different values set in use for admin-status and when tunneling is enabled or disabled:

| Nearest-bridge mac Admin status | Tunneling Enabled | Tunneling Disabled |
|---|---|---|
| Rx | Process/Peer | Process/Peer |
| Tx | Tunnel | Drop |
| Rx-Tx | Process/Peer | Process/Peer |
| Disabled | Tunnel | Drop |

**NOTE**: Transparent forwarding of LLDP frames can be achieved using the standard defined mechanism when using the either nearest-non-tmpr or the nearest-customer as the destination MAC address in the LLDP frames. It is recommended that the customers use these MAC address where possible to conform to standards. This command allows legacy LLDP implementations that do not support these additional destinations MAC addresses to tunnel LLDP frames that use the nearest-bridge destination MAC address.

The no form of the command disable LLDP tunneling for frames using nearest-bridge destination MAC address.

**Default** no tunnel-nearest-bridge-dest-mac

## dest-mac

**Syntax** **dest-mac** {*bridge-mac*}

**Context** config>port>ethernet>lldp

**Description** This command configures destination MAC address parameters.

**Parameters** **bridge-mac —** Specifies destination bridge MAC type to use by LLDP.

**Values** **nearest-bridge** — Specifies to use the nearest bridge.
**nearest-non-tpmr** — Specifies to use the nearest non-Two-Port MAC Relay (TPMR) .
**nearest-customer** — Specifies to use the nearest customer.

## admin-status

**Syntax** **admin-status** {**rx | tx | tx-rx | disabled**}

**Context** config>port>ethernet>lldp>dstmac

**Description** This command specifies the desired administrative status of the local LLDP agent.

**Parameters** **rx —** Specifies the LLDP agent will receive, but will not transmit LLDP frames on this port.

**tx —** Specifies that the LLDP agent will transmit LLDP frames on this port and will not store any information about the remote systems connected.

**tx-rx —** Specifies that the LLDP agent transmitw and receives LLDP frames on this port.

**disabled —** Specifies that the LLDP agent does not transmit or receive LLDP frames on this port. If there is remote systems information which is received on this port and stored in other tables, before the port's admin status becomes disabled, then the information will naturally age out.

## notification

**Syntax** [**no**] **notification**

**Context** config>port>ethernet>lldp>dstmac

**Description** This command enables LLDP notifications.

The **no** form of the command disables LLDP notifications.

## tx-mgmt-address

**Syntax** **tx-mgmt-address** [**system**]
**no tx-mgmt-address**

**Context** config>port>ethernet>lldp>dstmac

**Description** This command specifies which management address to transmit.

The no form of the command resets value to the default.

**Default** no tx-mgmt-address

**Parameters** **system —** Specifies to use the system IP address. Note that the system address will only be transmitted once it has been configured if this parameter is specified.

## tx-tlvs

**Syntax** **tx-tlvs** [**port-desc**] [**sys-name**] [**sys-desc**] [**sys-cap**]
**no tx-tlvs**

**Context** config>port>ethernet>lldp>dstmac

**Description** This command specifies which LLDP TLVs to transmit. The **no** form of the command resets the value to the default.

no tx-tlvs

**Parameters** **port-desc —** Indicates that the LLDP agent should transmit port description TLVs.

**sys-name —** Indicates that the LLDP agent should transmit system name TLVs.

**sys-desc —** Indicates that the LLDP agent should transmit system description TLVs.

**sys-cap —** Indicates that the LLDP agent should transmit system capabilities TLVs.

# Port Commands

## network

**Syntax** **network**

**Context** config>port>ethernet

Description This command enables access to the context to configure network port parameters.

## uplink

**Syntax** **uplink**

**Context** config>port>ethernet>access>uplink

**Description** This command enables the context to configure access uplink port parameters.

## accounting-policy

**Syntax** **accounting-policy** *policy-id*
**no accounting-policy**

**Context** config>port>ethernet>network
config>port>ethernet>access>uplink

**Description** This command configures an accounting policy that can apply to an interface.

An accounting policy must be configured before it can be associated to an interface. If the accounting *policy-id* does not exist, an error is returned.

Accounting policies associated with service billing can only be applied to SAPs. Accounting policies associated with network ports can only be associated with interfaces. Only one accounting policy can be associated with an interface at a time.

The **no** form of this command removes the accounting policy association from the network interface, and the acccounting policy reverts to the default.

**Default** No accounting policies are specified by default. You must explicitly specify a policy. If configured, the accounting policy configured as the default is used.

**Parameters** *policy-id* — The accounting *policy-id* of an existing policy. Accounting policies record either service (access) or network information. A network accounting policy can only be associated with the network port configurations. Accounting policies are configured in the config>log>accounting-policy context.

**Values** 1 — 99

## collect-stats

**Syntax** [**no**] **collect-stats**

**Context** config>port>ethernet>network
config>port>ethernet>access>uplink

**Description** This command enables the collection of accounting and statistical data for the network 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 cards, however, the CPU does not obtain the results and write them to the billing file.
If the **collect-stats** command is issued again (enabled), then the counters written to the billing file will include the traffic collected while the **no collect-stats** command was in effect.

**Default** no collect-stats

## queue-policy

**Syntax** **queue-policy** *name*
**no queue-policy**

**Context** config>port>ethernet>access>uplink
config>port>ethernet>access>network

**Description** This command specifies the existing network queue policy which defines queue parameters such as CIR and PIR rates, as well as forwarding-class to queue mappings. The network-queue policy is defined in the **config>qos>network-queue** context.

**Default** default

**Parameters** *name* — Specifies an exisiting network-queue policy name.

# TDM Commands

Note: TDM commands are applicable only for 7210 SAS-M.

## tdm

**Syntax** **tdm**

**Context** config>port

**Description** This command enables the context to configure DS-1/E-1 parameters for a port on a CES MDA. TDM is a mechanism to divide the bandwidth of a stream into separate channels or time slots by assigning each stream a different time slot in a set. TDM repeatedly transmits a fixed sequence of time slots over a single transmission channel. Each individual data stream is reassembled at the receiving end based on the timing.

**Default** None

## ds1

**Syntax** [**no**] **ds1**

**Context** config>port>tdm

**Description** This command enables the context to configure digital signal level 1 (DS-1) frame parameters on a T1/E1 CES MDA. T-1 transmits DS-1-formatted data at 1.544 Mbps through the network. If channel has been configured for DS1 on a T1/E1 CES MDA, all ports on that card can be configured for DS1. A combination of DS1 and E1 channels cannot exist on the same card.

The **no** form of this command disables DS-1 capabilities.

**Default** None

**Parameters** *ds1-id* — Identifies the DS-1 channel being created.

**Values** DS1: 1 — 28

## e1

**Syntax** **e1**

**Context** config>port>tdm

**Description** This command enables the context to configure E-1 parameters on a T1/E1 CES MDA. E-1 is a basic time division multiplexing scheme used to carry digital circuits. It is also a standard WAN digital communication format designed to operate over copper facilities at a rate of 2.048 Mbps.

If the channel has been configured for E1 on a T1/E1 CES MDA, all ports on that card can be configured for E1. A combination of DS1 and E1 channels cannot exist on the same card.

The **no** form of this command disables E-1 capabilities.

**Parameters** *duration* — Sets the duration for the BERT test.

**Values** Up to 24 hours, in seconds or hh:mm:ss format

**2e15** — Sends a pseudo-random 2^15 -1 pattern.

**2e20** — Sends a pseudo-random 2^20 -1 pattern.

**2e23** — Sends a pseudo-random 2^23 -1 pattern.

## buildout

**Syntax** **buildout short**

**Context** config>port>tdm

**Description** This command specifies line buildout (cable length) for physical DS-1 interfaces on the T1/E1 CES MDA.

**Default** short

**Parameters** **short** — Sets the line buildout for length runs up to 655 feet.

## lbo

**Syntax** **lbo** [**0dB** | **-7.5dB** | **-15.0dB** | **-22.5dB**]

**Context** config>port>tdm

**Description** This command applies only to a DS-1 port configured with a 'long' buildout (see the **buildout** command). Specify the number of decibels the transmission signal decreases over the line.

For 'short' buildout the following values are valid:

lboNotApplicable — Not applicable

For 'long' buildout the following values are valid:

-> lbo0dB For 0 dB

lboNeg7p5dB For -7.5 dB

lboNeg15p0dB For -15.0 dB

lboNeg22p5dB For -22.5 dB

The default for 'short' build out is 'NotApplicable' while the default for 'long' buildout is 'lbo0dB'.

## length

**Syntax** **length** {**133** | **266** | **399** | **533** | **655**}

**Context** config>port>tdm

**Description** This command configures the line length for the physical DS1 port on the T1/E1 card.

**Default** 133

## line-impedance

**Syntax** **line-impedance** {**75** | **100** | **120**}

**Context** config>port>tdm

**Description** This command configures the line impedance of a port. Line impedance is set on a per-port basis and ports on the same card can have different values. Before changing the line impedance of a port, the port must be shut down.

**Default** 100 for DS1
120 for E1

**Parameters** 100 for DS1
120 or 75 for E1

## channel-group

**Syntax** [**no**] **channel-group** *channel-group-id*

**Context** config>port>tdm>ds1
config>port>tdm>e1

**Description** This command creates DS0 channel groups in a channelized DS1 or E1 circuit. Channel groups cannot be further subdivided.

The **no** form of this command deletes the specified DS1 or E1 channel.

**Default** None

**Description** *channel-group-id* — Identifies the channel-group ID number.

**Values** DS1: 1 — 24
E1: 1 — 32

## clock-source

**Syntax** **clock-source** {**loop-timed** | **node-timed** | **adaptive**}

**Context** config>port>tdm>ds1
config>port>tdm>e1

**Description** This command specifies the clock source to be used for the link transmit timing. Adaptive timing is supported only on T1/E1 CES MDA card ports used for TDM pseudowires.

**Default** looped-timed

**Parameters** **loop-timed —** The link recovers the clock from the received data stream.

**node-timed —** The link uses the internal clock when transmitting data. The internal clock is a free-running clock.

**adaptive —** The clocking is derived from the incoming pseudowire packets from the MPLS network.

## encap-type

**Syntax** **encap-type** {**cem**}

**no-encap-type**

**Context** config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

**Description** This command configures the encapsulation method used to on the specified port, path, or channel for the port on the T1/E1 CES MDA. This parameter can be set on access ports. For access mode, only **cem** encapsulation is supported.

**Default** **cem**

**Parameters** **cem —** Specifies the encapsulation type as circuit emulation mode for TDM pseudowires on the CES MDA.

## framing (DS-1)

**Syntax** **framing** {**esf** | **sf** | **ds1-unframed**}

**Context** config>port>>tdm>ds1

**Description** This command specifies the DS1 framing to be used for the port. The **ds1-unframed** parameter allows the configuration of an unstructured DS1 channel on a T1/E1 MDA. If a DS1 unframed channel is shut down, the channel sends an AIS pattern to the far-end DS1. If the far-end DS1 is configured as unframed, it does not react to the AIS pattern. If the far-end DS1 is configured as framed, the far end declares the AIS pattern. The operational status remains up and no alarms are generated when the near end is operationally down. This is normal behavior for unframed G.703 mode.

**Default** dsl-unframed

**Parameters** **esf —** Configures the DS-1 port for extended super frame framing.

**sf —** Configures the DS-1 port for super frame framing.

**ds1-unframed —** Specifies the DS1 unframed (G.703) mode for DS1 interfaces. DS1 unframed mode is only applicable if the encapsulation type is set to cem.

## framing (E-1)

**Syntax** **framing** {**no-crc-g704** | **g704** | **e1-unframed**}

**Context** config>port>tdm>e1

**Description** This command specifies the E-1 framing to be used for the port.

**Default** e1-unframed

**Parameters** **g704 —** Configure the E-1 port for G.704 framing.

**no-crc-g70 —** Configures the E-1 for G.704 with no CRC4.

**e1-unframed —** Specifies E1 unframed (G.703) mode for E1 interfaces. E1 unframed mode is only applicable if the encapsulation type is set to 'cem'.

## idle-cycle-flag

**Syntax** **idle-cycle-flag** {**flags** | **ones**}

**Context** config>port>tdm>ds1>channel-group
config>port>tdm>ds3
config>port>tdm>e1
config>port>tdm>e1>channel-group
config>port>tdm>e3

**Description** This command configures the value that the HDLC TDM DS-0, E-1, E-3, DS-1, or DS-3 interface transmits during idle cycles. For ATM ports/channels/channel-groups, the configuration does not apply and only the no form is accepted.

The **no** form of this command reverts the idle cycle flag to the default value.

**Default** flags (0x7E)

no flags (ATM)

**Parameters** **flags —** Specifies that 0x7E is used as the idle cycle flag.

**ones —** Specifies that 0xFF is used as the idle cycle flag.

## idle-payload-fill

**Syntax** **idle-payload-fill** {**all-ones | pattern** *pattern*}

**Context** config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

**Description** This command defines the data pattern to be transmitted when the circuit emulation service is not operational or temporarily experiences under-run conditions.This command is only valid for cesopsn services.

Note: See the 7210 SAS-M Services guide for more information on CESoPSN services.

**Default** all-ones

**Parameters** **all-ones —** Defines the 8 bit value to be transmitted as 11111111.

*pattern* — Transmits a user-defined pattern.

**Values** 0 to 255 (can be entered in decimal, binary, or hexadecimal format)

## idle-signal-fill

**Syntax** **idle-signal-fill** {**all-ones | pattern** *pattern*}
**no idle-signal-fill**

**Context** config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

**Description** This command defines the signaling pattern to be transmitted (4-bit value) when the circuit emulation service is not operational or temporarily experiences underrun conditions. This command is only valid for CES with CAS.

Note: See the 7210 SAS-M Services guide for more information on CESoPSN

**Default** all-ones

**Parameters** **all-ones —** Defines the 4 bit value to be transmitted as 1111.

*pattern* — Transmits a user-defined pattern.

**Values** 0 to 15 (can be entered in decimal, binary, or hexadecimal format).

## loopback

**Syntax** **loopback** {**line** | **internal** | **fdl-ansi** | **fdl-bellcore** | **payload-ansi**}
**no loopback**

**Context** config>port>tdm>ds1

config>port>tdm>e1

Note: Only line and internal options are supported for "e1".

**Description** This command puts the specified port or channel into a loopback mode. A line loopback, loops frames received on the corresponding port or channel back towards the transmit (egress) direction before reaching the framer. The bit stream is not reframed. The electrical signal is regenerated by the Tx line interface unit (LIU) and the timing is provided by the Rx LIU.

An internal loopback, loops the frames from the local router back to the framer. This is usually referred to as an equipment loopback. The Tx signal is looped back and received by the interface.

**Note:** The loopback command is not saved to the system configuration.

The **no** form of this command disables the specified type of loopback.

**Note:** The fdl-ansi, fdl-bellcore and payload-ansi options can only be configured if DS1 framing is set to ESF.

**Default** no loopback

**Parameters** **line —** Places the associated port or channel into a line loopback mode. A line loopback loops frames received on the corresponding port or channels back to the remote router.

**internal —** Places the associated port or channel into a internal loopback mode. A internal loopback loops the frames from the local router back at the framer.

**fdl-ansi —** Requests FDL line loopback according to ANSI T1.403.

**fdl-bellcore —** Requests FDL line loopback according to Bellcore TR-TSY-000312.

**payload-ansi —** Requests payload loopback using ANSI signaling.

## mode

**Syntax** **mode** {**access**}
**no mode**

**Context** config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

**Description** This command configures a TDM channel for access mode operation. An **access** port or channel is used for customer-facing traffic on which services are configured. A Service Access Point (SAP) can only be configured on an access port or channel. When a port is configured for access mode, the **encap-type** cem must be specified to distinguish the services on the port.

The **no** form of this command restores the default.

**Default** access

**Parameters** **access —** Configures the port or channel as service access.

## remote-loop-respond

**Syntax** [**no**] **remote-loop-respond**

**Context** config>port>tdm>ds1

**Description** This command configures the DS1 channel response to remote loop backs. When enabled, the channel responds to remote loop backs; when disabled, the channel does not respond.

**Default** no remote-loop-respond

## report-alarm

**Syntax** [**no**] **report-alarm** [**ais**] [**los**] [**oof**] [**rai**] [**looped**] [**ber-sd**] [**ber-sf**]

**Context** config>port>tdm>ds1
config>port>tdm>e1

**Description** This command enables logging of DS-1 or E-1 alarms for DS-1 or E-1 ports or channels.

The **no** form of this command disables logging of the specified alarms.

**Parameters** **ais —** Reports alarm indication signal errors. When configured, **ais** alarms are not raised and cleared.

**Default** **ais** alarms are issued

**los —** Reports loss of signal errors. When configured, **los** traps are not raised and cleared.

**Default** **los** traps are issued.

**oof —** Reports out-of-frame errors. When configured, **oof** alarms are not raised and cleared.

**Default** **oof** alarms are not issued.

**rai —** Reports resource availability indicator events. When configured, **rai** events are not raised and cleared.

**Default** **rai** alarms are not issued

**looped —** Reports looped packets errors.

**Default** **looped** alarms are not issued

## signal-mode

**Syntax** **no signal-mode** {**cas**}

**Context** config>port>tdm>ds1
config>port>tdm>e1

**Description** This command activates the signal mode on the channel.

When enabled, control signals (such as those for synchronizing and bounding frames) are carried in the same channels as voice and data signals. Configure the signal mode before configuring the Cpipe service to support T1 or E1 with CAS.

Refer to the 7210 SAS Services Guide, “Creating a Cpipe Service”, for information on configuring a Cpipe service.

This command is valid when:

- T1 framing is set to esf or sf

- E1 framing is set to g704 or no-crc-g704.

Note: On the 7210 SAS, CAS is enabled at the port level, rather than at the 64 kb/s channel level. This means that control signals and voice and data signals are all carried in the same channels. However, T1 and E1 links with a mix of voice and data channels cannot be transported directly across a 7210 SAS network. For a workaround, please contact Alcatel-Lucent technical service representatives.

This limitation does not apply to Serial Data Interface card and E&M card traffic transported over MPLS as the signaling is transported in individual pseudowires.

**Parameters** **cas —** Specifies channel associated signaling.

## timeslots

**Syntax** **timeslots** *timeslots*
**no timeslots**

**Context** config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group

**Description** This command defines the list of DS-0 timeslots to be used in the DS-1 or E-1 channel-group. The timeslots need not be consecutive.

The **no** form of this command removes DS-0 timeslots from a channel group.

**Default** no timeslots — Non-ATM channel groups.

**Parameters** *timeslots* — Specifies the timeslot(s) to be associated with the channel group. The value can consist of a list of timeslots. Each member of the list can either be a single timeslot or a range of timeslots.

**Values** 1 — 24 for DS-1 interfaces
2 — 32 for E-1 interfaces

# LAG Commands

## lag

**Syntax** [**no**] **lag** [*lag-id*]

**Context** config

**Description** This command creates the context for configuring Link Aggregation Group (LAG) attributes.

A LAG can be used to group up to 4 ports into one logical link. The aggregation of multiple physical links allows for load sharing and offers seamless redundancy. If one of the links fails, traffic will be redistributed over the remaining links. Up to 4 links can be supported in a single LAG, up to 12 LAGs can be configured on a node.

**NOTE:** All ports in a LAG group must have autonegotiation set to Limited or Disabled.

There are three possible settings for autonegotiation:

- "on" or enabled with full port capabilities advertised
- "off" or disabled where there is no autonegotiation advertisements
- "limited" where a single speed/duplex is advertised.

When autonegotiation is enabled on a port, the link attempts to automatically negotiate the link speed and duplex parameters. If autonegotiation is enabled, the configured duplex and speed parameters are ignored.

When autonegotiation is disabled on a port, the port does not attempt to autonegotiate and will only operate at the **speed** and **duplex** settings configured for the port. Note that disabling autonegotiation on gigabit ports is not allowed as the IEEE 802.3 specification for gigabit Ethernet requires autonegotiation be enabled for far end fault indication.

If the **autonegotiate limited** keyword option is specified the port will autonegotate but will only advertise a specific speed and duplex. The speed and duplex advertised are the **speed** and **duplex** settings configured for the port. One use for limited mode is for multispeed gigabit ports to force gigabit operation while keeping autonegotiation is enabled for compliance with IEEE 801.3.

The system requires that autonegotiation be disabled or limited for ports in a LAG to guarantee a specific port speed.

The **no** form of this command deletes the LAG from the configuration. Deleting a LAG can only be performed while the LAG is administratively shut down. Any dependencies such as IP-Interfaces configurations must be removed from the configuration before issuing the **no lag** command.

**Default** No LAGs are defined.

**Parameters** *lag-id* — The LAG identifier, expressed as a decimal integer.

**Values** 1 — 12

## dynamic-cost

**Syntax** [**no**] **dynamic-cost**

**Context** config>lag *lag-id*

**Description** This command enables OSPF costing of a Link Aggregation Group (LAG) based on the available aggregated, operational bandwidth.

The path cost is dynamically calculated based on the interface bandwidth. OSPF path cost can be changed through the interface metric or the reference bandwidth.

If dynamic cost is configured, then costing is applied based on the total number of links configured and the cost advertised is inversely proportional to the number of links available at the time. This is provided that the number of links that are up exceeds the configured LAG threshold value at which time the configured threshold action determines if, and at what cost, this LAG will be advertised.

For example:

Assume a physical link in OSPF has a cost associated with it of 100, and the LAG consists of four physical links. The cost associated with the logical link is 25. If one link fails then the cost would automatically be adjusted to 33.

If dynamic cost is not configured and OSPF autocost is configured, then costing is applied based on the total number of links configured. This cost will remain static provided the number of links that are up exceeds the configured LAG threshold value at which time the configured threshold action determines if and at what cost this LAG will be advertised.

If dynamic-cost is configured and OSPF autocost is not configured, the cost is determined by the cost configured on the OSPF metric provided the number of links available exceeds the configured LAG threshold value at which time the configured threshold action determines if this LAG will be advertised.

If neither dynamic-cost nor OSPF autocost are configured, the cost advertised is determined by the cost configured on the OSPF metric provided the number of links available exceeds the configured LAG threshold value at which time the configured threshold action determines if this LAG will be advertised.

The **no** form of this command removes dynamic costing from the LAG.

**Default** no dynamic-cost

## encap-type

**Syntax** **encap-type** {**dot1q** | **null** | **qinq**}
**no encap-type**

**Context** config>lag

**Description** This command configures the encapsulation method used to distinguish customer traffic on a LAG. The encapsulation type is configurable on a LAG port. The LAG port and the port member encapsulation types must match when adding a port member.

If the encapsulation type of the LAG port is changed, the encapsulation type on all the port members will also change. The encapsulation type can be changed on the LAG port only if there is no interface associated

with it. If the MTU is set to a non default value, it will be reset to the default value when the encap type is changed.

The **no** form of this command restores the default.

**Default** **null** — All traffic on the port belongs to a single service or VLAN.

**Parameters** **dot1q —** Ingress frames carry 802.1Q tags where each tag signifies a different service.

**null —** Ingress frames will not use any tags to delineate a service. As a result, only one service can be configured on a port with a null encapsulation type.

**qinq —** This encapsulation type is specified for QinQ access SAPs.

## hold-time

**Syntax** **hold-time down** *hold-down-time*
**no hold-time**

**Context** config>lag

**Description** This command specifies the timer, in tenths of seconds, which controls the delay between detecting that a LAG is down (all active ports are down) and reporting it to the higher levels.

A non-zero value can be configured, for example, when active/standby signalling is used in a 1:1 fashion to avoid informing higher levels during the small time interval between detecting that the LAG is down and the time needed to activate the standby link.

**Default** 0

**Parameters** **down** *hold-down-time* **—** Specifies the hold-time for event reporting

**Values** 0 — 2000

## lacp

**Syntax** **lacp** [*mode*] [**administrative-key** *admin-key*]

**Context** config>lag

**Description** This command specifies the LACP mode for aggregated Ethernet interfaces only. This command enables the LACP protocol. Per the IEEE 802.3ax standard (formerly 802.3ad), the Link Aggregation Control Protocol (LACP) provides a standardized means for exchanging information between Partner Systems on a link to allow their Link Aggregation Control instances to reach agreement on the identity of the Link Aggregation Group to which the link belongs, move the link to that Link Aggregation Group, and enable its transmission and reception functions in an orderly manner. LACP can be enabled on a maximum of 12 ports.

**Default** no lacp

**Parameters** *mode* — Specifies the mode in which LACP will operate.

**Values** **passive** — Starts transmitting LACP packets only after receiving packets.
**active** — Initiates the transmission of LACP packets.

**administrative-key** *admin-key* **—** Specifies an administrative key value to identify the channel group on each port configured to use LACP. This value should be configured only in exceptional cases. If it is not specified, a random key is assigned.

**Values** 1 — 65535

## lacp-xmit-interval

**Syntax** **lacp-xmit-interval** {**slow** | **fast**}

**Context** config>lag

**Description** This command sepcifies the interval signaled to the peer and tells the peer at which rate it should transmit.

**Default** fast

**Parameters** **slow —** Transmits packets every 30 seconds.

**fast —** Transmits packets every second.

## lacp-xmit-stdby

**Syntax** [**no**] **lacp-xmit-stdby**

**Context** config>lag

**Description** This command enables LACP message transmission on standby links.

The **no** form of this command disables LACP message transmission. This command should be disabled for compatibility when using active/standby groups. This forces a timeout of the standby links by the peer. Use the **no** form if the peer does not implement the correct behavior regarding the lacp sync bit.

**Default** lacp-xmit-stdby

## port

**Syntax** **port** *port-id* [*port-id …*up to 4 total] [**priority** *priority*] [**subgroup** *sub-group-id*]
**no port** *port-id* [*port-id …*up to 4 total]

**Context** config>lag *lag-id*

**Description** This command adds ports to a Link Aggregation Group (LAG).

The port configuration of the first port added to the LAG is used as a basis to compare to subsequently added ports. If a discrepancy is found with a newly added port, that port will be not added to the LAG.

Up to 4 (space separated) ports can be added or removed from the LAG link assuming the maximum of 4 ports is not exceeded.

All ports, when added to a LAG, must share the same characteristics (speed, duplex, etc.). An error message will be displayed when adding ports that do not share the same characteristics. Hold-timers down must be 0. Ports that are part of a LAG must be configured with autonegotiate limited or disabled.

The **no** form of this command removes ports from the LAG.

**Default** No ports are defined as members of a LAG.

**Parameters** *port-id* — The port ID configured or displayed in the *slot/mda/port* format.

**priority** *priority* — Port priority used by LACP. The port priority is also used to determine the primary port. The port with the lowest priority is the primary port. In the event of a tie, the smallest port ID becomes the primary port.

**Values** 1 — 65535

**subgroup** *sub-group-id* **—** This parameter identifies a LAG subgroup. When using subgroups in a LAG, they should only be configured on one side of the LAG, not both. Only having one side perform the active/standby selection will guarantee a consistent selection and fast convergence. The active/standby selection will be signalled through LACP to the other side. The hold time should be configured when using subgroups to prevent the LAG going down when switching between active and standby links in case no links are usable for a short time, especially in case a subgroup consists of one member.

**Values** 1 — 2 identifies a LAG subgroup.

## port-threshold

**Syntax** **port-threshold** *value* [**action** {**dynamic-cost** | **down**}
**no port-threshold**

**Context** config>lag *lag-id*

**Description** This command configures the behavior for the Link Aggregation Group (LAG) if the number of operational links is equal to or below a threshold level.

**Note:** The 7210 SAS-M and 7210 SAS-T access-uplink mode supports only 'down' value for the action parameter. The 7210 SAS-X and M network mode supports both 'dynamic-cost' and 'down' values for action parameter.

The **no** form of this command reverts to the default values.

**Default** "0" action down

**Parameters** *value* — The decimal integer threshold number of operational links for the LAG at or below which the configured action will be invoked. If the number of operational links exceeds the port-threshold value, any action taken for being below the threshold value will cease.

**Values** 0 — 3

**action** {**dynamic-cost** | **down**} **—** Specifies the action to take if the number of active links in the LAG is at or below the threshold value.

When the **dynamic-cost** action is specified, then dynamic costing will be activated. As a result the LAG will remain operationally up with a cost relative to the number of operational links. The link will only be regarded as operationally down when all links in the LAG are down.

This is supported only in 7210 SAS-X and SAS-M network mode.

When the **down** action is specified, then the LAG will be brought operationally down if the number of operational links is equal to or less than the configured threshold value. The LAG will only be regarded as up once the number of operational links exceeds the configured threshold value.

This is supported in 7210 SAS-X and SAS-M network mode, 7210 SAS-M and 7210 SAS-T access-uplink mode.

## selection-criteria

**Syntax** **selection-criteria** [**highest-count** | **highest-weight**] [**slave-to-partner**]
**no selection-criteria**

**Context** config>lag

**Description** This command specifies which selection criteria should be used to select the active sub-group.

**Default** highest-count

**Parameters** **highest-count —** Specifies sub-group with the highest number of eligible members.

**highest-weight —** Specifies sub-group with the highest aggregate weight.

**best-port —** Selection criteria used with "power-off" mode of operation. The sub-group containing the port with highest priority port. In case of equal port priorities the sub-group containing the port with the lowest port-id is taken

**slave-to-partner —** The slave-to-partner keyword specifies that it, together with the selection criteria, should be used to select the active sub-group. An eligible member is a lag-member link which can potentially become active. This means it is operationally up (not disabled) for use by the remote side. The **slave-to-partner** parameter can be used to control whether or not this latter condition is taken into account.

# Ethernet Ring Commands

## eth-ring

**Syntax** **eth-ring** *ring-id*
**no eth-ring**

**Context** config

**Description** This command configures a G.8032 protected Ethernet ring. G.8032 Rings may be configured as major rings with two paths (a&b).

The **no** form of this command deletes the Ethernet ring specified by the ring-id.

**Default** no eth-ring

**Parameters** *ring-id* — Specifies the ring ID.

**Values** 1—128

## description

**Syntax** **description** *description-string*
**no description**

**Context** config>eth-ring

**Description** This command adds a text description for the ring. The no form of this command removes the text description.

**Default** “Eth ring”

**Parameters** *string* — Specifies the text description up to 160 characters in length.

## guard-time

**Syntax** **guard-time** *time*
**no guard-time**

**Context** config>eth-ring

**Description** This command configures the guard time for an Eth-Ring. The guard timer is standard and is configurable from “x”ms to 2 seconds

The **no** form of this command restores the default guard-time.

**Default** 5 deciseconds

**Parameters** *value* — Specifies the guard-time.

**Values** 1—20 deciseconds

## revert-time

**Syntax** **revert-time** *time*
**no revert-time**

**Context** config>eth-ring

This command configures the revert time for an Eth-Ring. It ranges from 60 seconds to 720 second by 1 second intervals.

The no form of this command this command means non-revertive mode and revert time essentially is 0 meaning the revert timers are not set.

**Default** 300 seconds

**Parameters** *value* — Specifies the guard-time.

**Values** 60 —720 seconds

## ccm-hold-time

**Syntax** **ccm-hold-time** {**down** *down-timeout* | **up** *up-timeout*}
**no ccm-hold-time**

**Context** config>eth-ring

This command configures eth-ring dampening timers.

The **no** form of this command set the up and down timer to the default values.

## down

**Syntax** **down** *down-timeout*

**Context** config>eth-ring>ccm-hold-time

This command specifies the timer, which controls the delay between detecting that ring path is down and reporting it to the G.8032 protection module. If a non-zero value is configured, the CPM will wait for the time specified in the value parameter before reporting it to the G.8032 protection module.

**Note:** This parameter applies only to ring path CCM. It does NOT apply to the ring port link state. To damp ring port link state transitions, use hold-time parameter from the physical member port.

**Default** 0 - the fault will be reported immediately to the protection module.

**Parameters** *value* — Specifies the down timeout.

**Values** 0 — 5000 deciseconds

## up

**Syntax** **up** *up-timeout*

**Context** config>eth-ring>ccm-hold-time

This command specifies the timer, which controls the delay between detecting that ring path is up and reporting it to the G.8032 protection module. If a non-zero value is configured, the CPM will wait for the time specified in the value parameter before reporting it to the G.8032 protection module.

**Note:** This parameter applies only to ring path CCM. It does NOT apply to the member port link state. To damp member port link state transitions, use hold-time parameter from the physical member port.

**Default** 20 deciseconds

**Parameters** *value* — Specifies the hold-time for reporting the recovery.

**Values** 0 — 5000 deciseconds

## rpl-node

**Syntax** **rpl-node** <**owner | nbr**>
**no rpl-node**

**Context** config>eth-ring

This command configures the G.8032 ring protection link type as owner or neighbor. The no form of the command means this node is not connected to an RPL link. When RPL owner or neighbor is specified either the a or b path must be configured with the RPL end command. An owner is responsible for operation of the rpl link. Configuring the RPL as neighbor is optional (can be left as no rpl-node) but if the command is used the nbr is mandatory.

The **no** form of this command removes the RPL link.

**Default** no rpl-node

## node-id

**Syntax** **node-id**
**no node-id**

**Context** config>eth-ring

This optional command configures the MAC address of the RPL control. The default is to use the chassis MAC for the ring control. This command allows the chassis MAC to be overridden with another MAC address.

The no form of this command removes the RPL link.

**Default** no node-id

**Parameters** *mac* — <xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx>

## sub-ring

**Syntax** **sub-ring {virtual-link | non-virtual-link}**
**[no] sub-ring**

**Context** config>eth-ring>sub-ring

This command specifies this ring-id to be sub-ring as defined in G.8032. By declaring the ring as a sub-ring object, the ring will only have one valid path and the sub-ring will be connected to a major ring or a VPLS instance. The virtual-link parameter declares that a sub-ring is connected to another ring and that control messages can be sent over the attached ring to the other side of the sub-ring. The non-virtual channel parameter declares that a sub-ring may be connected to a another ring or to a VPLS instance but that no control messages from the sub-ring use the attached ring or VPLS instance. The non-virtual channel behavior is standard G.8032 capability.

The no form of this command deletes the sub-ring and its virtual channel associations.

**Default** no sub-ring

**Parameters** *virtual-link* — Specifies the interconnection is to a ring and a virtual link will be used.

*non-virtual-link* — Specifies the interconnection is to a ring or a VPLS instance and a virtual link will not be used.

## compatible-version

**Syntax** **compatible-version** *version*
**[no] compatible-version**

**Context** config>eth-ring

**Description** This command configures the backward compatibility logic for the Ethernet rings.

**Default** 2

**Parameters** *version* — Specifies the Ethernet ring version.

**Values** 1— 2

## interconnect

**Syntax** **interconnect {ring-id** *ring-index* **| vpls}**
**[no] interconnect**

**Context** config>eth-ring>sub-ring>interconnect

This command links the G.8032 sub-ring to a ring instance or to a VPLS instance. The ring instance must be a complete ring with two paths but may itself be a sub-ring or a major ring (declared by its configuration on another node) . When the interconnection is to another node, the sub-ring may have a virtual link or a non-virtual-link. When the sub-ring has been configured with a non-virtual link, the sub ring may be alternatively be connected to a VPLS service. This command is only valid on the interconnection node where a single sub-ring port connects to a major ring or terminates on a VPLS service.

The **no** form of this command removes interconnect node.

**Default** no interconnect

**Parameters** *ring-index* — Specifies the ring index of the connection ring for this sub-ring on this node.

*vpls* — Specifies that the sub- ring is connected to the VPLS instance that contains the sub-ring SAP.

**Values** *ring-ind*ex: 1—128

## propagate-topology-change

**Syntax** **propagate-topology-change**
**[no] propagate-topology-change**

**Context** config>eth-ring>sub-ring>interconnect

This command configures the G.8032 sub-ring to propagate topology changes. From the sub-ring to the major ring as specified in the G.8032 interconnection flush logic. This command is only valid on the sub-ring and on the interconnection node. Since this command is only valid on a Sub-ring, a virtual link or non-virtual link must be specified for this command to be configured. The command is blocked on major rings (when both path a and b are specified on a ring).

The **no** form of this command sets propagate to the default

**Default** no propagate-topology-change

## path

**Syntax** **path {a | b}** <*portid*> **raps-tag** <*qtag [.qtag]*>
[**no**] **path {a | b}**

**Context** config>eth-ring

**Description** This command assigns the ring (major or sub-ring) path to a port and defines the Ring APS tag. Rings typically have two paths a and b.

The no form of this command removes the path a or b.

**Default** no path

**Parameters** *raps-tag <qtag [.qtag]>* — Specifies the VIDqtag.

**Values** Dot1q: 1—4094

**Values** QinQ: 1—4094.1—4094

## description

**Syntax** **description** *long-description-string*
**no description**

**Context** config>eth-ring>path

**Description** This command adds a text description for the ring path. The no form of this command removes the text description.

**Default** “”

**Parameters** *string* — Specifies the text description up to 160 characters in length.

## rpl-end

**Syntax** **rpl-end**
**no rpl-end**

**Context** config>eth-ring>path

**Description** This command configures the G.8032 path as a ring protection link end. The ring should be declared as either a RPL owner or RPL neighbor for this command to be allowed. Only path a or path b can be declared an RPL-end.

The no form of this command sets the rpl-end to default no rpl-end.

**Default** no rpl-end

## eth-cfm

**Syntax** **eth-cfm**

**Context** config>eth-ring>path

**Description** This command enables the context to configure ETH-CFM parameters.

## mep

**Syntax** [**no**] **mep** *mep-id* **domain** *md-index* **association** *ma-index*

**Context** config>eth-ring>path>eth-cfm

**Description** This command provisions an 802.1ag maintenance endpoint (MEP).

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

## ccm-enable

**Syntax** [**no**] **ccm-enable**

**Context** config>eth-ring>path>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** *priority*
**no ccm-ltm-priority**

**Context** config>eth-ring>path>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** *priority* — Specifies the priority of CCM and LTM messages.

**Values** 0 — 7

## control-mep

**Syntax** **no control-mep**

**Context** config>eth-ring>path>eth-cfm>mep

**Description** This command enables the usage of the CC state by the Ethernet ring for consideration in the protection algorithm. The use of control-mep command is recommended if fast failure detection is required, especially when Link Layer OAM does not provide the required detection time.

The **no** form of this command disables the use of the CC state by the Ethernet ring.

**Default** no control-mep

## control-sap-tag

**Syntax** **control-sap-tag** *tag-range*
**no control-sap-tag**

**Context** config>eth-ring>path>eth-cfm>mep

**Description** To support 100ms CCM timers in hardware for G.8032 MEPs, user needs to reserve a VLAN tag value for exclusive use by G.8032 MEPs configured for a particular ring port (for the MEP configured under the path command). This command allows the user to tell the system which VLAN tag is reserved for use with this G.8032 MEP. This value can be the same one as configured with raps-tag value. Use of this command turns on use of 100ms CCM timers for this MEP. The system checks that the configured value is not in use by any SAP (as a SAP tag) configured on the port and not in use as a control-sap-tag by any other G.8032 instance on that port. Maximum of four hardware based control MEPs can be configured on a port.

The VLAN should be reserved for all port encapsulation type. In other words, NULL encapsulated port, Dot1q encapsulated port, and QinQ encapsulated ports that need to use G.8032 MEPs with 100ms CCM timers need to reserve a VLAN for use. Every G.8032 instance configured for the port, needs a VLAN value reserved for its use. Each G.8032 ring instance must use a different VLAN value, not in use currently by any other G.8032 instance on the same port.

**Note:** User needs to ensure that the VLAN value specified as control-sap-tag must not be received as the outermost VLAN tag on any of the SAPs in use on the same port. For example, if control-sap-tag is configured as 550, then any SAP (NULL, dot1q, dot1q Default SAP, Q1.Q2 SAP, Q1.* SAP, etc.) configured on the port do not receive any CFM packet that matches the VLAN tag 550.

The **no** form of the command reverts the ring port to use the raps-tag configured for the path and use of 1second CCM timers.

**Parameters** *tag-range* — Specifies the tag range.

**Values** 512 — 768

## eth-test-enable

**Syntax** [**no**] **eth-test-enable**

**Context** config>eth-ring>path>eth-cfm>mep

**Description** This command enables eth-test functionality on MEP. 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 mac-address mep mep-id domain md-index association
ma-index [priority priority] [data-length data-length]
```

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>eth-ring>path>eth-cfm>mep>eth-test-enable

**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

## bit-error-threshold

**Syntax** **bit-error-threshold** *bit-errors*

**Context** config>eth-ring>path>eth-cfm>mep

**Description** This command specifies the lowest priority defect that is allowed to generate a fault alarm.

**Default** 1

**Parameters** *bit-errors* **—** Specifies the lowest priority defect.

**Values** 0 — 11840

## low-priority-defect

**Syntax** **low-priority-defect** {**allDef** | **macRemErrXcon** | **remErrXcon** | **errXcon** | **xcon** | **noXcon**}

**Context** config>eth-tunnel>path>eth-cfm>mep

**Description** This command specifies the lowest priority defect that is allowed to generate a fault alarm.

**Default** remErrXcon

**Values**

| | |
|---|---|
| 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

**Syntax** **mac-address** *mac-address*
**no mac-address**

**Context** config>eth-ring>path>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** *mac-address — 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.

## one-way-delay-threshold

**Syntax** **one-way-delay-threshold** *seconds*

**Context** config>eth-ring>path>eth-cfm>mep

**Description** This command enables one way delay threshold time limit.

**Default** 3 seconds

**Parameters** *priority* — Specifies the value for the threshold in seconds.

**Values** 0 — 600

## shutdown

**Syntax** [**no**] **shutdown**

**Context** config>eth-ring>path>eth-cfm>mep

**Description** This command administratively enables or disables the MEP.

The **no** form of this command disables or enables the MEP.

**Default** shutdown

## shutdown

**Syntax** [**no**] **shutdown**

**Context** config>eth-ring>path
config>eth-ring

**Description** This command administratively enables or disables the path.

The **no** form of this command disables or enables the path.

**Default** shutdown

## resource-profile

**Syntax** **resource-profile**

**Context** config>system

**Description** This command is used to configure the system resource profile.

## g8032-fast-flood-enable

**Note: This command is supported only on 7210 SAS-M devices.**

**Syntax** **g8032-fast-flood-enable**
**no g8032-fast-flood-enable**

**Context** config>system>resource-profile

**Description** This command is used to enable the G.8032 fast-flood feature.When this command is executed it is stored in the configuration file after **admin save** is executed. A system reboot is required for this command to take effect.

It is recommended to enable this command to improve service failover time due to failures in the ring path. When fast flood is enabled, on a failure detection in one of the paths of the eth-ring, along with MAC flush the system starts to flood the traffic onto the available path.

If this command is present in the configuration file, on reboot the system allocates resources for G.8032, by reducing the amount of resources available for use with ACLs. When this command is used, G.8032 fast-flood needs an entire chunk with "**512"** entries,therefore the amount of resources available for use with ACLs is reduced by "**512**". User needs to free up resources used by ACLs and make them available for use by G.8032, before enabling this command.The user should ensure that the resource usage of ACLs has been appropriately modified before reboot, to make way for use of this feature.User can free up resources either disabling the use of ACLs with a SAP or deleting a SAP, so that an entire chunk of **512** entries is available.

Before enabling the **g8032-fast-flood-enable** command the user must check if sufficient resources are available.The **tools>dump>system-resources** command is available to check if sufficient resources are available.The field **'Ingress Shared CAM Entries'** shown in the output below of **tools>dump>system-resources** command, must be more than or equal to **512** (free column in the output shown below).

```
                            | Total   | Allocated   | Free
-----------------------------+---------+-----------+-----------
Ingress Shared CAM Entries  | 0       | 0           | 512
```

If the configuration file contains a **no** form of this command, then the system does not allocate any resources for use by G.8032.The entire resource pool is available for use by ACLs. The **no** form of the command takes affect only on reboot.

**Default** no g8032-fast-flood-enable

## split-horizon-group

**Syntax** **split-horizon-group** *group-name*
**no split-horizon-group**

**Context** config>lag
config>port

**Description** This command associates a split horizon group to which this port or LAG belongs. For LAGs, all the member ports of the LAG are added to the split horizon group. The split-horizon-group must be configured in the **config** context.

Configuring or removing the association of the port requires the following conditions to be satisfied:

- There are no applications associated with the port/lag (like SAPs on the port, etc.).
- The port or LAG should be administratively shutdown.
- The port should not be part of a LAG.
- To change split horizon group of a port or LAG, the old split horizon group should be first removed from the port or LAG, and then the new split horizon group can be configured.

The **no** form of this command removes the port or all member ports of the LAG from the split horizon group.

**Parameters** *group-name* — Specifies the name of the split horizon group up to 32 characters in length. The string must be composed of printable, 7-bit ASCII characters. If the string contains special characters (#, $, spaces, etc.), the entire string must be enclosed within double quotes.

# Multi-Chassis Redundancy Commands

## redundancy

**Syntax** **redundancy**

**Context** config

**Description** This command allows the user to configure redundancy operations.

## multi-chassis

**Syntax** **multi-chassis**

**Context** config>redundancy

**Description** This command enables the context to configure multi-chassis parameters.

## peer

**Syntax** [**no**] **peer** *ip-address* **create**

**Context** config>redundancy>multi-chassis

**Description** Use this command to configure up to 20 multi-chassis redundancy peers. Note that is is only for mc-lag (20) not for mc-sync (4).

**Parameters** *ip-address* — Specifies the IP address.

**Values** ipv4-address: a.b.c.d

**create —** Mandatory keyword specifies to create the peer.

## lag

**Syntax** **lag** *lag-id* **lacp-key** *admin-key* **system-id** *system-id* [**remote-lag** *remote-lag-id*] **system-priority** *system-priority*
**no lag** *lag-id*

**Context** config>redundancy>multi-chassis>peer>mc-lag

**Description** This command defines a LAG which is forming a redundant-pair for MC-LAG with a LAG configured on the given peer. The same LAG group can be defined only in the scope of 1 peer. In order MC-LAG to become operational, all parameters (**lacp-key**, **system-id**, **system-priority**) must be configured the same on both nodes of the same redundant pair.

The partner system (the system connected to all links forming MC-LAG) will consider all ports using the same **lacp-key**, **system-id**, **system-priority** as the part of the same LAG. In order to achieve this in MC operation, both redundant-pair nodes have to be configured with the same values. In case of the mismatch, MC-LAG is kept in oper-down status.

Note that the correct CLI command to enable MC LAG for a LAG in **standby-signaling power-off mode** is **lag** *lag-id* [**remote-lag** *remote-lag-id*]. In the CLI help output, the first three forms are used to enable MC LAG for a LAG in LACP mode. MC LAG is disabled (regardless of the mode) for a given LAG with **no lag** *lag-id*.

**Default** none

**Parameters** *lag-id* — The LAG identifier, expressed as a decimal integer. Specifying the *lag-id* allows the mismatch between lag-id on redundant-pair. If no **lag-id** is specified it is assumed that neighbor system uses the same *lag-id* as a part of the given MC-LAG. If no matching MC-LAG group can be found between neighbor systems, the individual LAGs will operate as usual (no MC-LAG operation is established.).

**Values** 1 — 200

**lacp-key *admin-key* —** Specifies a 16 bit key that needs to be configured in the same manner on both sides of the MC-LAG in order for the MC-LAG to come up.

**Values** 1 — 65535

**system-id *system-id* —** Specifies a 6 byte value expressed in the same notation as MAC address

**Values** xx:xx:xx:xx:xx:xx - xx [00..FF]

**remote-lag *lag-id* —** Specifies the LAG ID on the remote system.

**Values** 1 — 2001 — 64

**system-priority** *system-priority* **—** Specifies the system priority to be used in the context of the MC-LAG. The partner system will consider all ports using the same **lacp-key**, **system-id**, and **system-priority** as part of the same LAG.

**Values** 1 — 65535

## source-address

**Syntax** **source-address** *ip-address*
**no source-address**

**Context** config>redundancy>multi-chassis>peer

**Description** This command specifies the source address used to communicate with the multi-chassis peer.

**Parameters** *ip-address* — Specifies the source address used to communicate with the multi-chassis peer.

## peer-name

**Syntax** **peer-name** *name*
**no peer-name**

**Context** config>redundancy>multi-chassis>peer

**Description** This command specifies the peer name used to communicate with the multi-chassis peer.

**Parameters** *name* — Specifies the name used to communicate with the multi-chassis peer.

## sync

**Syntax** [**no**] **sync**

**Context** config>redundancy>multi-chassis>peer

**Description** This command enables the context to configure synchronization parameters.

## igmp-snooping

**Syntax** [**no**] **igmp-snooping**

**Context** config>redundancy>multi-chassis>peer>sync

**Description** This command specifies whether IGMP snooping information should be synchronized with the multi-chassis peer.

**Default** no igmp-snooping

## port

**Syntax** **port** [*port-id* | *lag-id*] [**sync-tag** *sync-tag*]
**no port** [*port-id* | *lag-id*]

**Context** config>redundancy>multi-chassis>peer>sync

**Description** This command specifies the port to be synchronized with the multi-chassis peer and a synchronization tag to be used while synchronizing this port with the multi-chassis peer.

**Parameters** *port-id* — Specifies the port to be synchronized with the multi-chassis peer.

*lag-id* — Specifies the LAG ID to be synchronized with the multi-chassis peer.

**sync-tag** *sync-tag* — Specifies a synchronization tag to be used while synchronizing this port with the multi-chassis peer.

## range

**Syntax** **range** *encap-range* **sync-tag** *sync-tag*
**no range** *encap-range*

**Context** config>redundancy>multi-chassis>peer>sync>port

**Description** This command configures a range of encapsulation values.

**Parameters**

**Values** encap-range

Specifies a range of encapsulation values on a port to be synchronized with a multi-chassis peer.

| **Values** | | |
|---|---|---|
| | Dot1Q | *start-qtag-end-qtag* |
| | *start-qtag* | *[0..4094]* |
| | *end-qtag* | *[0..4094]* |
| | QinQ | - <qtag1>.<start-qtag2>-<qtag1>.<end-qtag2><br>- <start-qtag1>.*-<end-qtag1>.* |
| | qtag1 | [1..4094] |
| | start-qtag1 | [1..4094] |
| | end-qtag1 | [1..4094] |
| | start-qtag2 | [0..4094] |
| | end-qtag2 | [0..4094] |

**sync-tag *sync-tag* —** Specifies a synchronization tag up to 32 characters in length to be used while synchronizing this encapsulation value range with the multi-chassis peer.

# Show Commands

# Hardware Commands

## chassis

**Syntax** **chassis** [**environment**] [**power-supply**]

**Context** show

**Description** This command displays general chassis status information.

**Parameters** **environment —** Displays chassis environmental status information.

**Default** Displays all chassis information.

**power-supply —** Displays chassis power supply status information.

**Default** Displays all chassis information.

**Output** **Chassis Output —** The following table describes chassis output fields.

| Label | Description |
|---|---|
| Name | The system name for the router. |
| Type | Displays the model number. |
| Location | The system location for the device. |
| Coordinates | A user-configurable string that indicates the Global Positioning System (GPS) coordinates for the location of the chassis.<br>For example:<br>N 45 58 23, W 34 56 12<br>N37 37' 00 latitude, W122 22' 00 longitude<br>N36*39.246' W121*40.121' |
| CLLI Code | The Common Language Location Identifier (CLLI) that uniquely identifies the geographic location of places and certain functional categories of equipment unique to the telecommunications industry. |
| Number of slots | The number of slots in this chassis that are available for plug-in cards. The total number includes the IOM slot(s) and the CPM slots. |
| Number of ports | The total number of ports currently installed in this chassis. This count does not include the Ethernet ports on the CPMs that are used for management access. |

| Label | Description (Continued) |
|---|---|
| Critical LED state | The current state of the Critical LED in this chassis. |
| Major LED state | The current state of the Major LED in this chassis. |
| Minor LED state | The current state of the Minor LED in this chassis. |
| Base MAC address | The base chassis Ethernet MAC address. |
| Admin chassis mode | The configured chassis mode. |
| Oper chassis mode | The current chassis mode. |
| Part number | The CPM's part number. |
| CLEI code | The code used to identify the router. |
| Serial number | The CPM's part number. Not user modifiable. |
| Manufacture date | The chassis manufacture date. Not user modifiable. |
| Manufacturing string | Factory-inputted manufacturing text string. Not user modifiable. |
| Administrative state | Up – The card is administratively up.<br>Down – The card is administratively down. |
| Operational state | Up – The card is operationally up. |
| | Down – The card is operationally down. |
| Time of last boot | The date and time the most recent boot occurred. |
| Current alarm state | Displays the alarm conditions for the specific board. |
| Number of fan trays | The total number of fan trays installed in this chassis. |
| Number of fans | The total number of fans installed in this chassis. |
| Operational sta-tus | Current status of the fan tray. |
| Fan speed | Half speed – The fans are operating at half speed. |
| | Full speed – The fans are operating at full speed. |
| Number of power supplies | The number of power supplies installed in the chassis. |

| Label | Description (Continued) |
|---|---|
| Power supply number | The ID for each power supply installed in the chassis. |
| AC power | Within range — AC voltage is within range. |
| | Out of range — AC voltage is out of range. |
| DC power | Within range — DC voltage is within range. |
| | Out of range — DC voltage is out of range. |
| Over temp | Within range — The current temperature is within the acceptable range. |
| | Out of range — The current temperature is above the acceptable range. |
| Status | Up — The specified power supply is up. |
| | Down — The specified power supply is down |

**Sample Output**

```
*A:MTU-A# show chassis
===============================================================================
Chassis Information
===============================================================================
    Name                          : MTU-A
    Type                          : 7210 SAS-M-1
    Location                      :
    Coordinates                   :
    CLLI code                     :
    Number of slots               : 2
    Number of ports               : 24
    Critical LED state            : Off
    Major LED state               : Off
    Minor LED state               : Off
    Over Temperature state        : OK
    Base MAC address              : 00:11:00:22:bc:11

Hardware Data
    Part number                   :
    CLEI code                     :
    Serial number                 : MTUSN107210
    Manufacture date              :
    Manufacturing string          :
    Manufacturing deviations      :
    Time of last boot             : 2001/06/27 11:14:43
    Current alarm state           : alarm cleared
-------------------------------------------------------------------------------
Environment Information
    Number of fan trays           : 1
    Number of fans                : 3
```

```
    Fan tray number              : 1
    Status                       : up
    Speed                        : half speed
-------------------------------------------------------------------------------
Power Supply Information
    Number of power supplies     : 2

    Power supply number          : 1
    Configured power supply type : ac single
    Status                       : up
    AC power                     : within range

    Power supply number          : 2
    Defaulted power supply type  : none
    Status                       : not equipped
===============================================================================
*A:MTU-A#


*A:MTU-A# show chassis power-supply
===============================================================================
Chassis Information
===============================================================================
Power Supply Information
    Number of power supplies     : 2

    Power supply number          : 1
    Configured power supply type : ac single
    Status                       : up
    AC power                     : within range

    Power supply number          : 2
    Defaulted power supply type  : none
    Status                       : not equipped
===============================================================================
*A:MTU-A#
```

**Sample output for 7210 SAS-X:**

```
A:7210-SAS-X>show# chassis

===============================================================================
Chassis Information
===============================================================================
    Name                         : SASX2595
    Type                         : 7210 SAS-X 24F 2XFP-1
    Location                     :
    Coordinates                  :
    CLLI code                    :
    Number of slots              : 2
    Number of ports              : 26
    Critical LED state           : Off
    Major LED state              : Off
    Minor LED state              : Off
    Over Temperature state       : OK
```

```
    Base MAC address             : 7c:20:64:ac:ff:8f

Hardware Data
    Part number                  : 3HE05171AAAA0501
    CLEI code                    : IPMNX10GRA
    Serial number                : NS1035F0181
    Manufacture date             : 08242010
    Manufacturing string         :
    Manufacturing deviations     : D01669 D01696
    Time of last boot            : 2010/11/10 20:38:27
    Current alarm state          : alarm cleared
-------------------------------------------------------------------------------
Environment Information
    Number of fan trays          : 1
    Number of fans               : 3

    Fan tray number              : 1
    Status                       : up
    Speed                        : half speed
-------------------------------------------------------------------------------
Power Supply Information
    Number of power supplies     : 2

    Power supply number          : 1
    Configured power supply type : ac single
    Status                       : up
    AC power                     : within range
    Over temp                    : within range
    Input power                  : within range
    Output power                 : within range

    Power supply number          : 2
    Configured power supply type : ac single
    Status                       : up
    AC power                     : within range
    Over temp                    : within range
    Input power                  : within range
    Output power                 : within range
===============================================================================


*A:7210-SAS-X>show# chassis environment

===============================================================================
Chassis Information
===============================================================================
Environment Information
    Number of fan trays          : 1
    Number of fans               : 3

    Fan tray number              : 1
    Status                       : up
    Speed                        : half speed
===============================================================================
*A:7210-SAS-X>show#


*A:7210-SAS-X>show# chassis power-supply
```

```
===============================================================================
Chassis Information
===============================================================================
Power Supply Information
    Number of power supplies      : 2

    Power supply number           : 1
    Configured power supply type  : ac single
    Status                        : up
    AC power                      : within range
    Over temp                     : within range
    Input power                   : within range
    Output power                  : within range

    Power supply number           : 2
    Configured power supply type  : ac single
    Status                        : up
    AC power                      : within range
    Over temp                     : within range
    Input power                   : within range
    Output power                  : within range
===============================================================================
*A:7210-SAS-X>show#
```

## card

**Syntax** **card** [*slot-number*] [**detail**]
**card state**

**Context** show

**Description** This command displays card information.

If no command line parameters are specified, a card summary for all cards is displayed.

**Parameters** *slot-number* — Displays information for the specified card slot.

**Default** Displays all cards.

**Values** state

Displays provisioned and equipped card and MDA information.

**detail —** Displays detailed card information.

**Default** Displays summary information only.

**Output** **Show Card Output —** The following table describes show card output fields.

| Label | Description |
|---|---|
| Slot | The slot number of the card in the chassis. |
| Provisioned Card-type | The card type that is configured for the slot. |
| Equipped Card-type | The card type that is actually populated in the slot. |
| Admin State | Up — The card is administratively up.<br>Down — The card is administratively down. |
| Operational State | Up — The card is operationally up.<br>Down — The card is operationally down. |

```
*A:MTU-A# show card
===============================================================================
Card Summary
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-24g             iom-24g             up         up
A         sfm-24g             sfm-24g             up         up/active
===============================================================================
*A:MTU-A#

*A:ces-A# show card

===============================================================================
Card Summary
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-sas             iom-sas             up         up
A         sfm-sas             sfm-sas             up         up/active
===============================================================================
```

**Sample output for 7210 SAS-X:**

```
A:7210-SAS-X > show card

===============================================================================
Card Summary
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
```

```
1         iom-sas             iom-sas             up         up
A         sfm-sas             sfm-sas             up         up/active
===============================================================================
A:7210-SAS-X >
```

**Show CardState Output —** The following table describes show card state output fields.

| Label | Description |
|---|---|
| Slot/MDA | The slot number of the card in the chassis. |
| Provisioned Type | The card type that is configured for the slot. |
| Equipped Type | The card type that is actually populated in the slot. |
| Admin State | Up — The card is administratively up. |
| | Down — The card is administratively down. |
| Operational State | Up — The card is operationally up. |
| | provisioned — There is no card in the slot but it has been pre-configured. |
| Num Ports | The number of ports available on the MDA. |
| Num MDA | The number of MDAs installed. |
| Comments | Indicates whether the SF/CPM is the active or standby. |

**Sample Output**

```
*A:MTU-A# show card state
===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-24g          iom-24g          up    up                 2
1/1    m24-100fx-1gb-s* m24-100fx-1gb-s* up    up           24
A      sfm-24g          sfm-24g          up    up                       Active
===============================================================================
* indicates that the corresponding row element may have been truncated.
```

**Sample output for 7210 SAS-X:**

```
A:7210-SAS-X> show card state

===============================================================================
Card State
```

```
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sas          iom-sas          up    up                  2
1/1    m24-1gb+2-10gb   m24-1gb+2-10gb   up    up            26
A      sfm-sas          sfm-sas          up    up                        Active
===============================================================================
A:7210-SAS-X>
```

**Show Card Detail Output —** The following table describes detailed card output fields.

| Label | Description |
|---|---|
| Available MDA slots | The number of MDA slots available on the IOM. |
| Installed MDAs | The number of MDAs installed on the IOM |
| Part number | The IOM part number. |
| CLEI code | The Common Language Location Identifier (CLLI) code string for the router. |
| Serial number | The serial number. Not user modifiable. |
| Manufacture date | The chassis manufacture date. Not user modifiable. |
| Manufacturing string | Factory-inputted manufacturing text string. Not user modifiable. |
| Manufacturing deviations | Displays a record of changes by manufacturing to the hardware or software and which is outside the normal revision control process. |
| Administrative state | Up — The card is administratively up. |
| | Down — The card is administratively down. |
| Operational state | Up — The card is operationally up. |
| | Down — The card is operationally down. |
| Temperature | Internal chassis temperature. |
| Temperature threshold | The value above which the internal temperature must rise in order to indicate that the temperature is critical. |
| Software boot version | The version of the boot image. |
| Software version | The software version number. |

| Label | Description (Continued) |
|---|---|
| Time of last boot | The date and time the most recent boot occurred. |
| Current alarm state | Displays the alarm conditions for the specific board. |
| Base MAC address | Displays the base MAC address of the hardware component. |
| Memory Capacity | Displays the memory capacity of the card. |

### Sample Output

```
*A:MTU-A# show card detail
===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-24g             iom-24g             up         up


IOM Card Specific Data
    Clock source                : none
    Available MDA slots         : 2
    Installed MDAs              : 1

Hardware Data
    Part number                 :
    CLEI code                   :
    Serial number               : MTUSN107210
    Manufacture date            :
    Manufacturing string        :
    Manufacturing deviations    :
    Administrative state        : up
    Operational state           : up
    Temperature                 : 40C
    Temperature threshold       : 50C
    Software boot (rom) version : 7
    Software version            : TiMOS-B-1.1.S29 both/mpc ALCATEL SAS-M 721*
    Time of last boot           : 2001/06/27 11:15:07
    Current alarm state         : alarm cleared
    Base MAC address            : 00:11:00:22:bc:11
    Memory capacity             : 1,024 MB
===============================================================================
*A:MTU-A#
```

### Sample Output for 7210 SAS-X:

```
A:7210-SAS-X> show card detail
```

```
===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-sas             iom-sas             up         up


IOM Card Specific Data
    Clock source                : none
    Named Pool Mode             : Disabled
    Available MDA slots         : 2
    Installed MDAs              : 1

Hardware Data
    Part number                 : 3HE05170AAAA0501
    CLEI code                   : IPMNX10GRA
    Serial number               : NS1034F0924
    Manufacture date            : 08312010
    Manufacturing string        :
    Manufacturing deviations    : D01696 D01669
    Administrative state        : up
    Operational state           : up
    Temperature                 : 26C
    Temperature threshold       : 50C
    Software boot (rom) version : X-0.0.I906 on Tue Nov 9 23:01:33 IST 2010 b*
    Software version            : TiMOS-B-2.0.B1-129 both/hops ALCATEL SAS-X *
    Time of last boot           : 2010/11/10 20:51:20
    Current alarm state         : alarm cleared
    Base MAC address            : 7c:20:64:ad:00:ef
    Last bootup reason          : hardReboot
    Memory capacity             : 1,024 MB

===============================================================================
Card A
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
A         sfm-sas             sfm-sas             up         up/active


BOF last modified               : N/A
Config file version             : TUE NOV 09 20:28:32 2010 UTC
Config file last modified       : N/A
Config file last saved          : N/A
M/S clocking ref state          : primary

Flash - cf1:
    Administrative State        : up
    Operational state           : up
    Serial number               : serial-1
    Firmware revision           : v1.0
    Model number                : Flash 1
    Size                        : 110,984 KB
    Free space                  : 88,548 KB

Hardware Data
```

```
    Part number                  : 3HE05170AAAA0501
    CLEI code                    : IPMNX10GRA
    Serial number                : NS1034F0924
    Manufacture date             : 08312010
    Manufacturing string         :
    Manufacturing deviations     : D01696 D01669
    Administrative state         : up
    Operational state            : up
    Temperature                  : 26C
    Temperature threshold        : 50C
    Software boot (rom) version  : X-0.0.I906 on Tue Nov 9 23:01:33 IST 2010 b*
    Software version             : TiMOS-B-2.0.B1-129 both/hops ALCATEL SAS-X *
    Time of last boot            : 2010/11/10 20:50:25
    Current alarm state          : alarm cleared
    Base MAC address             : 7c:20:64:ad:00:ef
    Memory capacity              : 1,024 MB
===============================================================================
A:7210-SAS-X>


*A:ces-A# show card 1 detail

===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-sas             iom-sas             up         up


IOM Card Specific Data
    Clock source                 : none
    Named Pool Mode              : Disabled
    Available MDA slots          : 2
    Installed MDAs               : 2

Hardware Data
    Part number                  : 3HE05029AA
    CLEI code                    : IPMK410JRA
    Serial number                : NS0950C1606
    Manufacture date             : 12202009
    Manufacturing string         :
    Manufacturing deviations     :
    Administrative state         : up
    Operational state            : up
    Temperature                  : 41C
    Temperature threshold        : 50C
    Software boot (rom) version  : 9-V-0.0.I771 on Thu Jun 24 21:47:52 IST 201*
    Software version             : TiMOS-B-2.0.S75 both/mpc ALCATEL SAS-M 7210*
    Time of last boot            : 2010/07/06 11:29:53
    Current alarm state          : alarm cleared
    Base MAC address             : 00:25:ba:01:cc:30
    Last bootup reason           : hardReboot
    Memory capacity              : 1,024 MB
===============================================================================
```

**CPM Output —** The following table describes the output fields for a CPM card.

| Label | Description |
|---|---|
| Slot | The slot of the card in the chassis. |
| Card Provisioned | The SF/CPM type that is configured for the slot. |
| Card Equipped | The SF/CPM type that is actually populated in the slot. |
| Admin State | Up — The SF/CPM is administratively up.<br>Down — The SF/CPM is administratively down. |
| Operational State | Up — The SF/CPM is operationally up.<br>Down — The SF/CPM is operationally down. |
| BOF last modified | The date and time of the most recent BOF modification. |
| Config file version | The configuration file version. |
| Config file last modified | The date and time of the most recent config file modification. |
| Config file last modified | The date and time of the most recent config file modification. |
| Config file last saved | The date and time of the most recent config file save. |
| CPM card status | active — The card is acting as the primary (active) CPM in a redundant system.<br>standby — The card is acting as the standby (secondary) CPM in a redundant system. |
| Administrative state | Up — The CPM is administratively up.<br>Down — The CPM is administratively down. |
| Operational state | Up — The CPM is operationally up.<br>Down — The CPM is operationally down. |
| Serial number | The compact flash part number. Not user modifiable. |
| Firmware revision | The firmware version. Not user modifiable. |
| Model number | The compact flash model number. Not user modifiable. |
| Size | The amount of space available on the compact flash card. |
| Free space | The amount of space remaining on the compact flash card. |

| Label | Description (Continued) |
|---|---|
| Part number | The SF/CPM part number. |
| CLEI code | The code used to identify the router. |
| Serial number | The SF/CPM part number. Not user modifiable. |
| Manufacture date | The chassis manufacture date. Not user modifiable. |
| Manufacturing string | Factory-inputted manufacturing text string. Not user modifiable. |
| Administrative state | Up – The card is administratively up.<br>Down – The card is administratively down. |
| Operational state | Up – The card is operationally up.<br>Down – The card is operationally down. |
| Time of last boot | The date and time the most recent boot occurred. |
| Current alarm state | Displays the alarm conditions for the specific board. |
| Status | Displays the current status. |
| Temperature | Internal chassis temperature. |
| Temperature threshold | The value above which the internal temperature must rise in order to indicate that the temperature is critical. |
| Software boot version | The version of the boot image. |
| Memory capacity | The total amount of memory. |

### Sample Output

```
*A:MTU-A# show card A detail
===============================================================================
Card A
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
A         sfm-24g             sfm-24g             up         up/active


BOF last modified               : N/A
Config file version             : WED JUN 27 11:12:21 2008 UTC
Config file last modified       : 2008/06/27 11:42:06
Config file last saved          : N/A
M/S clocking ref state          : primary
```

```
Flash - cf1:
    Administrative State          : up
    Operational state             : up
    Serial number                 : serial-1
    Firmware revision             : v1.0
    Model number                  : Flash 1
    Size                          : 110,984 KB
    Free space                    : 103,264 KB

Hardware Data
    Part number                   :
    CLEI code                     :
    Serial number                 : MTUSN107210
    Manufacture date              :
    Manufacturing string          :
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : up
    Temperature                   : 40C
    Temperature threshold         : 50C
    Software boot (rom) version   : 7
    Software version              : TiMOS-B-1.1.S29 both/mpc ALCATEL SAS-M 721*
    Time of last boot             : 2008/06/27 11:14:43
    Current alarm state           : alarm cleared
    Base MAC address              : 00:11:00:22:bc:11
    Memory capacity               : 1,024 MB
===============================================================================
*A:MTU-A#
```

**Sample output for 7210 SAS-X:**

```
A:7210-SAS-X> show card A detail

===============================================================================
Card A
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
A         sfm-sas             sfm-sas             up         up/active


BOF last modified                 : N/A
Config file version               : TUE NOV 09 20:28:32 2010 UTC
Config file last modified         : N/A
Config file last saved            : N/A
M/S clocking ref state            : primary

Flash - cf1:
    Administrative State          : up
    Operational state             : up
    Serial number                 : serial-1
    Firmware revision             : v1.0
    Model number                  : Flash 1
    Size                          : 110,984 KB
    Free space                    : 88,548 KB
```

```
Hardware Data
    Part number                  : 3HE05170AAAA0501
    CLEI code                    : IPMNX10GRA
    Serial number                : NS1034F0924
    Manufacture date             : 08312010
    Manufacturing string         :
    Manufacturing deviations     : D01696 D01669
    Administrative state         : up
    Operational state            : up
    Temperature                  : 26C
    Temperature threshold        : 50C
    Software boot (rom) version  : X-0.0.I906 on Tue Nov 9 23:01:33 IST 2010 b*
    Software version             : TiMOS-B-2.0.B1-129 both/hops ALCATEL SAS-X *
    Time of last boot            : 2010/11/10 20:50:25
    Current alarm state          : alarm cleared
    Base MAC address             : 7c:20:64:ad:00:ef
    Memory capacity              : 1,024 MB
===============================================================================
A:7210-SAS-X>
```

## mda

**Syntax** **mda** [*slot* [**/***mda*]] [**detail**]

**Context** show

**Description** This command displays MDA information.

If no command line options are specified, a summary output of all MDAs is displayed in table format.

**Parameters** *slot* — The slot number for which to display MDA information.

*mda* — The MDA number in the slot for which to display MDA information.

**Values** 1 — 2 (for 7210 SAS-M)

**Values** 1 (for 7210 SAS-X)

**detail —** Displays detailed MDA information.

**Output** **MDA Output —** The following table describes MDA output fields.

| Label | Description |
|---|---|
| Slot | The chassis slot number. |
| MDA | The MDA slot number. |
| Provisioned MDA-type | The MDA type provisioned. |
| Equipped MDA-type | The MDA type actually installed. |
| Admin State | Up — Administratively up. |

| Label | Description (Continued) |
|---|---|
| | Down – Administratively down. |
| Ops State | Up – Operationally up. |
| | Down – Operationally down. |

**Sample Output**

```
*A:MTU-A# show mda
===============================================================================
MDA Summary
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     m24-100fx-1gb-sfp     m24-100fx-1gb-sfp     up        up
===============================================================================
*A:MTU-A#
```

**Sample output for 7210 SAS-X:**

```
A:7210-SAS-X> show mda
===============================================================================
MDA Summary
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     m24-1gb+2-10gb        m24-1gb+2-10gb        up        up
===============================================================================
A:7210-SAS-X>


*A:ces-A# show mda
===============================================================================
MDA Summary
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     m24-100fx-1gb-sfp     m24-100fx-1gb-sfp     up        up
      2     m4-ds1-ces            m4-ds1-ces            up        up
===============================================================================
```

**MDA Detailed Output —** The following table describes detailed MDA output fields.

| Label | Description |
|---|---|
| Slot | The chassis slot number. |
| Slot | The MDA slot number. |

| Label | Description (Continued) |
|---|---|
| Provisioned Provisioned-type | The provisioned MDA type. |
| Equipped Mda-type | The MDA type that is physically inserted into this slot in this chassis. |
| Admin State | Up – The MDA is administratively up. |
| | Down – The MDA is administratively down. |
| Operational State | Up – The MDA is operationally up. |
| | Down – The MDA is operationally down. |
| Maximum port count | The maximum number of ports that can be equipped on the MDA card. |
| Number of ports equipped | The number of ports that are actually equipped on the MDA. |
| Transmit timing selected | Indicates the source for the timing used by the MDA. |
| Sync interface timing status | Indicates whether the MDA has qualified one of the timing signals from the CPMs. |
| Transmit timing selected | The transmit timing method which is presently selected and being used by this MDA. |
| Sync Interface timing status | Indicates the status of the synchronous equipment timing subsystem. |
| Network Ingress Queue Policy | Specifies the network queue policy applied to the MDA to define the queueing structure for this object. |
| Capabilities | Specifies the minimum size of the port that can exist on the MDA. |
| Part number | The hardware part number. |
| CLEI code | The code used to identify the MDA. |
| Serial number | The MDA part number. Not user modifiable. |
| Manufacture date | The MDA manufacture date. Not user modifiable. |
| Manufacturing string | Factory-inputted manufacturing text string. Not user modifiable. |
| Administrative state | Up – The MDA is administratively up. |
| | Down – The MDA is administratively down. |

| Label | Description (Continued) |
|---|---|
| Operational state | Up — The MDA is operationally up. |
| | Down — The MDA is operationally down. |
| Time of last boot | The date and time the most recent boot occurred. |
| Current alarm state | Displays the alarm conditions for the specific MDA. |
| Base MAC address | The base chassis Ethernet MAC address. Special purpose MAC addresses used by the system software are constructed as offsets from this base address. |

### Sample Output

```
*A:MTU-A# show mda 1/1 detail
===============================================================================
MDA 1/1 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     m24-100fx-1gb-sfp     m24-100fx-1gb-sfp     up        up


MDA Specific Data
    Maximum port count            : 24
    Number of ports equipped      : 24
    Network ingress queue policy  : default
    Capabilities                  : Ethernet

Hardware Data
    Part number                   :
    CLEI code                     :
    Serial number                 : MTUSN107210
    Manufacture date              :
    Manufacturing string          :
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : up
    Temperature                   : 40C
    Temperature threshold         : 50C
    Time of last boot             : 2001/06/27 11:15:10
    Current alarm state           : alarm cleared
    Base MAC address              : 00:11:00:22:bc:13
===============================================================================
*A:MTU-A#
```

### Sample output for 7210 SAS-X:

```
A:7210-SAS-X> show mda 1/1 detail
===============================================================================
MDA 1/1 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     m24-1gb+2-10gb        m24-1gb+2-10gb        up        up


MDA Specific Data
    Maximum port count            : 26
    Number of ports equipped      : 26
    Network ingress queue policy  : default
    Capabilities                  : Ethernet

Hardware Data
    Part number                   : 3HE05170AAAA0501
```

```
    CLEI code                    : IPMNX10GRA
    Serial number                : NS1034F0924
    Manufacture date             : 08312010
    Manufacturing string         :
    Manufacturing deviations     : D01696 D01669
    Administrative state         : up
    Operational state            : up
    Temperature                  : 26C
    Temperature threshold        : 50C
    Software version             : N/A
    Time of last boot            : 2010/11/10 20:51:23
    Current alarm state          : alarm cleared
    Base MAC address             : 7c:20:64:ad:00:f1

-------------------------------------------------------------------------------
QOS Settings
-------------------------------------------------------------------------------
Ing. Named Pool Policy           : None
Egr. Named Pool Policy           : None
===============================================================================
A:7210-SAS-X>


*A:ces-A# show mda detail
===============================================================================
MDA 1/1 detail
===============================================================================
Slot  Mda   Provisioned          Equipped             Admin     Operational
            Mda-type             Mda-type             State     State
-------------------------------------------------------------------------------
1     1     m24-100fx-1gb-sfp    m24-100fx-1gb-sfp    up        up


MDA Specific Data
    Maximum port count           : 24
    Number of ports equipped     : 24
    Network ingress queue policy : default
    Capabilities                 : Ethernet

Hardware Data
    Part number                  : 3HE05029AA
    CLEI code                    : IPMK410JRA
    Serial number                : NS0950C1606
    Manufacture date             : 12202009
    Manufacturing string         :
    Manufacturing deviations     :
    Administrative state         : up
    Operational state            : up
    Temperature                  : 36C
    Temperature threshold        : 50C
    Software version             : N/A
    Time of last boot            : 2010/07/06 11:30:00
    Current alarm state          : alarm cleared
    Base MAC address             : 00:25:ba:01:cc:32
-------------------------------------------------------------------------------
QOS Settings
-------------------------------------------------------------------------------
Ing. Named Pool Policy           : None
Egr. Named Pool Policy           : None
```

```
===============================================================================
MDA 1/2 detail
===============================================================================
Slot  Mda   Provisioned           Equipped             Admin     Operational
            Mda-type             Mda-type             State     State
-------------------------------------------------------------------------------
      2     m4-ds1-ces           m4-ds1-ces           up        up


MDA Specific Data
    Maximum port count            : 4
    Number of ports equipped      : 4
    Network ingress queue policy  : default
    Capabilities                  : TDM, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : PDH DS1
    Max number of channels        : 4
    Channels in use               : 4

CEM MDA Specific Data
    Clock Mode                    : adaptive

Hardware Data
    Part number                   : 3HE05561AA
    CLEI code                     :
    Serial number                 : NS102110177
    Manufacture date              : 06022010
    Manufacturing string          :
    Manufacturing deviations      :  82-0234-02 rev 1
    Administrative state          : up
    Operational state             : up
    Temperature                   : 41C
    Temperature threshold         : 50C
    Software version              : N/A
    Time of last boot             : 2010/07/06 11:31:37
    Current alarm state           : alarm cleared
    Base MAC address              : 00:03:fa:1d:7d:d2
-------------------------------------------------------------------------------
QOS Settings
-------------------------------------------------------------------------------
Ing. Named Pool Policy            : None
Egr. Named Pool Policy            : None
===============================================================================
```

## pools

**Syntax** **pools** *mda-id* [*/port*] [<**access-app**> [<*pool-name*>]]
**pools** *mda-id* [*/port*] [<**network-app**> [*[pool-name*]]

**Context** show

**Description** This command displays pool information.

**Parameters** *mda-id*[/*port*] — Displays the pool information of the specified MDA.

**access-app** *pool-name* — Displays the pool information of the specified QoS policy.

**Values** access-ingress, access-egress

**network-app** *pool-name* **—** Displays the pool information of the specified QoS policy.

**Values** network-egress

**Output** **Show Pool Output —** The following table describes show pool output fields.

| Label | Description |
|---|---|
| Type | Specifies the pool type. |
| ID | Specifies the card/mda or card/MDA/port designation. |
| Application/Type | Specifies the nature of usage the pool would be used for. The pools could be used for access or network traffic at either ingress or egress. |
| Pool Name | Specifies the name of the pool being used. |
| Resv CBS | Specifies the percentage of pool size reserved for CBS. |
| Utilization | Specifies the type of the slope policy. |
| State | The administrative status of the port. |
| Start-AvgThresh-old | Specifies the percentage of the buffer utilized after which the drop probability starts to rise above 0. |
| Max-Avg | Specifies the percentage of the buffer utilized after which the drop probability is 100 percent. This implies that all packets beyond this point will be dropped. |
| Time Avg Factor | Specifies the time average factor the weighting between the previous shared buffer average utilization result and the new shared buffer utilization in determining the new shared buffer average utilization. |
| Actual ResvCBS | Specifies the actual percentage of pool size reserved for CBS. |
| Admin ResvCBS | Specifies the percentage of pool size reserved for CBS. |
| PoolSize | Specifies the size in percentage of buffer space. The value '-1' implies that the pool size should be computed as per fair weighting between all other pools. |
| Pool Total | Displays the total pool size. |
| Pool Shared | Displays the amount of the pool which is shared. |
| Pool Resv | Specifies the percentage of reserved pool size. |

| Label | Description (Continued) |
|---|---|
| Pool Total In Use | Displays the total amount of the pool which is in use. |
| Pool Shared In Use | Displays the amount of the pool which is shared that is in use. |

```
*A:MTU-A# show pools 1/1/2 access-egress
===============================================================================
Pool Information
===============================================================================
Port                 : 1/1/2
Application          : Acc-Egr           Pool Name          : default
Resv CBS             : Sum
-------------------------------------------------------------------------------
High Slope
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
QueueId        State     Start-Avg(%)   Max-Avg(%)   Max-Prob(%)
-------------------------------------------------------------------------------
Queue1          Down           70           90          75
Queue2          Down           70           90          75
Queue3          Down           70           90          75
Queue4          Down           70           90          75
Queue5          Down           70           90          75
Queue6          Down           70           90          75
Queue7          Down           70           90          75
Queue8          Down           70           90          75
-------------------------------------------------------------------------------
Low Slope
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
QueueId        State     Start-Avg(%)   Max-Avg(%)   Max-Prob(%)
-------------------------------------------------------------------------------
Queue1          Down           50           75          75
Queue2          Down           50           75          75
Queue3          Down           50           75          75
Queue4          Down           50           75          75
Queue5          Down           50           75          75
Queue6          Down           50           75          75
Queue7          Down           50           75          75
Queue8          Down           50           75          75
-------------------------------------------------------------------------------
Non Tcp Slope
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
QueueId        State     Start-Avg(%)   Max-Avg(%)   Max-Prob(%)
-------------------------------------------------------------------------------
Queue1          Down           50           75          75
Queue2          Down           50           75          75
Queue3          Down           50           75          75
Queue4          Down           50           75          75
Queue5          Down           50           75          75
Queue6          Down           50           75          75
Queue7          Down           50           75          75
Queue8          Down           50           75          75
```

```
-------------------------------------------------------------------------------
Time Avg Factor
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Queue Id   Time Avg Factor
-------------------------------------------------------------------------------
Queue1            7
Queue2            7
Queue3            7
Queue4            7
Queue5            7
Queue6            7
Queue7            7
Queue8            7
MMU Pool Total In Use: 0 KB             MMU Pool Shared In*: 0 KB
Pool Total           : 163 KB
Pool Shared          : 89 KB            Pool Resv          : 68 KB
Pool Total In Use    : 0 KB
Pool Shared In Use   : 0 KB             Pool Resv In Use   : 0 KB
-------------------------------------------------------------------------------
FC-Maps                          ID       CBS (B)     Depth  A.CIR     A.PIR
                                                             O.CIR     O.PIR
-------------------------------------------------------------------------------
be                               1/1/2    8698        0      0         1000000
                                                               0         Max
l2                               1/1/2    8698        0      0         1000000
                                                               0         Max
af                               1/1/2    8698        0      0         1000000
                                                               0         Max
l1                               1/1/2    8698        0      0         1000000
                                                               0         Max
h2                               1/1/2    8698        0      0         1000000
                                                               0         Max
ef                               1/1/2    8698        0      0         1000000
                                                               0         Max
h1                               1/1/2    8698        0      0         1000000
                                                               0         Max
nc                               1/1/2    8698        0      0         1000000
                                                               0         Max
===============================================================================
* indicates that the corresponding row element may have been truncated.

*A:MTU-A# show pools 1/1/1 network-egress
===============================================================================
Pool Information
===============================================================================
Port                : 1/1/1 (lag-1)
Application         : Net-Egr          Pool Name          : default
Resv CBS            : Sum
-------------------------------------------------------------------------------
High Slope
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
QueueId        State     Start-Avg(%)   Max-Avg(%)   Max-Prob(%)
-------------------------------------------------------------------------------
Queue1          Down           70           90          75
Queue2          Down           70           90          75
Queue3          Down           70           90          75
Queue4          Down           70           90          75
```

```
Queue5          Down           70           90          75
Queue6          Down           70           90          75
Queue7          Down           70           90          75
Queue8          Down           70           90          75
-------------------------------------------------------------------------------
Low Slope
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
QueueId        State     Start-Avg(%)   Max-Avg(%)   Max-Prob(%)
-------------------------------------------------------------------------------
Queue1          Down           50           75          75
Queue2          Down           50           75          75
Queue3          Down           50           75          75
Queue4          Down           50           75          75
Queue5          Down           50           75          75
Queue6          Down           50           75          75
Queue7          Down           50           75          75
Queue8          Down           50           75          75
-------------------------------------------------------------------------------
Non Tcp Slope
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
QueueId        State     Start-Avg(%)   Max-Avg(%)   Max-Prob(%)
-------------------------------------------------------------------------------
Queue1          Down           50           75          75
Queue2          Down           50           75          75
Queue3          Down           50           75          75
Queue4          Down           50           75          75
Queue5          Down           50           75          75
Queue6          Down           50           75          75
Queue7          Down           50           75          75
Queue8          Down           50           75          75
-------------------------------------------------------------------------------
Time Avg Factor
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Queue Id   Time Avg Factor
-------------------------------------------------------------------------------
Queue1            7
Queue2            7
Queue3            7
Queue4            7
Queue5            7
Queue6            7
Queue7            7
Queue8            7
MMU Pool Total In Use: 0 KB             MMU Pool Shared In*: 0 KB
Pool Total           : 163 KB
Pool Shared          : 89 KB            Pool Resv          : 68 KB
Pool Total In Use    : 0 KB
Pool Shared In Use   : 0 KB             Pool Resv In Use   : 0 KB
-------------------------------------------------------------------------------
FC-Maps                         ID       CBS (B)     Depth  A.CIR     A.PIR
                                                            O.CIR     O.PIR
-------------------------------------------------------------------------------
be                              1/1/1    8698        0      0         1000000
                                                            0         Max
l2                              1/1/1    8698        0      250000    1000000
                                                            250000    Max
```

```
af                              1/1/1    8698        0      250000    1000000
                                                            250000    Max
l1                              1/1/1    8698        0      250000    1000000
                                                            250000    Max
h2                              1/1/1    8698        0      1000000   1000000
                                                            Max       Max
ef                              1/1/1    8698        0      1000000   1000000
                                                            Max       Max
h1                              1/1/1    8698        0      100000    1000000
                                                            100000    Max
nc                              1/1/1    8698        0      100000    1000000
                                                            100000    Max
===============================================================================
* indicates that the corresponding row element may have been truncated.
*A:MTU-A#
```

# Port Show Commands

## port

**Syntax** **port** *port-id*[**detail**]
**port** *port-id* **description**
**port** *port-id* **associations**
**port** *port-id* **ethernet** [**efm-oam** | **detail**]
**port** *port-id* **acr** [**detail**] (not supported on 7210 SAS-X)
**port** *port-id* **dot1x** [**detail**]
**port** *port-id* **vport** [*vport-name*] **associations**
**port** [**A1**] [**detail**] [**statistics**] [**description**]

**Context** show

**Description** This command displays port information.

If no command line options are specified, the command port displays summary information for all ports on provisioned MDAs.

**Parameters** *port-id* — Specifies the physical port ID in the form *slot/mda/port*.

**Syntax** port-id *slot*[/*mda*[/*port*]]

**MDA Values** 1, 2 (for 7210 SAS-M)

**MDA Values** 1 (for 7210 SAS-X)

**Slot Values** 1

**Port Values** 1 — 24 (depending on the MDA type)

**associations —** Displays a list of current router interfaces to which the port is associated.

**description —** Displays port description strings.

**dot1x —** Displays information.about 802.1x status and statistics.

**ethernet —** Displays ethernet port information.

**efm-oam** — Displays EFM OAM information.

**detail** — Displays detailed information about the Ethernet port.

**A1** — Displays the out-of-band Ethernet port information.

**acr —** Displays ACR-capable port information.

**Port Output —** The following tables describe port output fields:


- General Port Output Fields on page 211
- Entering port ranges: on page 229
- Specific Port Output Fields on page 215

- Detailed Port Output Fields on page 221
- Ethernet Output Fields on page 233
- Ethernet-Like Medium Statistics Output Fields on page 250
- Port Associations Output Fields on page 253


| Label | Description |
|---|---|
| Port ID | The port ID configured or displayed in the *slot/mda/port* format. |
| Admin State | Up — The administrative state is up. |
| | Down — The administrative state is down. |
| Phy Link | Yes — A physical link is present. |
| | No — A physical link is not present. |
| Port State | Up — The port is physically present and has physical link present. |
| | Down — The port is physically present but does not have a link. |
| | Ghost — A port that is not physically present. |
| | None — The port is in its initial creation state or about to be deleted. |
| | Link Up — A port that is physically present and has physical link present. |
| | Link Down — A port that is physically present but does not have a link. |
| Cfg MTU | The configured MTU. |
| Oper MTU | The negotiated size of the largest packet which can be sent on the port specified in octets. |
| LAG ID | The LAG or multi-link trunk (MLT) that the port is assigned to. |
| Port Mode | network — The port is configured for transport network use. |
| | access — The port is configured for service access. |
| Port Encap | Null — Ingress frames will not use tags or labels to delineate a service. |
| | dot1q — Ingress frames carry 802.1Q tags where each tag signifies a different service. |
| | QinQ — Encapsulation type specified for QinQ Access SAPs. |
| Port Type | The type of port or optics installed. |
| SFP/MDI MDX | GIGE — Indicates the GigE SFP type. |

| Label | Description (Continued) |
|---|---|
| | FASTE – Indicates the FastE SFP type.<br><br>MDI – Indicates that the Ethernet interface is of type MDI (Media Dependent Interface).<br><br>MDX – Indicates that the Ethernet interface is of type MDX (Media Dependent Interface with crossovers). |
| IP MTU | Displays the configured IP MTU value. |

### Sample Output

```
*A:ALU-211# show port 1/1/2
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100 Ethernet TX
Interface          : 1/1/2                     Oper Speed       : 100 mbps
Link-level         : Ethernet                  Config Speed     : 100 mbps
Admin State        : up                        Oper Duplex      : full
Oper State         : up - Active in LAG 10     Config Duplex    : full
Physical Link      : Yes                       MTU              : 1514
Single Fiber Mode  : No                                         : Internal
IfIndex            : 35717120                  Hold time up     : 0 seconds
Last State Change  : 12/16/2008 19:31:40       Hold time down   : 0 seconds
Last Cleared Time  : 12/16/2008 19:31:48
IP MTU             : 1000
===============================================================================
*A:ALU-211#


*A:ALU-211# show port 1/1/2
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100 Ethernet TX
Interface          : 1/1/2                     Oper Speed       : 100 mbps
Link-level         : Ethernet                  Config Speed     : 100 mbps
Admin State        : up                        Oper Duplex      : full
Oper State         : down - Standby in LAG 10  Config Duplex    : full
Physical Link      : Yes                       MTU              : 1514
Single Fiber Mode  : No                                         : None
IfIndex            : 35717120                  Hold time up     : 0 seconds
Last State Change  : 12/16/2008 18:28:52       Hold time down   : 0 seconds
Last Cleared Time  : 12/16/2008 18:28:51
IP MTU             : 1000
===============================================================================
*A:ALU-211#

*A:7210SAS>show# port

===============================================================================
Ports on Slot 1
===============================================================================
```

```
Port        Admin Link Port    Cfg  Oper LAG/ Port Port Port   SFP/XFP/
Id          State      State   MTU  MTU  Bndl Mode Encp Type   MDIMDX
-------------------------------------------------------------------------------
1/1/1       Down  No   Down    9212 9212    - netw null xcme
1/1/2       Down  No   Down    9212 9212    - netw null xcme   GIGE-SX
1/1/3       Down  No   Down    9212 9212    - netw null xcme
1/1/4       Down  No   Down    9212 9212    - netw null xcme
1/1/5       Down  No   Down    9212 9212    - netw null xcme   GIGE-T
1/1/6       Down  No   Down    9212 9212    - netw null xcme
1/1/7       Down  No   Down    9212 9212    - netw null xcme
1/1/8       Down  No   Down    9212 9212    - netw null xcme
1/1/9       Up    Yes  Up      1522 1522    - accs qinq xcme   MDI GIGE-T
1/1/10      Down  No   Down    9212 9212    - netw null xcme
1/1/11      Down  No   Down    9212 9212    - netw null xcme
1/1/12      Up    Yes  Up      9212 9212    - accs null xcme   MDI GIGE-SX
1/1/13      Down  No   Down    9212 9212    - netw null xcme
1/1/14      Down  No   Down    9212 9212    - netw null xcme
1/1/15      Down  No   Down    9212 9212    - netw null xcme
1/1/16      Down  No   Down    9212 9212    - netw null xcme
1/1/17      Down  No   Down    9212 9212    - netw null xcme   GIGE-SX
1/1/18      Down  No   Down    9212 9212    - netw null xcme   GIGE-LX  10KM
1/1/19      Up    Yes  Up      9212 9212    - accs null xcme   None(loopback)
1/1/20      Down  No   Down    9212 9212    - netw null xcme
1/1/21      Down  No   Down    9212 9212    - netw null xcme
1/1/22      Down  No   Down    9212 9212    - netw null xcme
1/1/23      Down  No   Down    9212 9212    - netw null xcme   GIGE-LX  10KM
1/1/24      Down  No   Down    9212 9212    - netw null xcme
1/1/25      Down  No   Down    9212 9212    - netw null xgige
1/1/26      Down  No   Down    9212 9212    - netw null xgige

===============================================================================
Ports on Slot A
===============================================================================
Port        Admin Link Port    Cfg  Oper LAG/ Port Port Port   SFP/XFP/
Id          State      State   MTU  MTU  Bndl Mode Encp Type   MDIMDX
-------------------------------------------------------------------------------
A/1         Up    Yes  Up      1514 1514    - netw null faste  MDI
===============================================================================
*A:7210SAS>show#
```

**Sample Output for SAS-X**

```
*A:7210SAS>show# port 1/1/2

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/2                       Oper Speed       : N/A
Link-level         : Ethernet                    Config Speed     : 1 Gbps
Admin State        : down                        Oper Duplex      : N/A
Oper State         : down                        Config Duplex    : full
Physical Link      : No                          MTU              : 9212
Single Fiber Mode  : No                          LoopBack Mode    : None
IfIndex            : 35717120                    Hold time up     : 0 seconds
Last State Change  : 03/03/2012 15:10:30         Hold time down   : 0 seconds
Last Cleared Time  : N/A                         DDM Events       : Enabled

Configured Mode    : network                     Encap Type       : null
Dot1Q Ethertype    : 0x8100                      QinQ Ethertype   : 0x8100
```

```
PBB Ethertype      : 0x88e7                     Acc Egr Sch Mode : N/A
Ing. Pool % Rate   : 100                        Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                    Network Qos Pol  : 1
Egr. Remark        : False                      Egr. Remark Plcy : N/A

Acc Egr Marking    : N/A                        Acc Egr Policy ID: N/A

Auto-negotiate     : true                       MDI/MDX          : unknown
Accounting Policy  : None                       Collect-stats    : Disabled
Egress Rate        : Default                    Max Burst        : Default
LACP Tunnel        : Disabled

Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                   Keep-alive       : 10
Loop Detected      : False                      Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                   Rx Quality Level : N/A
Code-Type          : SDH                        Tx Quality Level : N/A
Tx DUS/DNU         : Disabled

Configured Address : 7c:20:64:ad:00:f2
Hardware Address   : 7c:20:64:ad:00:f2
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 00000000000000000000000000000000
TX Laser Wavelength: 0 nm                       Diag Capable     : no
Connector Code     : LC                         Vendor OUI       : 00:30:d3
Manufacture date   : 2006/01/13                 Media            : Ethernet
Serial Number      : AM060202TW
Part Number        : HFBR-5710L
Optical Compliance : GIGE-SX
Link Length support: 550m for 50u MMF; 270m for 62.5u MMF

===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                                 0                    0
Packets                                                0                    0
Errors                                                 0                    0
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Unicast Packets                                        0                    0
Multicast Packets                                      0                    0
Broadcast Packets                                      0                    0
Discards                                               0                    0
```

```
Unknown Proto Discards                              0
===============================================================================

===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                  0  Sngl Collisions  :                   0
FCS Errors       :                  0  Mult Collisions  :                   0
SQE Test Errors  :                  0  Late Collisions  :                   0
CSE              :                  0  Excess Collisns  :                   0
Too long Frames  :                  0  Int MAC Tx Errs  :                   0
Symbol Errors    :                  0  Int MAC Rx Errs  :                   0
===============================================================================
*A:7210SAS>show#
```

**Specific Port Output —** The following table describes port output fields for a specific port.

| Label | Description |
|---|---|
| Description | A text description of the port. |
| Interface | The port ID displayed in the *slot/mda/port* format. |
| Speed | The speed of the interface. |
| Link-level | Ethernet — The port is configured as Ethernet. |
| MTU | The size of the largest packet which can be sent/received on the Ethernet physical interface, specified in octets. |
| LoopBack Mode | Indicates if the port is in use by loopback mac-swap application. If 'None' is displayed the port is not enabled for loopback testing. If 'Internal' is displayed, the port is in use by port loopback mac-swap application and no services can be configured on this port. |
| Admin State | Up — The port is administratively up.<br>Down — The port is administratively down. |
| Oper State | Up — The port is operationally up.<br>Down — The port is operationally down.<br>Additionally, the *lag-id* of the LAG it belongs to in addition to the status of the LAG member (active or standby) is specified. |
| Duplex | Full — The link is set to full duplex mode.<br>Half — The link is set to half duplex mode. |
| Hold time up | The link up dampening time in seconds. The port link dampening timer value which reduces the number of link transitions reported to upper layer protocols. |

| Label | Description (Continued) |
|---|---|
| Hold time down | The link down dampening time in seconds. The **down** timer controls the dampening timer for link down transitions. |
| Physical Link | Yes – A physical link is present. |
| | No – A physical link is not present. |
| IfIndex | Displays the interface's index number which reflects its initialization sequence. |
| Last State chg | Displays the system time moment that the peer is up. |
| Configured Mode | network – The port is configured for transport network use. |
| | access – The port is configured for service access. |
| Dot1Q Ethertype | Indicates the Ethertype expected when the port's encapsulation type is Dot1Q. |
| QinQ Ethertype | Indicates the Ethertype expected when the port's encapsulation type is QinQ. |
| Net. Egr. Queue Pol | Specifies the network egress queue policy or that the default policy is used. |
| Access Egr. Qos | Specifies the access egress policy or that the default policy 1 is in use |
| Egr. Sched. Pol | Specifies the port scheduler policy or that the default policy default is in use |
| Encap Type | Null – Ingress frames will not use any tags or labels to delineate a service. |
| | dot1q – Ingress frames carry 802.1Q tags where each tag signifies a different service. |
| | QinQ – Encapsulation type specified for QinQ Access SAPs. |
| Active Alarms | The number of alarms outstanding on this port. |
| Auto-negotiate | True – The link attempts to automatically negotiate the link speed and duplex parameters. |
| | False – The duplex and speed values are used for the link. |
| Alarm State | The current alarm state of the port. |
| Collect Stats | Enabled – The collection of accounting and statistical data for the network Ethernet port is enabled. When applying accounting policies the data by default will be collected in the appropriate records and written to the designated billing file. |

| Label | Description (Continued) |
|---|---|
| | `Disabled` — Collection is disabled. Statistics are still accumulated by the IOM cards, however, the CPU will not obtain the results and write them to the billing file. |
| `OTU` | OTU encapsulation status. |
| `Configured Address` | The base chassis Ethernet MAC address. |
| `Hardware Address` | The interface's hardware or system assigned MAC address at its protocol sub-layer. |
| `Transceiver Type` | Type of the transceiver. |
| `Model Number` | The model number of the transceiver. |
| `Transceiver Code` | The code for the transmission media. |
| `Laser Wavelength` | The light wavelength transmitted by the transceiver's laser. |
| `Connector Code` | The vendor organizationally unique identifier field (OUI) contains the IEEE company identifier for the vendor. |
| `Diag Capable` | Indicates if the transceiver is capable of doing diagnostics. |
| `Vendor OUI` | The vendor-specific identifier field (OUI) contains the IEEE company identifier for the vendor. |
| `Manufacture date` | The manufacturing date of the hardware component in the mmddyyyy ASCII format. |
| `Media` | The media supported for the SFP. |
| `Serial Number` | The vendor serial number of the hardware component. |
| `Part Number` | The vendor part number contains ASCII characters, defining the vendor part number or product name. |
| `Input/Output` | When the collection of accounting and statistical data is enabled, then octet, packet, and error statistics are displayed. |
| `Description` | A text description of the port. |
| `Interface` | The port ID displayed in the *slot/mda/port* format. |
| `Speed` | The speed of the interface |
| `Link-level` | `Ethernet` — The port is configured as Ethernet. |
| | `SONET` — The port is configured as SONET-SDH |
| `MTU` | The size of the largest packet which can be sent/received on the Ethernet physical interface, specified in octets. |

| Label | Description (Continued) |
|---|---|
| Admin State | Up — The port is administratively up. |
| | Down — The port is administratively down. |
| Oper State | Up — The port is operationally up. |
| | Down — The port is operationally down. |
| Duplex | Full — The link is set to full duplex mode. |
| | Half — The link is set to half duplex mode. |
| Hold time up | The link up dampening time in seconds. The port link dampening timer value which reduces the number of link transitions reported to upper layer protocols. |
| Hold time down | The link down dampening time in seconds. The **down** timer controls the dampening timer for link down transitions. |
| IfIndex | Displays the interface's index number which reflects its initialization sequence. |
| Phy Link | Yes — A physical link is present. |
| | No — A physical link is not present. |
| Configured Mode | network — The port is configured for transport network use. |
| | access — The port is configured for service access. |
| Network Qos Pol | The network QoS policy ID applied to the port. |
| Encap Type | Null — Ingress frames will not use any tags or labels to delineate a service. |
| | dot1q — Ingress frames carry 802.1Q tags where each tag signifies a different service. |
| | QinQ — Encapsulation type specified for QinQ Access SAPs. |
| Active Alarms | The number of alarms outstanding on this port. |
| Auto-negotiate | True — The link attempts to automatically negotiate the link speed and duplex parameters. |
| | False — The duplex and speed values are used for the link. |
| Alarm State | The current alarm state of the port. |
| Collect Stats | Enabled — The collection of accounting and statistical data for the network Ethernet port is enabled. When applying accounting policies the data by default will be collected in the appropriate records and written to the designated billing file. |

| Label | Description (Continued) |
|---|---|
| | `Disabled` — Collection is disabled. Statistics are still accumulated by the IOM cards, however, the CPU will not obtain the results and write them to the billing file. |
| `Down-When-Looped` | Shows whether the feature is enabled or disabled. |
| `Egress Buf (Acc)` | The access-buffer policy for the egress buffer. |
| `Egress Buf (Net)` | The network-buffer policy for the egress buffer. |
| `Ingress Buf (Acc)` | The access-buffer policy for the ingress buffer. |
| `Ingress Pool Size` | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering. |
| `Configured Address` | The base chassis Ethernet MAC address. |
| `Hardware Address` | The interface's hardware or system assigned MAC address at its protocol sub-layer. |
| `Errors Input/ Output` | For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.<br>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors. |
| `Unicast Packets Input/Output` | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent. |
| `Multicast Packets Input/Output` | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were addressed to a multicast address at this sub-layer. For a MAC layer protocol, this includes both group and functional addresses. The total number of packets that higher-level protocols requested be transmitted, and which were addressed to a multicast address at this sub-layer, including those that were discarded or not sent. For a MAC layer protocol, this includes both Group and Functional addresses. |

| Label | Description (Continued) |
|---|---|
| Broadcast Packets Input/Output | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were addressed to a broadcast address at this sub-layer.<br>The total number of packets that higher-level protocols requested be transmitted, and which were addressed to a multicast address at this sub-layer, including those that were discarded or not sent.<br>For a MAC layer protocol, this includes both Group and Functional addresses. |
| Discards Input/ Output | The number of inbound packets chosen to be discarded to possibly free up buffer space. |
| Unknown Proto Discards Input/ Output | For packet-oriented interfaces, the number of packets received through the interface which were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing the number of transmission units received via the interface which were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |
| Errors | This field displays the number of cells discarded due to uncorrectable HEC errors. Errors do not show up in the raw cell counts. |
| Sync. Status Msg | Whether synchronization status messages are enabled or disabled. |
| Tx DUS/DNU | Whether the QL value is forcibly set to QL-DUS/QL-DNU. |
| Rx Quality Level | Indicates which QL value has been received from the interface. |
| Tx Quality Level | Indicates which QL value is being transmitted out of the interface. |
| SSM Code Type | Indicates the SSM code type in use on the port. |

**Detailed Port Output —** The following table describes detailed port output fields.

| Label | Description |
|---|---|
| Description | A text description of the port. |
| Interface | The port ID displayed in the *slot/mda/port* format. |
| Speed | The speed of the interface. |
| Link-level | Ethernet — The port is configured as Ethernet. |
| MTU | The size of the largest packet which can be sent/received on the Ethernet physical interface, specified in octets. |
| Admin State | Up — The port is administratively up. |
| | Down — The port is administratively down. |
| Oper State | Up — The port is operationally up. |
| | Down — The port is operationally down. |
| Duplex | Full — The link is set to full duplex mode. |
| | Half — The link is set to half duplex mode. |
| Hold time up | The link up dampening time in seconds. The port link dampening timer value which reduces the number of link transitions reported to upper layer protocols. |
| Hold time down | The link down dampening time in seconds. The **down** timer controls the dampening timer for link down transitions. |
| IfIndex | Displays the interface's index number which reflects its initialization sequence. |
| Phy Link | Yes — A physical link is present. |
| | No — A physical link is not present. |
| Configured Mode | network — The port is configured for transport network use. |
| | access — The port is configured for service access. |
| Network Qos Pol | The QoS policy ID applied to the port. |
| Access Egr. Qos | Specifies the access egress policy or that the default policy 1 is in use. |
| Egr. Sched. Pol | Specifies the port scheduler policy or that the default policy default is in use. |
| Encap Type | Null — Ingress frames will not use any tags or labels to delineate a service. |

| Label | Description (Continued) |
|---|---|
| | `dot1q` — Ingress frames carry 802.1Q tags where each tag signifies a different service. |
| `Active Alarms` | The number of alarms outstanding on this port. |
| `Auto-negotiate` | `True` — The link attempts to automatically negotiate the link speed and duplex parameters. |
| | `False` — The duplex and speed values are used for the link. |
| `Alarm State` | The current alarm state of the port. |
| `Collect Stats` | `Enabled` — The collection of accounting and statistical data for the network Ethernet port is enabled. When applying accounting policies the data by default will be collected in the appropriate records and written to the designated billing file. |
| | `Disabled` — Collection is disabled. Statistics are still accumulated by the IOM cards, however, the CPU will not obtain the results and write them to the billing file. |
| `Down-When-Looped` | Shows whether the feature is enabled or disabled. |
| `Egress Rate` | The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate. |
| `Egress Buf (Acc)` | The access-buffer policy for the egress buffer. |
| `Egress Buf (Net)` | The network-buffer policy for the egress buffer. |
| `Egress Pool Size` | The amount of egress buffer space, expressed as a percentage of the available buffer space that will be allocated to the port for egress buffering. |
| `Ingress Buf (Acc)` | The access-buffer policy for the ingress buffer. |
| `Ingress Pool Size` | The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port for ingress buffering. |
| `Configured Address` | The base chassis Ethernet MAC address. |
| `Hardware Address` | The interface's hardware or system assigned MAC address at its protocol sub-layer. |

| Label | Description (Continued) |
|---|---|
| Errors Input/ Output | For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.<br>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors. |
| Unicast Packets Input/Output | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent. |
| Multicast Packets Input/Output | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were addressed to a multicast address at this sub-layer. For a MAC layer protocol, this includes both Group and Functional addresses. The total number of packets that higher-level protocols requested be transmitted, and which were addressed to a multicast address at this sub-layer, including those that were discarded or not sent. For a MAC layer protocol, this includes both Group and Functional addresses. |
| Broadcast Packets Input/Output | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were addressed to a broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were addressed to a multicast address at this sub-layer, including those that were discarded or not sent.<br>For a MAC layer protocol, this includes both Group and Functional addresses. |
| Discards Input/ Output | The number of inbound packets chosen to be discarded to possibly free up buffer space. |
| Unknown Proto Discards Input/ Output | For packet-oriented interfaces, the number of packets received through the interface which were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing the number of transmission units received via the interface which were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |
| LLF Admin State | Displays the Link Loss Forwarding administrative state. |
| LLF Oper State | Displays the Link Loss Forwarding operational state. |

| Label | Description (Continued) |
|---|---|
| Rx S1 Byte | Displays the received S1 byte and its decoded QL value. |
| Tx DUS/DNU | Displays whether the QL value is forcibly set to QL-DUS/QL-DNU. |
| Qinq etype | Displays the ethertype used for qinq packet encapsulation. |
| Reason down | Indicates the reason for an operation state "Down". |
| Acc Egr Sch Mode | Displays the port egress scheduler mode |
| Sync. Status Msg. | Enabled- If SSM is enabled.<br>Disabled-If SSM is disabled. |
| Code-Type | Displays the encoding type of SSM messages as SONET or SDH. |
| Acc Egr Marking | Displays the type of marking enabled on the access egress policy. (supported only on SAS-X) |
| Acc Egr Policy ID | Displays the policy ID of the access egress policy associated with the port. (supported only on SAS-X) |

### Sample Output

```
*A:MTU-A# show port 1/1/1
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/1                       Oper Speed       : 1 Gbps
Link-level         : Ethernet                    Config Speed     : 1 Gbps
Admin State        : up                          Oper Duplex      : full
Oper State         : up                          Config Duplex    : full
Physical Link      : Yes                         MTU              : 1578
Single Fiber Mode  : No                                           : Internal
IfIndex            : 35684352                    Hold time up     : 0 seconds
Last State Change  : 06/27/2001 11:15:22         Hold time down   : 0 seconds
Last Cleared Time  : 06/27/2001 11:14:44

Configured Mode    : network                     Encap Type       : 802.1q
Dot1Q Ethertype    : 0x8100                      QinQ Ethertype   : 0x8100
Net. Egr. Queue Pol: default                     Acc Egr Sch Mode : Fc-Based
Egr. Sched. Pol    : default                     Access Egr. Qos *: n/a
Auto-negotiate     : limited                     Network Qos Pol  : n/a
Accounting Policy  : None                        MDI/MDX          : MDI
                                                 Collect-stats    : Disabled

Down-when-looped   : Disabled                    Keep-alive       : 10
Loop Detected      : False                       Retry            : 120
Configured Address : 00:11:00:22:bc:13
Hardware Address   : 00:11:00:22:bc:13
Cfg Alarm          :
Alarm Status       :

Transceiver Data
```

```
Transceiver Type   : SFP
Model Number       : 3HE00027AAAA02  ALA  IPUIAELDAB2
TX Laser Wavelength: 850 nm                    Diag Capable     : yes
Connector Code     : LC                        Vendor OUI       : 00:90:65
Manufacture date   : 2008/09/29                Media            : Ethernet
Serial Number      : PEC5184
Part Number        : FTRJ8519P2BNL-A5
Optical Compliance : GIGE-SX
Link Length support: 300m for 50u MMF; 150m for 62.5u MMF;
===============================================================================
Traffic Statistics
===============================================================================
                                                  Input                Output
-------------------------------------------------------------------------------
Octets                                          1556859               1766709
Packets                                           18523                  5849
Errors                                                0                     0
===============================================================================
* indicates that the corresponding row element may have been truncated.
===============================================================================
Port Statistics
===============================================================================
                                                  Input                Output
-------------------------------------------------------------------------------
Unicast Packets                                    3324                  5847
Multicast Packets                                 15199                     0
Broadcast Packets                                     0                     2
Discards                                              0                     0
Unknown Proto Discards                                0
===============================================================================
Ethernet-like Medium Statistics
===============================================================================
Alignment Errors :                   0  Sngl Collisions  :                   0
FCS Errors       :                   0  Mult Collisions  :                   0
SQE Test Errors  :                   0  Late Collisions  :                   0
CSE              :                   0  Excess Collisns  :                   0
Too long Frames  :                   0  Int MAC Tx Errs  :                   0
Symbol Errors    :                   0  Int MAC Rx Errs  :                   0
===============================================================================
*A:MTU-A#


*A:7210>config>port# /show port 1/1/1
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/1                     Oper Speed       : 100 mbps
Link-level         : Ethernet                  Config Speed     : 1 Gbps
Admin State        : up                        Oper Duplex      : full
Oper State         : up                        Config Duplex    : full
Physical Link      : Yes                       MTU              : 9212
Single Fiber Mode  : No                                         : None
IfIndex            : 35684352                  Hold time up     : 0 seconds
Last State Change  : 05/31/2010 11:54:16       Hold time down   : 0 seconds
Last Cleared Time  : N/A                       DDM Events       : Enabled

Configured Mode    : access                    Encap Type       : null
```

```
Dot1Q Ethertype    : 0x8100                    QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                       Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                   Access Egr. Qos *: 1
Egr. Sched. Pol    : default                   Network Qos Pol  : n/a
Auto-negotiate     : true                      MDI/MDX          : MDI
Accounting Policy  : None                      Collect-stats    : Disabled
Egress Rate        : Default                   Max Burst        : Default
LACP Tunnel        : Enabled

Uplink             : No
Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                  Keep-alive       : 10
Loop Detected      : False                     Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                  Rx Quality Level : N/A

Configured Address : 00:25:ba:01:b7:f2
Hardware Address   : 00:25:ba:01:b7:f2
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00062AAAA01  ALA  IPUIAEHDAA
TX Laser Wavelength: 0 nm                      Diag Capable     : no
Connector Code     : Unknown                   Vendor OUI       : 00:90:65
Manufacture date   : 2008/09/11                Media            : Ethernet
Serial Number      : PEB2WPD
Part Number        : FCMJ-8521-3-A5
Optical Compliance : GIGE-T
Link Length support: 100m for copper
===============================================================================
Traffic Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Octets                                            72974                  20243
Packets                                             482                     10
Errors                                                0                      0
===============================================================================
* indicates that the corresponding row element may have been truncated.
===============================================================================
Port Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                     9                       6
Multicast Packets                                 469                       2
Broadcast Packets                                   4                       2
Discards                                            0                       0
Unknown Proto Discards                              0
===============================================================================
===============================================================================
Ethernet-like Medium Statistics
```

```
===============================================================================
Alignment Errors :                  0  Sngl Collisions  :                   0
FCS Errors       :                  0  Mult Collisions  :                   0
SQE Test Errors  :                  0  Late Collisions  :                   0
CSE              :                  0  Excess Collisns  :                   0
Too long Frames  :                  0  Int MAC Tx Errs  :                   0
Symbol Errors    :                  0  Int MAC Rx Errs  :                   0
===============================================================================
*A:SAS-M>config>port#

*A:SAS-M>config>port# /show port 1/1/1 detail
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/1                       Oper Speed       : 100 mbps
Link-level         : Ethernet                    Config Speed     : 1 Gbps
Admin State        : up                          Oper Duplex      : full
Oper State         : up                          Config Duplex    : full
Physical Link      : Yes                         MTU              : 9212
Single Fiber Mode  : No                                           : Internal
IfIndex            : 35684352                    Hold time up     : 0 seconds
Last State Change  : 05/31/2010 11:54:16         Hold time down   : 0 seconds
Last Cleared Time  : N/A                         DDM Events       : Enabled

Configured Mode    : access                      Encap Type       : null
Dot1Q Ethertype    : 0x8100                      QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                         Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                     Access Egr. Qos *: 1
Egr. Sched. Pol    : default                     Network Qos Pol  : n/a
Auto-negotiate     : true                        MDI/MDX          : MDI
Accounting Policy  : None                        Collect-stats    : Disabled
Egress Rate        : Default                     Max Burst        : Default
LACP Tunnel        : Enabled

Uplink             : No
Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                    Keep-alive       : 10
Loop Detected      : False                       Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                    Rx Quality Level : N/A

Configured Address : 00:25:ba:01:b7:f2
Hardware Address   : 00:25:ba:01:b7:f2
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00062AAAA01  ALA  IPUIAEHDAA
TX Laser Wavelength: 0 nm                        Diag Capable     : no
Connector Code     : Unknown                     Vendor OUI       : 00:90:65
Manufacture date   : 2008/09/11                  Media            : Ethernet
Serial Number      : PEB2WPD
```

```
Part Number        : FCMJ-8521-3-A5
Optical Compliance : GIGE-T
Link Length support: 100m for copper
===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                              72974                20243
Packets                                               482                   10
Errors                                                  0                    0
===============================================================================
Ethernet Statistics
===============================================================================
Broadcast Pckts  :                  6  Drop Events      :                    0
Multicast Pckts  :                471  CRC/Align Errors :                    0
Undersize Pckts  :                  0  Fragments        :                    0
Oversize Pckts   :                  0  Jabbers          :                    0
Collisions       :                  0

Octets                          :              93217
Packets                         :                492
Packets of 64 Octets            :                  0
Packets of 65 to 127 Octets     :                  2
Packets of 128 to 255 Octets    :                567
Packets of 256 to 511 Octets    :                  2
Packets of 512 to 1023 Octets   :                 16
Packets of 1024 to 1518 Octets  :                  7
Packets of 1519 or more Octets  :                  0
===============================================================================
* indicates that the corresponding row element may have been truncated.
===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Unicast Packets                                       9                    6
Multicast Packets                                   469                    2
Broadcast Packets                                     4                    2
Discards                                              0                    0
Unknown Proto Discards                                0
===============================================================================
===============================================================================
Ethernet-like Medium Statistics
===============================================================================
Alignment Errors :                  0  Sngl Collisions  :                    0
FCS Errors       :                  0  Mult Collisions  :                    0
SQE Test Errors  :                  0  Late Collisions  :                    0
CSE              :                  0  Excess Collisns  :                    0
Too long Frames  :                  0  Int MAC Tx Errs  :                    0
Symbol Errors    :                  0  Int MAC Rx Errs  :                    0
===============================================================================
===============================================================================
Queue Statistics
===============================================================================

-------------------------------------------------------------------------------
                        Packets                 Octets
-------------------------------------------------------------------------------
```

```
Egress Queue  1 (be)
Fwd Stats            :          112                    20243
Drop Stats           :          0                      0
Egress Queue  2 (l2)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  3 (af)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  4 (l1)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  5 (h2)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  6 (ef)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  7 (h1)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  8 (nc)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
===============================================================================
*A:7210>config>port#


*A:7210>config>port# /show port 1/1/1 detail
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/1                     Oper Speed       : 100 mbps
Link-level         : Ethernet                  Config Speed     : 1 Gbps
Admin State        : up                        Oper Duplex      : full
Oper State         : up                        Config Duplex    : full
Physical Link      : Yes                       MTU              : 9212
Single Fiber Mode  : No                                         : None
IfIndex            : 35684352                  Hold time up     : 0 seconds
Last State Change  : 05/31/2010 11:54:16       Hold time down   : 0 seconds
Last Cleared Time  : N/A                       DDM Events       : Enabled

Configured Mode    : access                    Encap Type       : null
Dot1Q Ethertype    : 0x8100                    QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                       Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                   Access Egr. Qos *: 1
Egr. Sched. Pol    : default                   Network Qos Pol  : n/a
Auto-negotiate     : true                      MDI/MDX          : MDI
Accounting Policy  : None                      Collect-stats    : Disabled
Egress Rate        : Default                   Max Burst        : Default
LACP Tunnel        : Enabled

Uplink             : No
Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                  Keep-alive       : 10
```

```
Loop Detected      : False                      Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                   Rx Quality Level : N/A

Configured Address : 00:25:ba:01:b7:f2
Hardware Address   : 00:25:ba:01:b7:f2
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00062AAAA01  ALA  IPUIAEHDAA
TX Laser Wavelength: 0 nm                       Diag Capable     : no
Connector Code     : Unknown                    Vendor OUI       : 00:90:65
Manufacture date   : 2008/09/11                 Media            : Ethernet
Serial Number      : PEB2WPD
Part Number        : FCMJ-8521-3-A5
Optical Compliance : GIGE-T
Link Length support: 100m for copper
===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                              72974                 20243
Packets                                               482                    10
Errors                                                  0                     0
===============================================================================
Ethernet Statistics
===============================================================================
Broadcast Pckts  :                   6  Drop Events      :                   0
Multicast Pckts  :                 471  CRC/Align Errors :                   0
Undersize Pckts  :                   0  Fragments        :                   0
Oversize Pckts   :                   0  Jabbers          :                   0
Collisions       :                   0

Octets                          :              93217
Packets                         :                492
Packets of 64 Octets            :                  0
Packets of 65 to 127 Octets     :                  2
Packets of 128 to 255 Octets    :                567
Packets of 256 to 511 Octets    :                  2
Packets of 512 to 1023 Octets   :                 16
Packets of 1024 to 1518 Octets  :                  7
Packets of 1519 or more Octets  :                  0
===============================================================================
* indicates that the corresponding row element may have been truncated.
===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Unicast Packets                                       9                     6
Multicast Packets                                   469                     2
Broadcast Packets                                     4                     2
Discards                                              0                     0
Unknown Proto Discards                                0
```

```
===============================================================================
===============================================================================
Ethernet-like Medium Statistics
===============================================================================
Alignment Errors :                  0  Sngl Collisions  :                   0
FCS Errors       :                  0  Mult Collisions  :                   0
SQE Test Errors  :                  0  Late Collisions  :                   0
CSE              :                  0  Excess Collisns  :                   0
Too long Frames  :                  0  Int MAC Tx Errs  :                   0
Symbol Errors    :                  0  Int MAC Rx Errs  :                   0
===============================================================================
===============================================================================
Queue Statistics
===============================================================================

-------------------------------------------------------------------------------
                        Packets                 Octets
-------------------------------------------------------------------------------
Egress Queue  1 (be)
Fwd Stats            :          112                     20243
Drop Stats           :          0                       0
Egress Queue  2 (l2)
Fwd Stats            :          0                       0
Drop Stats           :          0                       0
Egress Queue  3 (af)
Fwd Stats            :          0                       0
Drop Stats           :          0                       0
Egress Queue  4 (l1)
Fwd Stats            :          0                       0
Drop Stats           :          0                       0
Egress Queue  5 (h2)
Fwd Stats            :          0                       0
Drop Stats           :          0                       0
Egress Queue  6 (ef)
Fwd Stats            :          0                       0
Drop Stats           :          0                       0
Egress Queue  7 (h1)
Fwd Stats            :          0                       0
Drop Stats           :          0                       0
Egress Queue  8 (nc)
Fwd Stats            :          0                       0
Drop Stats           :          0                       0
===============================================================================
*A:MTU-A#
*A:MTU-A# show port 1/1/1
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/1                       Oper Speed       : 1 Gbps
Link-level         : Ethernet                    Config Speed     : 1 Gbps
Admin State        : up                          Oper Duplex      : full
Oper State         : up                          Config Duplex    : full
Physical Link      : Yes                         MTU              : 1578
Single Fiber Mode  : No                                           : Internal
IfIndex            : 35684352                    Hold time up     : 0 seconds
Last State Change  : 06/27/2001 11:15:22         Hold time down   : 0 seconds
Last Cleared Time  : 06/27/2001 11:14:44
```

```
Configured Mode    : network                    Encap Type       : 802.1q
Dot1Q Ethertype    : 0x8100                     QinQ Ethertype   : 0x8100
Net. Egr. Queue Pol: default                    Access Egr. Qos *: n/a
Egr. Sched. Pol    : default                    Network Qos Pol  : n/a
Auto-negotiate     : limited                    MDI/MDX          : MDI
Accounting Policy  : None                       Collect-stats    : Disabled

Down-when-looped   : Disabled                   Keep-alive       : 10
Loop Detected      : False                      Retry            : 120

Configured Address : 00:11:00:22:bc:13
Hardware Address   : 00:11:00:22:bc:13
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00027AAAA02  ALA  IPUIAELDAB2
TX Laser Wavelength: 850 nm                     Diag Capable     : yes
Connector Code     : LC                         Vendor OUI       : 00:90:65
Manufacture date   : 2008/09/29                 Media            : Ethernet
Serial Number      : PEC5184
Part Number        : FTRJ8519P2BNL-A5
Optical Compliance : GIGE-SX
Link Length support: 300m for 50u MMF; 150m for 62.5u MMF;
===============================================================================
Traffic Statistics
===============================================================================
                                                 Input                 Output
-------------------------------------------------------------------------------
Octets                                         1556859               1766709
Packets                                          18523                  5849
Errors                                               0                     0
===============================================================================
* indicates that the corresponding row element may have been truncated.
===============================================================================
Port Statistics
===============================================================================
                                                 Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                   3324                  5847
Multicast Packets                                15199                     0
Broadcast Packets                                    0                     2
Discards                                             0                     0
Unknown Proto Discards                               0
===============================================================================
Ethernet-like Medium Statistics
===============================================================================
Alignment Errors :                   0  Sngl Collisions  :                   0
FCS Errors       :                   0  Mult Collisions  :                   0
SQE Test Errors  :                   0  Late Collisions  :                   0
CSE              :                   0  Excess Collisns  :                   0
Too long Frames  :                   0  Int MAC Tx Errs  :                   0
Symbol Errors    :                   0  Int MAC Rx Errs  :                   0
===============================================================================
*A:MTU-A#
```

### Ethernet Output Fields

```
*A:7210-SAS>show# port 1/1/1 detail

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/1                       Oper Speed       : N/A
Link-level         : Ethernet                    Config Speed     : 1 Gbps
Admin State        : down                        Oper Duplex      : N/A
Oper State         : down                        Config Duplex    : full
Physical Link      : No                          MTU              : 9212
Single Fiber Mode  : No                                           : Internal
IfIndex            : 35684352                    Hold time up     : 0 seconds
Last State Change  : 03/03/2011 04:34:26         Hold time down   : 0 seconds
Last Cleared Time  : N/A                         DDM Events       : Enabled

Configured Mode    : network                     Encap Type       : null
Dot1Q Ethertype    : 0x8100                      QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                         Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                     Network Qos Pol  : 1
Egr. Sched. Pol    : default                     Access Egr. Qos *: n/a
Auto-negotiate     : true                        MDI/MDX          : unknown
Accounting Policy  : None                        Collect-stats    : Disabled
Egress Rate        : Default                     Max Burst        : Default
LACP Tunnel        : Disabled

Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                    Keep-alive       : 10
Loop Detected      : False                       Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                    Rx Quality Level : N/A
Code-Type          : SDH                         Tx Quality Level : N/A
Tx DUS/DNU         : Disabled

Configured Address : 00:25:ba:02:bd:62
Hardware Address   : 00:25:ba:02:bd:62
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00062AAAA01  ALA  IPUIAEHDAA
TX Laser Wavelength: 0 nm                        Diag Capable     : no
Connector Code     : Unknown                     Vendor OUI       : 00:90:65
Manufacture date   : 2010/01/06                  Media            : Ethernet
Serial Number      : PH22J35
Part Number        : FCMJ-8521-3-A5
Optical Compliance : GIGE-T
Link Length support: 100m for copper

===============================================================================
```

```
Traffic Statistics
================================================================================
                                                 Input                 Output
--------------------------------------------------------------------------------
Octets                                               0                      0
Packets                                              0                      0
Errors                                               0                      0

================================================================================
Ethernet Statistics
================================================================================

Broadcast Pckts  :                   0  Drop Events      :                   0
Multicast Pckts  :                   0  CRC/Align Errors :                   0
Undersize Pckts  :                   0  Fragments        :                   0
Oversize Pckts   :                   0  Jabbers          :                   0
Collisions       :                   0

Octets                          :                  0
Packets                         :                  0
Packets of 64 Octets            :                  0
Packets of 65 to 127 Octets     :                  0
Packets of 128 to 255 Octets    :                  0
Packets of 256 to 511 Octets    :                  0
Packets of 512 to 1023 Octets   :                  0
Packets of 1024 to 1518 Octets  :                  0
Packets of 1519 or more Octets  :                  0
================================================================================
* indicates that the corresponding row element may have been truncated.

================================================================================
Port Statistics
================================================================================
                                                 Input                 Output
--------------------------------------------------------------------------------
Unicast Packets                                      0                      0
Multicast Packets                                    0                      0
Broadcast Packets                                    0                      0
Discards                                             0                      0
Unknown Proto Discards                               0
================================================================================

================================================================================
Ethernet-like Medium Statistics
================================================================================

Alignment Errors :                   0  Sngl Collisions  :                   0
FCS Errors       :                   0  Mult Collisions  :                   0
SQE Test Errors  :                   0  Late Collisions  :                   0
CSE              :                   0  Excess Collisns  :                   0
Too long Frames  :                   0  Int MAC Tx Errs  :                   0
Symbol Errors    :                   0  Int MAC Rx Errs  :                   0
================================================================================

================================================================================
Meter Statistics
================================================================================

--------------------------------------------------------------------------------
```

```
                        Packets                  Octets
-------------------------------------------------------------------------------
Ingress Meter  1 (Unicast)
For. InProf           :         0                        0
For. OutProf          :         0                        0

-------------------------------------------------------------------------------

===============================================================================
Queue Statistics
===============================================================================

-------------------------------------------------------------------------------
                        Packets                  Octets
-------------------------------------------------------------------------------
Egress Queue  1 (be)
Fwd Stats             :         0                        0
Drop Stats            :         0                        0
Egress Queue  2 (l2)
Fwd Stats             :         0                        0
Drop Stats            :         0                        0
Egress Queue  3 (af)
Fwd Stats             :         0                        0
Drop Stats            :         0                        0
Egress Queue  4 (l1)
Fwd Stats             :         0                        0
Drop Stats            :         0                        0
Egress Queue  5 (h2)
Fwd Stats             :         0                        0
Drop Stats            :         0                        0
Egress Queue  6 (ef)
Fwd Stats             :         0                        0
Drop Stats            :         0                        0
Egress Queue  7 (h1)
Fwd Stats             :         0                        0
Drop Stats            :         0                        0
Egress Queue  8 (nc)
Fwd Stats             :         0                        0
Drop Stats            :         0                        0
===============================================================================
*A:7210-SAS>

*A:ces-A# show port 1/2/1 detail
===============================================================================
TDM DS1 Physical Interface
===============================================================================
Description        : DS1/E1
Interface          : 1/2/1                  Port IfIndex         : 37781504
Admin Status       : up                     Oper Status          : up
Physical Link      : Yes
Line Impedance     : 100
Type               : ds1                    Buildout             : short
Length             : 133
===============================================================================
===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
```

```
Packets                                          20062480               1887151
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
*A:ces-A#
*A:ces-A# show port 1/2/1.ds1 detail
===============================================================================
TDM DS1 Interface
===============================================================================
Description        : DS1
Interface          : 1/2/1.ds1
Type               : ds1                     Framing             : ds1-unframed
Admin Status       : up                      Oper Status         : up
Physical Link      : yes                     Clock Source        : adaptive
Clock Sync State   : normal
Last State Change  : 07/06/2010 11:31:37     Channel IfIndex     : 574652417
Loopback           : none
Remote Loop respond: N/A                     In Remote Loop      : N/A
Cfg Alarm          : ais los
Alarm Status       :
===============================================================================
===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                         3853385856             363722496
Packets                                          20069718               1894388
Errors                                                  0                     0
============================
DS1/E1 Line
============================

----------------------------
ES                     1
SES                    1
SEFS                   1
UAS                    0
CSS                    1
PCV                    0
LES                    1
BES                    0
DM                     0
LCV      :
============================
============================
Transmit:

AIS      :             0

Receive:

AIS      :             0
LOS      :             0
LOF      :             0

Looped   :             0
============================
===============================================================================
```

```
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                          20069718               1894388
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
*A:ces-A#

*A:ces-A# show port 1/2/1.1 detail
===============================================================================
TDM DS0 Chan Group
===============================================================================
Description        : DS0GRP
Interface          : 1/2/1.1
TimeSlots          : 1-24
Speed              : 64
Admin Status       : up                      Oper Status          : up
Last State Change  : 07/06/2010 11:31:38     Chan-Grp IfIndex     : 574652477

Configured mode    : access                  Encap Type           : cem
Admin MTU          : 1514                    Oper MTU             : 1514
Scramble           : false
Physical Link      : yes                     Idle Cycle Flags     : n/a
Payload Fill Type  : all-ones                Payload Pattern      : N/A
Signal Fill Type   : n/a                     Signal Pattern       : N/A
===============================================================================
===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                        3854167488              364504128
Packets                                         20073789                1898459
Errors                                                 0                     0
===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                          20073789               1898459
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================

*A:MTU-T1>show# port 1/1/6

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/6                   Oper Speed       : N/A
Link-level         : Ethernet                Config Speed     : 1 Gbps
Admin State        : down                    Oper Duplex      : N/A
Oper State         : down                    Config Duplex    : full
Physical Link      : No                      MTU              : 9212
Single Fiber Mode  : No
IfIndex            : 35848192                Hold time up     : 0 seconds
```

```
Last State Change  : 04/06/2001 07:30:45        Hold time down   : 0 seconds
Last Cleared Time  : N/A                        DDM Events       : Enabled

Configured Mode    : network                    Encap Type       : null
Dot1Q Ethertype    : 0x8100                     QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                        Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                    Network Qos Pol  : 1
Egr. Sched. Pol    : default                    Access Egr. Qos *: n/a
Auto-negotiate     : true                       MDI/MDX          : unknown
Accounting Policy  : None                       Collect-stats    : Disabled
Egress Rate        : Default                    Max Burst        : Default
LACP Tunnel        : Disabled

Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                   Keep-alive       : 10
Loop Detected      : False                      Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                   Rx Quality Level : N/A

Configured Address : 00:25:ba:03:92:77
Hardware Address   : 00:25:ba:03:92:77
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00027AAAA02  ALA  IPUIAELDAB
TX Laser Wavelength: 850 nm                     Diag Capable     : yes
Connector Code     : LC                         Vendor OUI       : 00:90:65
Manufacture date   : 2010/05/28                 Media            : Ethernet
Serial Number      : PHN661L
Part Number        : FTRJ8519P2BNL-A6
Optical Compliance : GIGE-SX
Link Length support: 550m for 50u MMF; 300m for 62.5u MMF

===============================================================================
Transceiver Digital Diagnostic Monitoring (DDM), Internally Calibrated
===============================================================================
                             Value High Alarm  High Warn   Low Warn  Low Alarm
-------------------------------------------------------------------------------
Temperature (C)               +26.2     +95.0      +90.0      -20.0     -25.0
Supply Voltage (V)             3.25      3.90       3.70       2.90      2.70
Tx Bias Current (mA)            1.0      17.0       14.0        2.0       1.0
Tx Output Power (dBm)        -23.77     -2.00      -2.00     -11.02    -11.74
Rx Optical Power (avg dBm)   -35.23      1.00      -1.00     -18.01    -20.00
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Octets                                              128                    640
Packets                                               2                     10
```

```
Errors                                                  0                     0
===============================================================================
* indicates that the corresponding row element may have been truncated.

===============================================================================
Port Statistics
===============================================================================
                                                    Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                         2                     10
Multicast Packets                                       0                      0
Broadcast Packets                                       0                      0
Discards                                                0                      0
Unknown Proto Discards                                  0
===============================================================================

===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                  0  Sngl Collisions  :                    0
FCS Errors       :                  0  Mult Collisions  :                    0
SQE Test Errors  :                  0  Late Collisions  :                    0
CSE              :                  0  Excess Collisns  :                    0
Too long Frames  :                  0  Int MAC Tx Errs  :                    0
Symbol Errors    :                  0  Int MAC Rx Errs  :                    0
===============================================================================
*A:MTU-T1>show#


*A:MTU-T1>show# port 1/1/6 detail

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/6                     Oper Speed       : N/A
Link-level         : Ethernet                  Config Speed     : 1 Gbps
Admin State        : down                      Oper Duplex      : N/A
Oper State         : down                      Config Duplex    : full
Physical Link      : No                        MTU              : 9212
Single Fiber Mode  : No                                         : None
IfIndex            : 35848192                  Hold time up     : 0 seconds
Last State Change  : 04/06/2001 07:30:45       Hold time down   : 0 seconds
Last Cleared Time  : N/A                       DDM Events       : Enabled

Configured Mode    : network                   Encap Type       : null
Dot1Q Ethertype    : 0x8100                    QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                       Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                   Network Qos Pol  : 1
Egr. Sched. Pol    : default                   Access Egr. Qos *: n/a
Auto-negotiate     : true                      MDI/MDX          : unknown
Accounting Policy  : None                      Collect-stats    : Disabled
Egress Rate        : Default                   Max Burst        : Default
LACP Tunnel        : Disabled
```

```
Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                   Keep-alive       : 10
Loop Detected      : False                      Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                   Rx Quality Level : N/A

Configured Address : 00:25:ba:03:92:77
Hardware Address   : 00:25:ba:03:92:77
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00027AAAA02  ALA  IPUIAELDAB
TX Laser Wavelength: 850 nm                     Diag Capable     : yes
Connector Code     : LC                         Vendor OUI       : 00:90:65
Manufacture date   : 2010/05/28                 Media            : Ethernet
Serial Number      : PHN661L
Part Number        : FTRJ8519P2BNL-A6
Optical Compliance : GIGE-SX
Link Length support: 550m for 50u MMF; 300m for 62.5u MMF

===============================================================================
Transceiver Digital Diagnostic Monitoring (DDM), Internally Calibrated
===============================================================================
                             Value High Alarm  High Warn   Low Warn  Low Alarm
-------------------------------------------------------------------------------
Temperature (C)              +26.2     +95.0      +90.0      -20.0     -25.0
Supply Voltage (V)            3.25      3.90       3.70       2.90      2.70
Tx Bias Current (mA)           1.0      17.0       14.0        2.0       1.0
Tx Output Power (dBm)        -23.77     -2.00      -2.00     -11.02    -11.74
Rx Optical Power (avg dBm)   -35.23      1.00      -1.00     -18.01    -20.00
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                 Input                 Output
-------------------------------------------------------------------------------
Octets                                             128                    640
Packets                                              2                     10
Errors                                               0                      0

===============================================================================
Ethernet Statistics
===============================================================================

Broadcast Pckts  :                   0  Drop Events      :                   0
Multicast Pckts  :                   0  CRC/Align Errors :                   0
Undersize Pckts  :                   0  Fragments        :                   0
Oversize Pckts   :                   0  Jabbers          :                   0
Collisions       :                   0

Octets                         :                768
Packets                        :                 12
Packets of 64 Octets           :                 12
```

```
Packets of 65 to 127 Octets    :                  0
Packets of 128 to 255 Octets   :                  0
Packets of 256 to 511 Octets   :                  0
Packets of 512 to 1023 Octets  :                  0
Packets of 1024 to 1518 Octets :                  0
Packets of 1519 or more Octets :                  0
===============================================================================
* indicates that the corresponding row element may have been truncated.

===============================================================================
Port Statistics
===============================================================================
                                                 Input                  Output
-------------------------------------------------------------------------------
Unicast Packets                                      2                      10
Multicast Packets                                    0                       0
Broadcast Packets                                    0                       0
Discards                                             0                       0
Unknown Proto Discards                               0
===============================================================================

===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                  0  Sngl Collisions  :                   0
FCS Errors       :                  0  Mult Collisions  :                   0
SQE Test Errors  :                  0  Late Collisions  :                   0
CSE              :                  0  Excess Collisns  :                   0
Too long Frames  :                  0  Int MAC Tx Errs  :                   0
Symbol Errors    :                  0  Int MAC Rx Errs  :                   0
===============================================================================

===============================================================================
Meter Statistics
===============================================================================

-------------------------------------------------------------------------------
                        Packets                 Octets
-------------------------------------------------------------------------------
Ingress Meter  1 (Unicast)
For. InProf           :         0                     0
For. OutProf          :         0                     0
Ingress Meter  9 (Multipoint)
For. InProf           :         0                     0
For. OutProf          :         0                     0

-------------------------------------------------------------------------------

===============================================================================
Queue Statistics
===============================================================================

-------------------------------------------------------------------------------
                        Packets                 Octets
-------------------------------------------------------------------------------
Egress Queue  1 (be)
Fwd Stats            :          0                     0
Drop Stats           :          0                     0
```

```
Egress Queue  2 (l2)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  3 (af)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  4 (l1)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  5 (h2)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  6 (ef)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  7 (h1)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  8 (nc)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
===============================================================================
*A:MTU-T1>show#
A:7210-SAS># show port 1/1/2 detail

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/2                       Oper Speed       : N/A
Link-level         : Ethernet                    Config Speed     : 1 Gbps
Admin State        : down                        Oper Duplex      : N/A
Oper State         : down                        Config Duplex    : full
Reason Down        : noServicePort
Physical Link      : No                          MTU              : 9212
Single Fiber Mode  : No                                           : Internal
IfIndex            : 35717120                    Hold time up     : 0 seconds
Last State Change  : 12/20/2010 20:51:55         Hold time down   : 0 seconds
Last Cleared Time  : N/A                         DDM Events       : Enabled

Configured Mode    : network                     Encap Type       : null
Dot1Q Ethertype    : 0x8100                      QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                         Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                     Network Qos Pol  : 1
Egr. Sched. Pol    : default                     Access Egr. Qos *: n/a
Auto-negotiate     : true                        MDI/MDX          : unknown
Accounting Policy  : None                        Collect-stats    : Disabled
Egress Rate        : Default                     Max Burst        : Default
LACP Tunnel        : Disabled

Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                    Keep-alive       : 10
Loop Detected      : False                       Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                    Rx Quality Level : N/A
```

```
Configured Address : 00:25:ba:00:5e:34
Hardware Address   : 00:25:ba:00:5e:34
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00867CAAA01  ALA  IPUIBD9DAA
TX Laser Wavelength: 1310 nm                    Diag Capable     : yes
Connector Code     : LC                         Vendor OUI       : 00:00:5f
Manufacture date   : 2010/03/10                 Media            : Ethernet
Serial Number      : 9ZT500000163
Part Number        : SCP6G14-A8-AWE
Optical Compliance : GIGE-LX
Link Length support: 40km for SMF

===============================================================================
Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated
===============================================================================
                             Value High Alarm  High Warn   Low Warn  Low Alarm
-------------------------------------------------------------------------------
Temperature (C)               +32.3     +98.0      +88.0      -43.0     -45.0
Supply Voltage (V)             3.29      4.12       3.60       3.00      2.80
Tx Bias Current (mA)            0.0      70.0       60.0        0.1       0.0
Tx Output Power (dBm)        -40.00      3.00       1.00      -5.50     -7.50
Rx Optical Power (avg dBm)   -40.00      0.00      -1.00     -21.49    -22.44
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                 Input                  Output
-------------------------------------------------------------------------------
Octets                                               0                       0
Packets                                              0                       0
Errors                                               0                       0

===============================================================================
Ethernet Statistics
===============================================================================

Broadcast Pckts  :                   0  Drop Events      :                   0
Multicast Pckts  :                   0  CRC/Align Errors :                   0
Undersize Pckts  :                   0  Fragments        :                   0
Oversize Pckts   :                   0  Jabbers          :                   0
Collisions       :                   0

Octets                         :                 0
Packets                        :                 0
Packets of 64 Octets           :                 0
Packets of 65 to 127 Octets    :                 0
Packets of 128 to 255 Octets   :                 0
Packets of 256 to 511 Octets   :                 0
Packets of 512 to 1023 Octets  :                 0
Packets of 1024 to 1518 Octets :                 0
Packets of 1519 or more Octets :                 0
===============================================================================
```

```
* indicates that the corresponding row element may have been truncated.

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Unicast Packets                                         0                     0
Multicast Packets                                       0                     0
Broadcast Packets                                       0                     0
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================

===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                  0  Sngl Collisions  :                   0
FCS Errors       :                  0  Mult Collisions  :                   0
SQE Test Errors  :                  0  Late Collisions  :                   0
CSE              :                  0  Excess Collisns  :                   0
Too long Frames  :                  0  Int MAC Tx Errs  :                   0
Symbol Errors    :                  0  Int MAC Rx Errs  :                   0
===============================================================================

===============================================================================
Meter Statistics
===============================================================================

-------------------------------------------------------------------------------
                       Packets                 Octets
-------------------------------------------------------------------------------
Ingress Meter  1 (Unicast)
For. InProf           :         0                       0
For. OutProf          :         0                       0
Ingress Meter  9 (Multipoint)
For. InProf           :         0                       0
For. OutProf          :         0                       0

-------------------------------------------------------------------------------

===============================================================================
Queue Statistics
===============================================================================

-------------------------------------------------------------------------------
                       Packets                 Octets
-------------------------------------------------------------------------------
Egress Queue  1 (be)
Fwd Stats             :         0                       0
Drop Stats            :         0                       0
Egress Queue  2 (l2)
Fwd Stats             :         0                       0
Drop Stats            :         0                       0
Egress Queue  3 (af)
Fwd Stats             :         0                       0
Drop Stats            :         0                       0
Egress Queue  4 (l1)
```

```
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  5 (h2)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  6 (ef)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  7 (h1)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
Egress Queue  8 (nc)
Fwd Stats            :          0                      0
Drop Stats           :          0                      0
===============================================================================
```

**Sample output for 7210 SAS-X**

```
A:7210-SAS-X>show# show port 1/1/2 detail

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/2                       Oper Speed       : N/A
Link-level         : Ethernet                    Config Speed     : 1 Gbps
Admin State        : up                          Oper Duplex      : N/A
Oper State         : down                        Config Duplex    : full
Physical Link      : No                          MTU              : 1514
Single Fiber Mode  : No                                           : None
IfIndex            : 35717120                    Hold time up     : 0 seconds
Last State Change  : 11/11/2010 11:45:40         Hold time down   : 0 seconds
Last Cleared Time  : N/A                         DDM Events       : Enabled

Configured Mode    : access                      Encap Type       : null
Dot1Q Ethertype    : 0x8100                      QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                         Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                     Network Qos Pol  : n/a
Acc Egr Marking    : Sap-based                   Acc Egr Policy ID: 1
Auto-negotiate     : true                        MDI/MDX          : unknown
Accounting Policy  : None                        Collect-stats    : Disabled
Egress Rate        : Default                     Max Burst        : Default
Load-balance-algo  : default                     LACP Tunnel      : Disabled
LACP Tunnel        : Disabled
Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                    Keep-alive       : 10
Loop Detected      : False                       Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                    Rx Quality Level : N/A

Configured Address : 7c:20:64:ad:00:f2
Hardware Address   : 7c:20:64:ad:00:f2
Cfg Alarm          :
```

```
Alarm Status      :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00062AAAA01  ALA  IPUIAEHDAA
TX Laser Wavelength: 0 nm                      Diag Capable     : no
Connector Code     : Unknown                   Vendor OUI       : 00:90:65
Manufacture date   : 2008/03/17                Media            : Ethernet
Serial Number      : PDC0C4V
Part Number        : FCMJ-8521-3-A5
Optical Compliance : GIGE-T
Link Length support: 100m for copper

===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                                 0                  1408
Packets                                                0                     0
Errors                                                 0                     0

===============================================================================
Ethernet Statistics
===============================================================================

Broadcast Pckts  :                   0  Drop Events      :                   0
Multicast Pckts  :                   0  CRC/Align Errors :                   0
Undersize Pckts  :                   0  Fragments        :                   0
Oversize Pckts   :                   0  Jabbers          :                   0
Collisions       :                   0

Octets                          :               1408
Packets                         :                  0
Packets of 64 Octets            :                 22
Packets of 65 to 127 Octets     :                  0
Packets of 128 to 255 Octets    :                  0
Packets of 256 to 511 Octets    :                  0
Packets of 512 to 1023 Octets   :                  0
Packets of 1024 to 1518 Octets  :                  0
Packets of 1519 or more Octets  :                  0
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Unicast Packets                                        0                     0
Multicast Packets                                      0                     0
Broadcast Packets                                      0                     0
Discards                                               0                     0
Unknown Proto Discards                                 0
===============================================================================

===============================================================================
Ethernet-like Medium Statistics
===============================================================================
```

```
Alignment Errors :                  0  Sngl Collisions  :                  0
FCS Errors       :                  0  Mult Collisions  :                  0
SQE Test Errors  :                  0  Late Collisions  :                  0
CSE              :                  0  Excess Collisns  :                  0
Too long Frames  :                  0  Int MAC Tx Errs  :                  0
Symbol Errors    :                  0  Int MAC Rx Errs  :                  0
===============================================================================

A:7210-SAS-X>show#
*A:SAS-M>show# show port 1/1/1

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100/Gig Ethernet SFP
Interface          : 1/1/1                       Oper Speed       : 1 Gbps
Link-level         : Ethernet                    Config Speed     : 1 Gbps
Admin State        : up                          Oper Duplex      : full
Oper State         : up                          Config Duplex    : full
Physical Link      : Yes                         MTU              : 1522
Single Fiber Mode  : No                                           : Internal
IfIndex            : 35684352                    Hold time up     : 0 seconds
Last State Change  : 04/29/2001 06:59:15         Hold time down   : 0 seconds
Last Cleared Time  : 04/28/2001 03:09:37         DDM Events       : Enabled

Configured Mode    : access                      Encap Type       : QinQ
Dot1Q Ethertype    : 0x8100                      QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                         Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol: default                     Network Qos Pol  : n/a
Egr. Sched. Pol    : default                     Access Egr. Qos *: 1
Auto-negotiate     : true                        MDI/MDX          : MDI
Accounting Policy  : None                        Collect-stats    : Disabled
Egress Rate        : Default                     Max Burst        : Default
LACP Tunnel        : Disabled

Uplink             : No
Split Horizon Group: (Not Specified)
Down-when-looped   : Disabled                    Keep-alive       : 10
Loop Detected      : False                       Retry            : 120
Use Broadcast Addr : False

Sync. Status Msg.  : Disabled                    Rx Quality Level : N/A

Configured Address : 00:25:ba:02:ea:02
Hardware Address   : 00:25:ba:02:ea:02
Cfg Alarm          :
Alarm Status       :

Transceiver Data

Transceiver Type   : SFP
Model Number       : 3HE00028AAAA02  ALA  IPUIAEMDAB
TX Laser Wavelength: 1310 nm                     Diag Capable     : yes
Connector Code     : LC                          Vendor OUI       : 00:06:b5
Manufacture date   : 2008/09/17                  Media            : Ethernet
```

```
Serial Number      : 8AIT200082
Part Number        : SPGBLXTDBAL
Optical Compliance : GIGE-LX
Link Length support: 10km for SMF

===============================================================================
Transceiver Digital Diagnostic Monitoring (DDM), Externally Calibrated
===============================================================================
                             Value High Alarm  High Warn   Low Warn  Low Alarm
-------------------------------------------------------------------------------
Temperature (C)              +40.5     +98.0      +96.0      -42.0     -43.0
Supply Voltage (V)            3.23      4.12       3.60       3.00      2.80
Tx Bias Current (mA)          25.5     100.0       85.0        7.5       5.0
Tx Output Power (dBm)        -5.67     -1.00      -2.00     -10.00    -11.00
Rx Optical Power (avg dBm)   -1.87     -1.00      -2.00!    -23.01    -24.01
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                 Input                  Output
-------------------------------------------------------------------------------
Octets                                    9670292997181                       0
Packets                                    142210189554                       0
Errors                                             2651                       0
===============================================================================
* indicates that the corresponding row element may have been truncated.

===============================================================================
Port Statistics
===============================================================================
                                                 Input                  Output
-------------------------------------------------------------------------------
Unicast Packets                            142210189554                       0
Multicast Packets                                     0                       0
Broadcast Packets                                     0                       0
Discards                                              0                       0
Unknown Proto Discards                                0
===============================================================================

===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                0  Sngl Collisions  :                    0
FCS Errors       :             1095  Mult Collisions  :                    0
SQE Test Errors  :                0  Late Collisions  :                    0
CSE              :                0  Excess Collisns  :                    0
Too long Frames  :                0  Int MAC Tx Errs  :                    0
Symbol Errors    :             1509  Int MAC Rx Errs  :                    0
===============================================================================
```

**Ethernet Output —** The following table describes Ethernet output fields.

| Label | Description |
|---|---|
| Broadcast Pckts | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were addressed to a broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were addressed to a multicast address at this sub-layer, including those that were discarded or not sent. For a MAC layer protocol, this includes both Group and Functional addresses. |
| Multicast Pckets | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were addressed to a multicast address at this sub-layer. For a MAC layer protocol, this includes both Group and Functional addresses. The total number of packets that higher-level protocols requested be transmitted, and which were addressed to a multicast address at this sub-layer, including those that were discarded or not sent. For a MAC layer protocol, this includes both Group and Functional addresses. |
| Undersize Pckets | The total number of packets received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed. |
| Oversize Pckts | The total number of packets received that were longer than can be accepted by the physical layer of that port (9900 octets excluding framing bits, but including FCS octets for GE ports) and were otherwise well formed. |
| Collisions | The best estimate of the total number of collisions on this Ethernet segment. |
| Drop Events | The total number of events in which packets were dropped by the probe due to lack of resources. Note that this number is not necessarily the number of packets dropped; it is just the number of times this condition has been detected. |
| CRC Align Errors | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). |
| Fragments | The total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets) and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). |

| Label | Description (Continued) |
|---|---|
| Jabbers | The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). |
| Ingress Pool Size | The amount of ingress buffer space, expressed as a percentage of the available buffer space that will be allocated to the port for ingress buffering. |
| Octets | The total number of octets received. |
| Packets | The total number of packets received. |
| Packets to | The number of packets received that were equal to or less than the displayed octet limit. |

**Sample Output**

```
===============================================================================
Ethernet Statistics
===============================================================================
Broadcast Pckts  :                2  Drop Events      :                  0
Multicast Pckts  :            15863  CRC/Align Errors :                  0
Undersize Pckts  :                0  Fragments        :                  0
Oversize Pckts   :                0  Jabbers          :                  0
Collisions       :                0

Octets                        :            3468749
Packets                       :              25439
Packets of 64 Octets          :              25370
Packets of 65 to 127 Octets   :               4987
Packets of 128 to 255 Octets  :              10937
Packets of 256 to 511 Octets  :                  0
Packets of 512 to 1023 Octets :                  0
Packets of 1024 to 1518 Octets :                 0
Packets of 1519 or more Octets :                 0
===============================================================================
```

**Ethernet-like Medium Statistics Output —** The following table describes Ethernet-like medium statistics output fields.

| Label | Description |
|---|---|
| Alignment Errors | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets. |

| Label | Description (Continued) |
|---|---|
| FCS Errors | The number of frames received on a particular interface that are an integral number of octets in length but do not pass the FCS check. |
| SQE Errors | The number of times that the SQE TEST ERROR is received on a particular interface. |

**Ethernet-like Medium Statistics —** the following table describe Ethernet-like Medium Statistics field..

| Label | Description |
|---|---|
| Alignment Errors | The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets. |
| FCS Errors | The number of frames received that are an integral number of octets in length but do not pass the FCS check. |
| SQE Errors | The number of times that the SQE TEST ERROR is received. |
| CSE | The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame. |
| Too long Frames | The number of frames received that exceed the maximum permitted frame size. |
| Symbol Errors | For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present |
| Sngl Collisions | The number of frames that are involved in a single collision, and are subsequently transmitted successfully. |
| Mult Collisions | The number of frames that are involved in more than one collision and are subsequently transmitted successfully. |
| Late Collisions | The number of times that a collision is detected later than one slot Time into the transmission of a packet. |
| Excess Collisions | The number of frames for which a transmission fails due to excessive collisions. |
| Int MAC Tx Errs | The number of frames for which a transmission fails due to an internal MAC sub-layer transmit error. |
| Int MAC Rx Errs | The number of frames for which a reception fails due to an internal MAC sub-layer receive error. |

| Label | Description |
|---|---|
| Multicast Pckts | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sub-layer, including those that were discarded or not sent. |
| Undersize Pckts | The total number of packets received that were shorter than 64 octets (excluding framing bits, but including FCS octets) but were otherwise well formed. |
| Oversize Pckts | The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) but were otherwise well formed. |
| Collisions | The best estimate of the total number of collisions on this Ethernet segment. |
| Drop Events | The total number of times that packets were detected as being dropped due to a lack of resources (not necessarily the total number of packets dropped). |
| CRC Align Errors | The total number of packets received that were between 64 and 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). |
| Fragments | The total number of packets received that were shorter than 64 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). |
| Jabbers | The total number of packets received that were longer than 1518 octets (excluding framing bits but including FCS octets) that had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). |
| Octets | Total number of octets received. |
| Packets | The number of packets received, broken down by size Port Statistics. |
| Unicast packets input/output | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent. |

| Label | Description |
|---|---|
| Multicast packets input/output | The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or broadcast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or broadcast address at this sub-layer,including those that were discarded or not sent. |
| Broadcast packets input/output | The number of packets, delivered by this sub-layer to a higher (sub-) layer,which were not addressed to a unicast or multicast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sub-layer, including those that were discarded or not sent. |
| Discards input/output | The number of inbound packets chosen to be discarded to possibly free up buffer space. |
| Unknown proto discards input/output | For packet-oriented interfaces, the number of packets received via the interface that were discarded because of an unknown or unsupported protocol. For character-oriented or fixed-length interfaces that support protocol multiplexing, the number of transmission units received via the interface that were discarded because of an unknown or unsupported protocol. For any interface that does not support protocol multiplexing, this counter will always be 0. |
| Unknown proto | Discards do not show up in the packet counts. |

### Sample Output

```
*A:MTU-A#
===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                  0  Sngl Collisions  :                   0
FCS Errors       :                  0  Mult Collisions  :                   0
SQE Test Errors  :                  0  Late Collisions  :                   0
CSE              :                  0  Excess Collisns  :                   0
Too long Frames  :                  0  Int MAC Tx Errs  :                   0
Symbol Errors    :                  0  Int MAC Rx Errs  :                   0
===============================================================================
*A:MTU-A#
```

**Port Associations Output —** The following table describes port associations output fields.

| Label | Description |
|---|---|
| Svc ID | The service identifier. |

| Label | Description |
|---|---|
| Name | The name of the IP interface. |
| Encap Value | The dot1q or qinq encapsulation value on the port for this IP interface |

**Sample Output**

```
*A:MTU-A>config# show port 1/1/23 associations
===============================================================================
Interface Table
===============================================================================
Router/ServiceId                Name                            Encap Val
-------------------------------------------------------------------------------
Router: Base                    one                             0
-------------------------------------------------------------------------------
Interfaces
===============================================================================
*A:MTU-A>config#
```

**A1 Detailed Output —** The following table describes A1 detailed output fields.

| Label | Description |
|---|---|
| Description | A text description of the port. |
| Interface | The port ID displayed in the slot/mda/port format. |
| Oper Speed | The operating speed of the interface. |
| Link-level | Ethernet — the port is configured as Ethernet. |
| Config Speed | The configured speed of the interface. |
| Admin State | up — the port is administratively up.<br>down — the port is administratively down. |
| Oper Duplex | The operating duplex mode of the interface. |
| Oper State | up — the port is operationally up.<br>down — the port is operationally down. |
| Config Duplex | full — the link is configured to full duplex mode.<br>half — the link is configured to half duplex mode. |
| Physical Link | Yes — a physical link is present.<br>No — a physical link is not present. |
| MTU | The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets. |
| IfIndex | The interface's index number that reflects its initialization sequence. |

| Label | Description (Continued) |
|---|---|
| Hold time up | The link-up dampening time in seconds. The port link dampening timer value that reduces the number of link transitions reported to upper layer protocols. |
| Last State Change | The last time that the operational status of the port changed state. |
| Hold time down | The link-down dampening time in seconds. The down timer controls the dampening timer for link down transitions. |
| Configured Mode | network — the port is configured for transport.<br>network use access — the port is configured for service access. |
| Encap Type | null — ingress frames will not use any tags or labels to delineate a service.<br>dot1q — ingress frames carry 802.1Q tags where each tag signifies a different service. |
| Dot1Q Ethertype | The protocol carried in an Ethernet frame. |
| Net.Egr. Queue Pol. | The number of the associated network egress queue QoS policy, or default if the default policy is used. |
| Auto-negotiate | true — the link attempts to automatically negotiate the link speed and duplex parameters.<br>false — the duplex and speed values are used for the link. |
| Egress Rate | The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate. |
| Loopback | The type of loopback configured on the port, either line,internal, or none. |
| Loopback Time Left | The number of seconds left in a timed loopback If there is no loopback configured or the configured loopback is latched, the value is unspecified. |
| Configured Address | The base chassis Ethernet MAC address. |
| Hardware Address | The interface’s hardware or system assigned MAC address at its protocol sub-layer. |

| Label | Description (Continued) |
|---|---|
| Traffic Statistics | Octets input/output – the total number of octets received and transmitted on the port Packets input/output – the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a multicast or broadcast address at this sublayer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a multicast or broadcast address at this sub-layer, including those that were discarded or not sent.<br><br>Errors input/output – for packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character-oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.<br><br>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed length interfaces, the number of outbound transmission units that could not be transmitted because of errors. |
| Ethernet Statistics | Broadcast Pckts — the number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast or multicast address at this sub-layer. The total number of packets that higher-level protocols requested be transmitted, and which were not addressed to a unicast or multicast address at this sub-layer, including those that were discarded or not sent. |

```
A:7210>show# port A/1

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100 Ethernet TX
Interface          : A/1                       Oper Speed       : 10 mbps
Link-level         : Ethernet                  Config Speed     : 100 mbps
Admin State        : up                        Oper Duplex      : half
Oper State         : up                        Config Duplex    : full
Physical Link      : Yes                       MTU              : 1514
Single Fiber Mode  : No
IfIndex            : 67141632                  Hold time up     : 0 seconds
Last State Change  : 07/12/2010 14:26:43       Hold time down   : 0 seconds
Last Cleared Time  : N/A

Configured Mode    : network                   Encap Type       : null
Dot1Q Ethertype    : 0x8100                    QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                       Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol:                           Access Egr. Qos *: n/a
```

```
Egr. Sched. Pol    : default                   Network Qos Pol  : n/a
Auto-negotiate     : true                      MDI/MDX          : MDI
Accounting Policy  : None                      Collect-stats    : Disabled
Egress Rate        : Default                   Max Burst        : Default
LACP Tunnel        : Disabled

Split Horizon Group: (Not Specified)
Down-when-looped   : N/A                       Keep-alive       : N/A
Loop Detected      : N/A                       Retry            : N/A
Use Broadcast Addr : N/A

Sync. Status Msg.  : Disabled                  Rx Quality Level : N/A

Configured Address : 00:0a:0b:0a:0d:01
Hardware Address   : 00:0a:0b:0a:0d:01
Cfg Alarm          :
Alarm Status       :

===============================================================================
Traffic Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Octets                                           185674                      0
Packets                                            2256                      0
Errors                                                0                      0
===============================================================================
* indicates that the corresponding row element may have been truncated.

===============================================================================
Port Statistics
===============================================================================
                                                  Input                 Output
-------------------------------------------------------------------------------
Unicast Packets                                       0                      0
Multicast Packets                                     0                      0
Broadcast Packets                                  2256                      0
Discards                                              0                      0
Unknown Proto Discards                                0
===============================================================================

===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                   0  Sngl Collisions  :                   0
FCS Errors       :                   0  Mult Collisions  :                   0
SQE Test Errors  :                   0  Late Collisions  :                   0
CSE              :                   0  Excess Collisns  :                   0
Too long Frames  :                   0  Int MAC Tx Errs  :                   0
Symbol Errors    :                   0  Int MAC Rx Errs  :                   0
===============================================================================
A:7210>show#
```

**Sample output for 7210 SAS-X:**

```
A:7210-SAS-X>show# port A/1

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100 Ethernet TX
Interface          : A/1                       Oper Speed       : 100 mbps
Link-level         : Ethernet                  Config Speed     : 100 mbps
Admin State        : up                        Oper Duplex      : full
Oper State         : up                        Config Duplex    : full
Physical Link      : Yes                       MTU              : 1514
Single Fiber Mode  : No
IfIndex            : 67141632                  Hold time up     : 0 seconds
Last State Change  : 11/10/2010 20:50:27       Hold time down   : 0 seconds
Last Cleared Time  : N/A

Configured Mode    : network                   Encap Type       : null
Dot1Q Ethertype    : 0x8100                    QinQ Ethertype   : 0x8100
PBB Ethertype      : 0x88e7
Ing. Pool % Rate   : 100                       Egr. Pool % Rate : 100
Ing. Pool Policy   : n/a
Egr. Pool Policy   : n/a
Net. Egr. Queue Pol:                           Network Qos Pol  : n/a
Auto-negotiate     : true                      MDI/MDX          : MDI
Accounting Policy  : None                      Collect-stats    : Disabled
Egress Rate        : Default                   Max Burst        : Default
Load-balance-algo  : default                   LACP Tunnel      : Disabled
LACP Tunnel        : Disabled

Down-when-looped   : N/A                       Keep-alive       : N/A
Loop Detected      : N/A                       Retry            : N/A
Use Broadcast Addr : N/A

Sync. Status Msg.  : Disabled                  Rx Quality Level : N/A

Configured Address : 7c:20:64:ad:00:f0
Hardware Address   : 7c:20:64:ad:00:f0
Cfg Alarm          :
Alarm Status       :

===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                             411179                    0
Packets                                              5415                    0
Errors                                                  0                    0
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
```

```
Unicast Packets                                    0                    0
Multicast Packets                                  0                    0
Broadcast Packets                               5415                    0
Discards                                           0                    0
Unknown Proto Discards                             0
===============================================================================

===============================================================================
Ethernet-like Medium Statistics
===============================================================================

Alignment Errors :                 0  Sngl Collisions  :                 0
FCS Errors       :                 0  Mult Collisions  :                 0
SQE Test Errors  :                 0  Late Collisions  :                 0
CSE              :                 0  Excess Collisns  :                 0
Too long Frames  :                 0  Int MAC Tx Errs  :                 0
Symbol Errors    :                 0  Int MAC Rx Errs  :                 0
===============================================================================
A:7210-SAS-X>show#
```

**Port ACR Detail Output —** The following table describes ACR detail output fields.

| Label | Description |
|---|---|
| Clock Master PW | The SAP being used by the port for recovering the clock. |
| Clock Sync State | The current state of the ACR adaptive algorithm. |
| Endpoint | The type of endpoint. |
| Bit-rate | The number of DS0s or timeslots in the channel group. |
| Payload Size | The number of octets contained in the payload of a TDM PW packet when the packet is transmitted. |
| Jitter Buffer | The size of the receive jitter buffer, expressed in milliseconds. |
| Use RTP Header | Whether RTP headers are used in CES packets (Yes or No). |
| CAS Framing | The type of CAS framing. |
| Effective PDVT | The peak-to-peak packet delay variation (PDV) used by the circuit emulation service. Since the operating system may adjust the jitter buffer setting in order to ensure no packet loss, the configured jitter buffer value may not be the value used by the system. The effective PDVT provides an indication that the PDV has been adjusted by the operating system. |
| Cfg Alarm | The alarms that have alarm reporting enabled. |
| Alarm Status | The current alarm state (for example, stray, malformed, packet loss, overrun, underrun, remote packet loss, remote fault, or remote RDI). |

| Label | Description |
|---|---|
| ACR DPLL Statistics | **Frequency offset mean** — The ACR frequency offset mean for the previous 15 sets of 60-second intervals.<br>**Frequency offset stddev** — The ACR frequency offset standard deviation for the previous 15 sets of 60-second intervals.<br>**Phase error mean** — The ACR input phase error mean and output DCO mean for the previous 15 sets of 60-second intervals.<br>**Phase error stddev** — The ACR input phase error standard deviation and output DCO standard deviation for the previous 15 sets of 60-second intervals. |
| Algorithm State Counts | **Normal** — The number of 2-second intervals the ACR algorithm was in the normal state.<br>**Phase-tracking** — The number of 2-second intervals the ACR algorithm was in the phase-tracking state.<br>**Freq-tracking** — The number of 2-second intervals the ACR algorithm was in the frequency tracking state.<br>**Holdover** — The number of 2-second intervals the ACR algorithm was in the holdover state.<br>**Free-run** — The number of 2-second intervals the ACR algorithm was in the free-run state. |
| Events | **ACR Calc Out of Range** — The number of times the ACR algorithm was internally reset.<br>**Prolonged ACR failure** — The number of times the ACR algorithm was in the phase-tracking or holdover state for an extended period of time.<br>**Excessive Packet Loss** — Increments every 2-second interval that ACR is in the phase-tracking state and the tolerated packet loss threshold is exceeded.<br>**Excessive Phase Shift** — Increments each time the ACR algorithm transitions to the phase-tracking state from normal as a result of a phase shift above the tolerated shift level. |

```
*A:ces-A# show port 1/2/1.ds1 acr detail

===============================================================================
Adaptive Clock Recovery (ACR) Configuration
===============================================================================
Clock Master PW  : 1/2/1.1
Clock Sync State : normal
-------------------------------------------------------------------------------
CEM SAP Configuration Information
-------------------------------------------------------------------------------
Endpoint Type          : Unstruct. T1     Bit-rate                   : 24
Payload Size           : 192              Jitter Buffer (ms)         : 5
Jitter Buffer (packets): 6                Playout Threshold (packets): 4
Use RTP Header         : No               Differential               : No
```

```
Timestamp Freq         : 0                CAS Framing                : No CAS
Effective PDVT         : +/-2.984 ms

Cfg Alarm      : stray malformed pktloss overrun underrun
Alarm Status   :
-------------------------------------------------------------------------------
CEM SAP Statistics
-------------------------------------------------------------------------------
                         Packets           Seconds           Events
Egress Stats
Forwarded             :  852539
Dropped               :  0
Missing               :  0
Reordered Forwarded   :  0
Underrun              :  11119                               3
Overrun               :  0                                   0
Misordered Dropped    :  0
Malformed Dropped     :  0
LBit Dropped          :  0
Multiple Dropped      :  0
Error                 :                    17
Severely Error        :                    15
Unavailable           :                    0
Failure Count         :                                      1
Jitter Buffer Depth   :  3

Ingress Stats
Forwarded             :  852590
Dropped               :  0
===============================================================================
===============================================================================
Adaptive Clock Recovery (ACR)
  - Internal Digital Phase Locked Loop (DPLL) Statistics
===============================================================================
                      frequency    frequency        phase        phase
                         offset       offset        error        error
                           mean       stddev         mean       stddev
time                       (ppb)        (ppb)         (ns)         (ns)
-------------------------------------------------------------------------------
07/06/2010 19:25:51         -548            0            1           31
07/06/2010 19:24:51         -548            1            6           38
07/06/2010 19:23:51         -548            1           20           48
07/06/2010 19:22:51         -549            1           -2           49
~07/06/2010 19:21:51           0            0            0            0
~07/06/2010 19:20:50           0            0            0            0
07/06/2010 19:19:50         -549            1          -19           31
07/06/2010 19:18:50         -549            1           -4           36
07/06/2010 19:17:50         -548            2           18          139
07/06/2010 19:16:50         -548            1           35           38
07/06/2010 19:15:50         -549            1           28           33
07/06/2010 19:14:50         -549            1          -18           47
07/06/2010 19:13:50         -550            1          -56           38
07/06/2010 19:12:50         -549            0          -36           37
07/06/2010 19:11:50         -548            1          -21           40
-------------------------------------------------------------------------------
(~ - indicates an invalid interval)
-------------------------------------------------------------------------------
Current
24 Hour
```

```
(105 min)             -388         217
===============================================================================

===============================================================================
ACR State Statistics
===============================================================================
Algorithm State Counts
  normal                : 1386
  Phase-tracking        : 35
  Freq-tracking         : 0
  Holdover              : 12741
  Free-run              : 64
Events
  ACR Calc Out of Range : 0
  Prolonged ACR Failure : 293
  Excessive Packet Loss : 0
  Excessive Phase Shift : 0
===============================================================================
```

## lldp

**Syntax** **lldp** [**nearest-bridge**|**nearest-non-tpmr**|**nearest-customer**] [**remote-info**] [**detail**]

**Context** show>port>ethernet

**Description** This command displays Link Layer Discovery Protocol (LLDP) information.

**Parameters** **nearest-bridge —** Displays nearest bridge information.

**nearest-non-tpmr —** Displays nearest Two-Port MAC Relay (TPMR) information.

**nearest-customer —** Displays nearest customer information.

**remote-info —** Displays remote information on the bridge MAC.

**detail —** Shows detailed information.

**Output** **Sample Output**

```
*A:7210-SAS# show port 1/1/3 ethernet lldp
===============================================================================
Link Layer Discovery Protocol (LLDP) Port Information
===============================================================================

Port 1/1/3 Bridge nearest-bridge
-------------------------------------------------------------------------------
Admin State           : rxOnly         Notifications         : Disabled
Transmit TLVs         : None

Management Address Transmit Configuration:
Index 1 (system)      : Disabled       Address               : Not Configured


Port 1/1/3 Bridge nearest-non-tpmr
-------------------------------------------------------------------------------
Admin State           : rxOnly         Notifications         : Disabled
```

```
Transmit TLVs         : None

Management Address Transmit Configuration:
Index 1 (system)      : Disabled       Address               : Not Configured


Port 1/1/3 Bridge nearest-customer
-------------------------------------------------------------------------------
Admin State           : rxOnly         Notifications         : Disabled
Transmit TLVs         : None

Management Address Transmit Configuration:
Index 1 (system)      : Disabled       Address               : Not Configured

===============================================================================
*A:7210-SAS#


*A:7210-SAS# show port 1/1/3 ethernet lldp nearest-bridge detail
===============================================================================
Link Layer Discovery Protocol (LLDP) Port Information
===============================================================================

Port 1/1/3 Bridge nearest-bridge
-------------------------------------------------------------------------------
Admin State           : rxOnly         Notifications         : Disabled
Transmit TLVs         : None

Management Address Transmit Configuration:
Index 1 (system)      : Disabled       Address               : Not Configured

Port LLDP Stats:
Tx Frames             : 0              Tx Length Err Frames  : 0
Rx Frames             : 0              Rx Frame Discard      : 0
Rx Frame Errors       : 0              Rx TLV Discard        : 0
Rx TLV Unknown        : 0              Rx Ageouts            : 0
===============================================================================
*A:7210-SAS#




*A:7210-SAS# show port 1/1/3 ethernet lldp remote-info detail
===============================================================================
Link Layer Discovery Protocol (LLDP) Port Information
===============================================================================
Port 1/1/3 Bridge nearest-bridge Remote Peer Information
-------------------------------------------------------------------------------
No remote peers found

Port 1/1/3 Bridge nearest-non-tpmr Remote Peer Information
-------------------------------------------------------------------------------
Remote Peer Index 142 at timestamp 06/10/2010 00:23:22:
Supported Caps        : bridge router
Enabled Caps          : bridge router
Chassis Id Subtype    : 4 (macAddress)
Chassis Id            : 0a:a5:ff:00:00:00
PortId Subtype        : 7 (local)
Port Id               : 35749888
```

```
Port Description      : 10/100/Gig Ethernet SFP
System Name           : Dut-B
System Description    : TiMOS-B-0.0.I927 both/i386 ALCATEL SAS 7210
                        Copyright (c) 2000-2010 Alcatel-Lucent.
                        All rights reserved. All use subject to applicable
                        license agreements.
                        Built on Wed Dec 1 22:23:12 IST 2010 by builder in
                        /builder/0.0/panos/main

Remote Peer Index 142 management addresses at time 06/10/2010 00:23:22:
No remote management addresses found


Port 1/1/3 Bridge nearest-customer Remote Peer Information
-------------------------------------------------------------------------------
Remote Peer Index 143 at timestamp 06/10/2010 00:23:22:
Supported Caps        : bridge router
Enabled Caps          : bridge router
Chassis Id Subtype    : 4 (macAddress)
Chassis Id            : 0a:a7:ff:00:00:00
PortId Subtype        : 7 (local)
Port Id               : 35782656
Port Description      : 10/100 Ethernet TX
System Name           : Dut-G
System Description    : TiMOS-B-8.0.R5 both/i386 ALCATEL SR 7750 Copyright (c)
                         2000-2010 Alcatel-Lucent.
                        All rights reserved. All use subject to applicable
                        license agreements.
                        Built on Tue Sep 28 18:24:07 PDT 2010 by builder in
                        /rel8.0/b1/R5/panos/main
Remote Peer Index 143 management addresses at time 06/10/2010 00:23:22:
```

## poe

**Syntax** **poe** [**detail**]

**Context** show>port>ethernet

**Description** This command displays the poe support status.

**Parameters** *detail* — Shows detailed information.

The following table describes the poe detail output fields.

| Label | Description |
|---|---|
| PSE Maximum Power Budget | |
| PSE Power Committed | Sum of the power supplied to all ports as determined by class |
| PSE Power Available | Maximum Power Budget – Power Consumed |

| Label | Description |
|---|---|
| Port-Id | Displays the port ID. |
| PoE Admin/state | Indicates whether PoE/PoE+ is enabled on the port. |
| PoE Oper/state | Indicates whether power is supplied to the port or not. |
| Class | Displays the Class of the PoE device connected to the port. Class of the device is classified by software as per standard, based on the power consumed by the device. |

**Output** **Sample Output**

```
A:7210SAST>show>system# poe detail
============================================================
PoE Information
============================================================
PSE Maximum Power Budget     : 60 watts
PSE Power Committed          : 0 watts
PSE Power Available          : 60 watts

============================================================
PoE Port Information
============================================================
Port-Id        PoE Admin/     PoE Oper/      Class
               State          State
------------------------------------------------------------
1/1/19         Disabled       NotApplicable  None (0 W)
1/1/20         Disabled       NotApplicable  None (0 W)
1/1/21         Disabled       NotApplicable  None (0 W)
1/1/22         Disabled       NotApplicable  None (0 W)
============================================================

*A:SAST>show>system#
============================================================
PoE Information
============================================================
PSE Maximum Power Budget     : 60 watts
PSE Power Consumed           : 0 watts
PSE Power Available          : 60 watts

============================================================
PoE Port Information
============================================================
Port-Id        PoE Admin/     PoE Oper/      Class
               State          State
------------------------------------------------------------
1/1/19         Enabled        Off            None (0 W)
1/1/20         Enabled        Off            None (0 W)
1/1/21         Enabled        Off            None (0 W)
1/1/22         Enabled        Off            None (0 W)
============================================================

A:7210SAST>show>system#
```

## internal-loopback-ports

**Syntax** **internal-loopback-ports** [**detail**]

**Context** show>system

**Description** This command displays information about internal loopback ports.

**Parameters** *Detail* — keyword - includes application information

**Sample Output to show use of internal-loopback-ports.**

**Sample Output for 7210 SAS-M**

```
*A:7210SAS>config>port# show system internal-loopback-ports detail

===============================================================================
Internal Loopback Port Status
===============================================================================
Port                Loopback            Application         Service
Id                  Type                                    Enabled
-------------------------------------------------------------------------------
1/1/12              Physical            Mac-Swap            Yes
1/1/25              Virtual             Mac-Swap            No

=======================================
Mac-swap Application Status
=======================================
Enabled            : Yes
Test Service Id    : 1
Test Sap Id        : 1/1/12:90
Loopback Src Addr  : 00:00:01:00:02:00
Loopback Dst Addr  : 00:00:01:00:03:00
=======================================
===============================================================================
*A:7210SAS>config>port#
```

**Sample Output for 7210 SAS-T**

```
A:SAST-1# show system internal-loopback-ports detail

===============================================================================
Internal Loopback Port Status
===============================================================================
Port                Loopback            Application         Service
Id                  Type                                    Enabled
-------------------------------------------------------------------------------
1/1/27              Virtual             Not-In-Use          No
1/1/28              Virtual             Not-In-Use          No

=======================================
Mac-swap Application Status
=======================================
```

```
Enabled            : No
Test Service Id    : None
Test Sap Id        : None
=======================================
```

### Sample Output for 7210 SAS-X

```
A:SASX# show system internal-loopback-ports detail

===============================================================================
Internal Loopback Port Status
===============================================================================
Port                Loopback            Application         Service
Id                  Type                                    Enabled
-------------------------------------------------------------------------------
1/1/10              Physical            Mac-Swap            No
1/1/11              Physical            Testhead            No

=======================================
Mac-swap Application Status
=======================================
Enabled            : Yes
Test Service Id    : None
Test Sap Id        : None
=======================================
============================================================
```

**Mac-swap Application Status —** The following table describes Mac-swap Application Status associations output fields.

| Label | Description |
|---|---|
| LoopBack Type | The Loopback type indicates whether the port is in Physical Front panel port or Internal Virtual port. |
| Application | Application mentions the application in use of the port. |
| Service enabled | The Service enabled displays, if services can be configured over this port. |
| Enabled | Displays the current status. |
| Test Service Id | The service ID that is used in the configuration of Mac-swap test. |
| Test Sap Id | The SAP ID that is used to configure the loopback SAP for the Mac-swap application. |
| Loopback Src Addr | The source MAC address that is used in the configuration of port loopback mac-swap test. |
| Loopback Dst Addr | The destination MAC address that is used in the configuration of port loopback mac-swap test. |

# LAG Commands

## lag

**Syntax** **lag** [*lag-id*] [**detail**] [**statistics**]
**lag** *lag-id* **associations**

**Context** show

**Description** This command displays Link Aggregation Group (LAG) information.

If no command line options are specified, a summary listing of all LAGs is displayed.

**Parameters** *lag-id* — Displays only information on the specified LAG ID.

**Default** Display information for all LAG IDs.

**Values** 1 — 12

**detail —** Displays detailed LAG information.

**Default** Displays summary information.

**statistics —** Displays LAG statistics information.

**associations —** Displays a list of current router interfaces to which the LAG is assigned.

**Output** **LAG Output —** The following table describes LAG output fields.

| Label | Description |
|---|---|
| LAG ID | The LAG ID that the port is assigned to. |
| Adm | Up — The LAG is administratively up. |
| | Down — The LAG is administratively down. |
| Opr | Up — The LAG is operationally up. |
| | Down — The LAG is operationally down. |
| Port-Threshold | The number of operational links for the LAG at or below which the configured action will be invoked. |
| Up-Link-Count | The number of ports that are physically present and have physical links present. |
| MC Act/Stdby | Member port is selected as active or standby link. |

**Sample Output**

```
A:ALA-48>config# show lag
A:ALA-48# show lag
```

```
===============================================================================
Lag Data
===============================================================================
Lag-id         Adm     Opr     Port-Threshold   Up-Link-Count   MC Act/Stdby
-------------------------------------------------------------------------------
1                up      up      0                2               N/A
2                up      up      0                2               N/A
3                up      up      0                2               N/A
4                up      up     0                2               N/A
5                up      up      0                2               N/A
6                up      up      0                2               N/A
-------------------------------------------------------------------------------
Total Lag-ids: 6       Single Chassis: 6        MC Act: 0       MC Stdby: 0
===============================================================================
A:ALA-48#
```

**Detailed LAG Output —** The following table describes detailed LAG output fields.

| Label | Description |
|---|---|
| LAG ID | The LAG or multi-link trunk (MLT) that the port is assigned to. |
| Adm | Up — The LAG is administratively up.<br>Down — The LAG is administratively down. |
| Port Threshold | If the number of available links is equal or below this number, the threshold action is executed. |
| Thres. Last Cleared | The last time that keepalive stats were cleared. |
| Dynamic Cost | The OSPF costing of a link aggregation group based on the available aggregated, operational bandwidth. |
| Configured Address | The base chassis Ethernet MAC address. |
| Hardware Address | The hardware address. |
| Hold-Time Down | The timer, in tenths of seconds, which controls the delay between detecting that a LAG is down and reporting it to the higher levels. |
| LACP | Enabled — LACP is enabled.<br>Down — LACP is disabled. |
| LACP Transmit Intvl | LACP timeout signalled to peer. |
| Selection Crite-ria | Configured subgroup selection criteria. |
| Number of sub-groups | Total subgroups in LAG. |
| System ID | System ID used by actor in LACP messages. |
| Admin Key | Configured LAG key. |

| Label | Description (Continued) |
|---|---|
| Oper Key | Key used by actor in LACP messages. |
| System Priority | System priority used by actor in LACP messages. |
| Prtr System ID | System ID used by partner in LACP messages. |
| Prtr Oper Key | Key used by partner in LACP messages. |
| Prtr System Priority | System priority used by partner in LACP messages. |
| Mode | LAG in access or network mode. |
| Opr | Up – The LAG is operationally up.<br>Down – The LAG is operationally down. |
| Port Threshold | Configured port threshold. |
| Thres. Exceeded Cnt | The number of times that the drop count was reached. |
| Threshold Action | Action to take when the number of available links is equal or below the port threshold. |
| Encap Type | The encapsulation method used to distinguish customer traffic on a LAG. |
| Lag-IFIndex | A box-wide unique number assigned to this interface. |
| Port ID | The specific slot/MDA/port ID. |
| (LACP) Mode | LACP active or passive mode. |
| LACP xmit standby | LACP transmits on standby links enabled / disabled. |
| Slave-to-partner | Configured enabled/disabled. |
| Port-id | Displays the member port ID. |
| Adm | Displays the member port administrative state. |
| Active/stdby | Indicates that the member port is selected as the active or standby link. |
| Opr | Indicates that the member port operational state. |
| Primary | Indicates that the member port is the primary port of the LAG. |
| Sub-group | Displays the member subgroup where the member port belongs to. |
| Priority | Displays the member port priority. |

```
*A:dut-c# show lag 1 detail
===============================================================================
LAG Details
```

```
-------------------------------------------------------------------------------
Details
-------------------------------------------------------------------------------
Lag-id              : 1                     Mode                : access
Adm                 : up                    Opr                 : up
Thres. Exceeded Cnt : 5428                  Port Threshold      : 0
Thres. Last Cleared : 05/18/2009 11:57:56   Threshold Action    : down
Dynamic Cost        : false                 Encap Type          : dot1q
Configured Address  : 00:ab:00:5a:01:1c     Lag-IfIndex         : 1342177281
Hardware Address    : 00:ab:00:5a:01:1c
Hold-time Down      : 0.0 sec               Uplink              : No
LACP                : enabled               Mode                : active
LACP Transmit Intvl : fast                  LACP xmit stdby     : enabled
Selection Criteria  : highest-count         Slave-to-partner    : disabled
Number of sub-groups: 1                     Forced              : -
System Id           : 00:ab:00:5a:01:01     System Priority     : 32768
Admin Key           : 32768                 Oper Key            : 32768
Prtr System Id      : 00:9a:9a:ba:ba:60     Prtr System Priority : 32768
Prtr Oper Key       : 32768
-------------------------------------------------------------------------------
Port-id        Adm    Act/Stdby Opr    Primary   Sub-group     Forced   Prio
-------------------------------------------------------------------------------
1/1/3          up     active    up     yes       1             -        32768
1/1/4          up     active    up               1             -        32768
-------------------------------------------------------------------------------
Port-id        Role      Exp   Def   Dist  Col   Syn   Aggr  Timeout  Activity
-------------------------------------------------------------------------------
1/1/3          actor     No    No    Yes   Yes   Yes   Yes   Yes      Yes
1/1/3          partner   No    No    Yes   Yes   Yes   Yes   Yes      Yes
1/1/4          actor     No    No    Yes   Yes   Yes   Yes   Yes      Yes
1/1/4          partner   No    No    Yes   Yes   Yes   Yes   Yes      Yes
===============================================================================
*A:dut-c#
```

**LAG Statistics Output —** The following table describes detailed LAG statistics output fields.

| Label | Description |
|---|---|
| LAG ID | The LAG or multi-link trunk (MLT) that the port is assigned to. |
| Port ID | The port ID configured or displayed in the *slot/mda/port* format. |
| Input Bytes | The number of incoming bytes for the LAG on a per-port basis. |
| Input Packets | The number of incoming packets for the LAG on a per-port basis. |
| Output Bytes | The number of outbound bytes for the LAG on a per-port basis. |
| Output Packets | The number of outbound packets for the LAG on a per-port basis. |
| Input/Output Errors | For packet-oriented interfaces, the number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. For character- oriented or fixed-length interfaces, the number of inbound transmission units that contained errors preventing them from being deliverable to a higher-layer protocol.<br>For packet-oriented interfaces, the number of outbound packets that could not be transmitted because of errors. For character-oriented or fixed-length interfaces, the number of outbound transmission units that could not be transmitted because of errors. |
| Totals | Displays the column totals for bytes, packets, and errors. |

### Sample Output

```
ALA-1# show lag statistics
===============================================================================
LAG Statistics
===============================================================================
Description:
Lag-id Port-id   Input     Input      Output    Output     Input     Output
                 Bytes     Packets    Bytes     Packets    Errors    Errors
-------------------------------------------------------------------------------
1      1/1/3     0         1006       0         2494       0         0
       1/1/4     0         435        0         401        0         0
       1/1/5     0         9968       0         9833       0         0
-------------------------------------------------------------------------------
Totals           0         11409      0         12728      0         0
===============================================================================
ALA-1#
```

**LAG Associations Output —** The following table describes LAG associations output fields.

| Label | Description |
|---|---|
| Service ID | The service associated with the LAG. |
| Name | The name of the IP interface. |
| Encap Val | The values of the port for the IP interface. |

### Sample Output

```
A:ALA-1# show lag 5 associations
===============================================================================
Interface Table
===============================================================================
Router/ServiceId               Name                           Encap Val
-------------------------------------------------------------------------------
Router: Base                   LAG2West                       0
-------------------------------------------------------------------------------
Interfaces
===============================================================================
A:ALA-1#
```

**LAG Details —** The following example displays LAG output

```
*A:dut-c# show lag 2 detail
===============================================================================
LAG Details
-------------------------------------------------------------------------------
Details
-------------------------------------------------------------------------------
Lag-id              : 2                    Mode                : network
Adm                 : up                   Opr                 : up
Thres. Exceeded Cnt : 85                   Port Threshold      : 0
Thres. Last Cleared : 05/17/2009 07:56:24   Threshold Action    : down
Dynamic Cost        : false                Encap Type          : null
Configured Address  : 00:ab:00:5a:01:1d    Lag-IfIndex         : 1342177282
Hardware Address    : 00:ab:00:5a:01:1d
LACP                : enabled              Mode                : active
LACP Transmit Intvl : fast                 LACP xmit stdby     : enabled
Selection Criteria  : highest-count        Slave-to-partner    : disabled
Number of sub-groups: 1                    Forced              : -
System Id           : 00:ab:00:5a:01:01    System Priority     : 32768
Admin Key           : 32769                Oper Key            : 32769
Prtr System Id      : 00:9a:9a:ba:ba:60    Prtr System Priority : 32768
Prtr Oper Key       : 32769

-------------------------------------------------------------------------------
Port-id        Adm    Act/Stdby Opr    Primary   Sub-group     Forced   Prio
-------------------------------------------------------------------------------
1/1/5          up     active    up     yes       1             -        32768
1/1/6          up     active    up               1             -        32768

-------------------------------------------------------------------------------
Port-id        Role      Exp   Def   Dist  Col   Syn   Aggr  Timeout  Activity
```

```
-------------------------------------------------------------------------------
1/1/5          actor     No    No    Yes   Yes   Yes   Yes   Yes      Yes
1/1/5          partner   No    No    Yes   Yes   Yes   Yes   Yes      Yes
1/1/6          actor     No    No    Yes   Yes   Yes   Yes   Yes      Yes
1/1/6          partner   No    No    Yes   Yes   Yes   Yes   Yes      Yes
===============================================================================
*A:dut-c#
```

## redundancy

**Syntax** **redundancy**

**Context** show

**Description** This command enables the context to show multi-chassis redundancy information.

## multi-chassis

**Syntax** **all**
**mc-lag peer** *ip-address* **[lag** *lag-id***]**
**mc-lag [peer** *ip-address* **[lag** *lag-id***]] statistics**
**sync peer [***ip-address***]**
**sync peer [***ip-address***] detail**
**sync peer [***ip-address***] statistics**

**Context** show>redundancy

**Description** This command displays multi-chassis redundancy information.

**Parameters** **all —** Displays all multi-chassis information.

**mc-lag —** Displays multi-chassis LAG information.

**peer** *ip-address* **—** Displays the address of the multi-chassis peer.

**lag lag-id —** Displays the specified LAG ID on this system that forms an multi-chassis LAG configuration with the indicated peer.

**statistics —** Displays statistics for the multi-chassis peer.

**sync —** Displays synchronization information.

**detail —** Displays detailed information.

**Sample Output**

```
A:pc1# show redundancy multi-chassis all
===============================================================================
Multi-Chassis Peers
===============================================================================
Peer IP         Src IP          Auth            Peer Admin
```

```
  MCS Admin       MCS Oper        MCS State       MC-LAG Admin    MC-LAG Oper
-------------------------------------------------------------------------------
10.10.10.102    10.10.10.101    hash            Enabled
  Enabled         Enabled         inSync          Enabled         Enabled
10.10.20.1      0.0.0.0         None            Disabled
  --              --              --              Disabled        Disabled
===============================================================================
A:pc1#


*A:Dut-C# show redundancy multi-chassis mc-lag peer 10.10.10.1
===============================================================================
Multi-Chassis MC-Lag Peer 10.10.10.1
===============================================================================
Last State chg: 09/24/2007 07:58:03
Admin State: Up      Oper State   : Up
KeepAlive: 10 deci-seconds     Hold On Ngbr Failure : 3
-------------------------------------------------------------------------------
Lag Id Lacp Key Remote Lag Id System Id  Sys Prio Last State Changed
-------------------------------------------------------------------------------
1      32666    1      00:00:00:33:33:33  32888  09/24/2007 07:56:35
-------------------------------------------------------------------------------
Number of LAGs : 1
===============================================================================
*A:Dut-C#

A:pc1# show redundancy multi-chassis mc-lag statistics
===============================================================================
Multi-Chassis Statistics
===============================================================================
Packets Rx                        : 129816
Packets Rx Keepalive              : 129798
Packets Rx Config                 : 3
Packets Rx Peer Config            : 5
Packets Rx State                  : 10
Packets Dropped KeepaliveTask     : 0
Packets Dropped Packet 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 LagId : 0
Packets Dropped MD5               : 0
Packets Dropped Unknown Peer      : 0
Packets Tx                        : 77918
Packets Tx Keepalive              : 77879
Packets Tx Config                 : 6
Packets Tx Peer Config            : 26
Packets Tx State                  : 7
Packets Tx Failed                 : 0
===============================================================================
A:pc1#
A:pc1# show redundancy multi-chassis mc-lag peer 10.10.10.102 lag 2 statistics
===============================================================================
Multi-Chassis Statistics, Peer 10.10.10.102 Lag 2
===============================================================================
Packets Rx Config                 : 1
Packets Rx State                  : 4
Packets Tx Config                 : 2
```

```
Packets Tx State                 : 3
Packets Tx Failed                : 0
===============================================================================
A:pc1#


A:pc1#show redundancy multi-chassis mc-lag peer 10.10.10.102 statistics
===============================================================================
Multi-Chassis Statistics, Peer 10.10.10.102
===============================================================================
Packets Rx                       : 129918
Packets Rx Keepalive             : 129900
Packets Rx Config                : 3
Packets Rx Peer Config           : 5
Packets Rx State                 : 10
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                       : 77979
Packets Tx Keepalive             : 77940
Packets Tx Peer Config           : 26
Packets Tx Failed                : 0
===============================================================================
A:pc1#


A:pc1# show redundancy multi-chassis sync
===============================================================================
Multi-chassis Peer Table
===============================================================================
Peer
-------------------------------------------------------------------------------
Peer IP Address         : 10.10.10.102
Description             : CO1
Authentication          : Enabled
Source IP Address       : 10.10.10.101
Admin State             : Enabled
-------------------------------------------------------------------------------
Sync-status
-------------------------------------------------------------------------------
Client Applications     :
Sync Admin State        : Up
Sync Oper State         : Up
DB Sync State           : inSync
Num Entries             : 0
Lcl Deleted Entries     : 0
Alarm Entries           : 0
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
===============================================================================
Peer
-------------------------------------------------------------------------------
Peer IP Address         : 10.10.20.1
Authentication          : Disabled
```

```
Source IP Address       : 0.0.0.0
Admin State             : Disabled
===============================================================================
A:pc1#

pc1# show redundancy multi-chassis sync peer 10.10.10.102
===============================================================================
Multi-chassis Peer Table
===============================================================================
Peer
-------------------------------------------------------------------------------
Peer IP Address         : 10.10.10.102
Description             : CO1
Authentication          : Enabled
Source IP Address       : 10.10.10.101
Admin State             : Enabled
-------------------------------------------------------------------------------
Sync-status
-------------------------------------------------------------------------------
Client Applications     :
Sync Admin State        : Up
Sync Oper State         : Up
DB Sync State           : inSync
Num Entries             : 0
Lcl Deleted Entries     : 0
Alarm Entries           : 0
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
===============================================================================
MCS Application Stats
===============================================================================
Application             : igmpSnooping
Num Entries             : 0
Lcl Deleted Entries     : 0
Alarm Entries           : 0
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
-------------------------------------------------------------------------------
Application             : subHostTrk
Num Entries             : 0
Lcl Deleted Entries     : 0
Alarm Entries           : 0
-------------------------------------------------------------------------------
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
===============================================================================
A:pc1#


A:pc1# show redundancy multi-chassis sync peer 10.10.10.102 detail
===============================================================================
Multi-chassis Peer Table
===============================================================================
```

```
Peer
-------------------------------------------------------------------------------
Peer IP Address         : 10.10.10.102
Description             : CO1
Authentication          : Enabled
Source IP Address       : 10.10.10.101
Admin State             : Enabled
-------------------------------------------------------------------------------
Sync-status
-------------------------------------------------------------------------------
Client Applications     :
Sync Admin State        : Up
Sync Oper State         : Up
DB Sync State           : inSync
Num Entries             : 0
Lcl Deleted Entries     : 0
Alarm Entries           : 0
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
===============================================================================
MCS Application Stats
===============================================================================
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
-------------------------------------------------------------------------------
Application             : igmpSnooping
Num Entries             : 0
Lcl Deleted Entries     : 0
Alarm Entries           : 0
-------------------------------------------------------------------------------
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
-------------------------------------------------------------------------------
Application             : subHostTrk
Num Entries             : 0
Lcl Deleted Entries     : 0
Alarm Entries           : 0
-------------------------------------------------------------------------------
Rem Num Entries         : 0
Rem Lcl Deleted Entries : 0
Rem Alarm Entries       : 0
===============================================================================
Ports synced on peer 10.10.10.102
===============================================================================
Port/Encap                    Tag
-------------------------------------------------------------------------------
1/1/1
  1-2                         r1
===============================================================================
A:pc1#


A:pc1# show redundancy multi-chassis sync statistics
```

```
===============================================================================
Multi-chassis Peer Sync Stats
===============================================================================
Peer IP Address         : 10.10.10.102
Packets Tx Total        : 511
Packets Tx Hello        : 510
Packets Tx Data         : 0
Packets Tx Other        : 1
Packets Tx Error        : 0
Packets Rx Total        : 511
Packets Rx Hello        : 510
Packets Rx Data         : 0
Packets Rx Other        : 1
Packets Rx Error        : 0
Packets Rx Header Err   : 0
Packets Rx Body Err     : 0
Packets Rx Seq Num Err  : 0
===============================================================================
Peer IP Address         : 10.10.20.1
Packets Tx Total        : 0
Packets Tx Hello        : 0
Packets Tx Data         : 0
Packets Tx Other        : 0
Packets Tx Error        : 0
Packets Rx Total        : 0
Packets Rx Hello        : 0
Packets Rx Data         : 0
Packets Rx Other        : 0
Packets Rx Error        : 0
Packets Rx Header Err   : 0
Packets Rx Body Err     : 0
Packets Rx Seq Num Err  : 0
===============================================================================
A:pc1#

A:pc1# show redundancy multi-chassis sync peer 10.10.10.102 statistics
===============================================================================
Multi-chassis Peer Sync Stats
===============================================================================
Peer IP Address         : 10.10.10.102
Packets Tx Total        : 554
Packets Tx Hello        : 553
Packets Tx Data         : 0
Packets Tx Other        : 1
Packets Tx Error        : 0
Packets Rx Total        : 554
Packets Rx Hello        : 553
Packets Rx Data         : 0
Packets Rx Other        : 1
Packets Rx Error        : 0
Packets Rx Header Err   : 0
Packets Rx Body Err     : 0
Packets Rx Seq Num Err  : 0
===============================================================================
A:pc1#
```

## mc-lag

**Syntax** **mac-lag peer** *ip-address* [**lag** *lag-id*]
**mac-lag** [**peer** *ip-address* [**lag** *lag-id*]] **statistics**

**Context** show>redundancy>multi-chassis

**Description** This command displays multi-chassis LAG information.

**Sample**

```
*7210-SAS>show>redundancy>multi-chassis# mc-lag peer 1.1.1.1

===============================================================================
Multi-Chassis MC-Lag Peer 1.1.1.1
===============================================================================
Last State chg  : 08/13/2011 09:02:31
Admin State     : Down               Oper State           : Down
KeepAlive       : 10 deci-seconds    Hold On Ngbr Failure : 3
-------------------------------------------------------------------------------
Lag Id Lacp   Remote System Id          Sys   Last State Changed
       Key    Lag Id                    Prio
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
No LAGs found
===============================================================================
*7210-SAS>show>redundancy>multi-chassis# ^C
```

# Port Monitor Commands

## port

**Syntax** **port** *port-id* [*port-id*...(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**] [**multiclass**]

**Context** monitor

**Description** This command enables port traffic monitoring. The specified port(s) statistical information displays at the configured interval until the configured count is reached.

The first screen displays the current statistics related to the specified port(s). The subsequent statistical information listed for each interval is displayed as a delta to the previous display.

When the keyword **rate** is specified, the "rate per second" for each statistic is displayed instead of the delta.

Monitor commands are similar to **show** commands but only statistical information displays. Monitor commands display the selected statistics according to the configured number of times at the interval specified.

**Parameters** **port** *port-id* **—** Specify up to 5 port IDs.

**Syntax:** *port-id* slot/mda/port
interval *seconds*

Configures the interval for each display in seconds.

**Default** 10 seconds

**Values** 3 — 60

**repeat** *repeat* **—** Configures how many times the command is repeated.

**Default** 10

**Values** 1 — 999

**absolute —** When the **absolute** keyword is specified, the raw statistics are displayed, without processing. No calculations are performed on the delta or rate statistics.

**rate —** When the **rate** keyword is specified, the rate-per-second for each statistic is displayed instead of the delta.

**Sample Output**

```
A:ALA-12>monitor# port 1/4 interval 3 repeat 3 absolute
===============================================================================
Monitor statistics for Port 1/4
===============================================================================
                                                Input                  Output
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
```

```
Octets                                             0                           0
Packets                                           39                         175
Errors                                             0                           0
-------------------------------------------------------------------------------
At time t = 3 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                             0                           0
Packets                                           39                         175
Errors                                             0                           0
-------------------------------------------------------------------------------
At time t = 6 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                             0                           0
Packets                                           39                         175
Errors                                             0                           0
-------------------------------------------------------------------------------
At time t = 9 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                             0                           0
Packets                                           39                         175
Errors                                             0                           0
===============================================================================
A:ALA-12>monitor#

A:ALA-12>monitor# port 1/4 interval 3 repeat 3 rate
===============================================================================
Monitor statistics for Port 1/4
===============================================================================
                                                 Input                      Output
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Octets                                             0                           0
Packets                                           39                         175
Errors                                             0                           0
-------------------------------------------------------------------------------
At time t = 3 sec (Mode: Rate)
-------------------------------------------------------------------------------
Octets                                             0                           0
Packets                                            0                           0
Errors                                             0                           0
-------------------------------------------------------------------------------
At time t = 6 sec (Mode: Rate)
-------------------------------------------------------------------------------
Octets                                             0                           0
Packets                                            0                           0
Errors                                             0                           0
-------------------------------------------------------------------------------
At time t = 9 sec (Mode: Rate)
-------------------------------------------------------------------------------
Octets                                             0                           0
Packets                                            0                           0
Errors                                             0                           0
===============================================================================
A:ALA-12>monitor#


*A:ces-A# monitor port 1/2/1
```

```
===============================================================================
Monitor statistics for Port 1/2/1
===============================================================================
                                                    Input                 Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Octets                                         3828256704             338593536
Packets                                          19938837               1763508
Errors                                                 0                     0

-------------------------------------------------------------------------------
At time t = 10 sec (Mode: Delta)
-------------------------------------------------------------------------------
Octets                                           1929984               1929984
Packets                                            10052                 10052
Errors                                                 0                     0

*A:ces-A# monitor port 1/2/1 rate

===============================================================================
Monitor statistics for Port 1/2/1
===============================================================================
                                                    Input                 Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Octets                                         3831865920             342202752
Packets                                          19957635               1782306
Errors                                                 0                     0

-------------------------------------------------------------------------------
At time t = 10 sec (Mode: Rate)
-------------------------------------------------------------------------------
Octets                                           192998                192998
Packets                                            1005                  1005
Errors                                                0                     0
Utilization (% of port capacity)                  99.99                 99.99

-------------------------------------------------------------------------------
At time t = 20 sec (Mode: Rate)
-------------------------------------------------------------------------------
Octets                                           192998                192998
Packets                                            1005                  1005
Errors                                                0                     0
Utilization (% of port capacity)                  99.99                 99.99

^C
*A:ces-A# monitor port 1/2/1 absolute

===============================================================================
Monitor statistics for Port 1/2/1
===============================================================================
                                                    Input                 Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
```

```
-------------------------------------------------------------------------------
Octets                                        3836382144             346718976
Packets                                         19981157               1805828
Errors                                                 0                     0

-------------------------------------------------------------------------------
At time t = 10 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                        3838312128             348648960
Packets                                         19991209               1815880
Errors                                                 0                     0

-------------------------------------------------------------------------------
At time t = 20 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                        3840242304             350578944
Packets                                         20001262               1825932
Errors                                                 0                     0
```

**Sample output for 7210 SAS X:**

```
A:7210-SAS-X>monitor# port 1/1/2 interval 3 repeat 3 absolute

===============================================================================
Monitor statistics for Port 1/1/2
===============================================================================
                                                    Input                  Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Octets                                                 0                  1408
Packets                                                0                     0
Errors                                                 0                     0

-------------------------------------------------------------------------------
At time t = 3 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                                 0                  1408
Packets                                                0                     0
Errors                                                 0                     0

-------------------------------------------------------------------------------
At time t = 6 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                                 0                  1408
Packets                                                0                     0
Errors                                                 0                     0

-------------------------------------------------------------------------------
At time t = 9 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                                 0                  1408
Packets                                                0                     0
Errors                                                 0                     0

===============================================================================
A:7210-SAS-X>monitor#
```

# Clear Commands

## lag

**Syntax** **lag** *lag-id* **statistics**

**Context** clear

**Description** This command clears statistics for the specified LAG ID.

**Parameters** *lag-id* — The LAG ID to clear statistics.

**Values** 1 — 12

**statistics —** Specifies to clear statistics for the specified LAG ID.

## mda

**Syntax** **mda** *mda-id*

**Context** clear

**Description** This command reinitializes the specified MDA in a particular slot.

**Parameters** *mda-id* — Clears the specified slot and MDA/CMA.

**Values** mda-id: slot/mda
slot: 1
mda: 1, 2 (for 7210 SAS-M)
mda: 1 (for 7210 SAS-X)

## port

**Syntax** **port** *port-id* **statistics**

**Context** clear

**Description** This command clears port statistics for the specified port(s).

**Parameters** *port-id* — The port identifier.

**Values**

**statistics —** Specifies that port statistics will be cleared.

*slot* — The slot number.

**Values** 1

*mda* — The MDA number.

**Default** All MDAs.

**Values** 1, 2

# Debug Commands

## lag

**Syntax** **lag** [**lag-id** *lag-id* [**port** *port-id*]] [**all**]
**lag** [**lag-id** *lag-id* [**port** *port-id*]] [**sm**] [**pkt**] [**cfg**] [**red**] [**iom-upd**] [**port-state**] [**timers**] [**sel-logic**] **[mc] [mc-pkt]**
**no lag** [**lag-id** *lag-id*]

**Context** debug

**Description** This command enables debugging for LAG.

**Parameters** *lag-id* — Specifies the link aggregation group ID.

*port-id* — Specifies the physical port ID.

**sm —** Specifies to display trace LACP state machine.

**pkt —** Specifies to display trace LACP packets.

**cfg —** Specifies to display trace LAG configuration.

**red —** Specifies to display trace LAG high availability.

**iom-upd —** Specifies to display trace LAG IOM updates.

**port-state —** Specifies to display trace LAG port state transitions.

**timers —** Specifies to display trace LAG timers.

**sel-logic —** Specifies to display trace LACP selection logic.

**mc —** Specifies to display multi-chassis parameters.

**mc-pkt —** Specifies to display the MC-LAG control packets with valid authentication were received on this system.

# Standards and Protocol Support (for 7210 SAS-M, 7210 SAS-X, and 7210 SAS-T)

**NOTE:** The capabilities available when operating in access-uplink mode/L2 mode and network mode/MPLS mode are different. Correspondingly, not all the standards and protocols listed below are supported in both the modes.

## 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 802.3 10BaseT
IEEE 802.3ad Link Aggregation
IEEE 802.3ae 10Gbps Ethernet
IEEE 802.3ah Ethernet OAM
IEEE 802.3u 100BaseTX
IEEE 802.3z 1000BaseSX/LX ITU-T Y.1731 OAM functions and mechanisms for Ethernet based networks draft-ietf-disman-alarm-mib-04.txt IANA-IFType-MIB
IEEE8023-LAG-MIB ITU-T G.8032 Ethernet Ring Protection Switching (version 2)

## Protocol Support

### BGP

RFC 1397 BGP Default Route Advertisement
RFC 1772 Application of BGP in the Internet
RFC 1997 BGP Communities Attribute
RFC 2385 Protection of BGP Sessions via MD5
RFC 2439 BGP Route Flap Dampening
RFC 2547 bis BGP/MPLS VPNs draft-ietf-idr-rfc2858bis-09.txt.
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 4760 Multi-protocol Extensions for BGP
RFC 4893 BGP Support for Four-octet AS Number Space

### CIRCUIT EMULATION

RFC 4553 Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)
RFC 5086 Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)
RFC 5287 Control Protocol Extensions for the Setup of Time-Division Multiplexing (TDM) Pseudowires in MPLS Networks

### DHCP

RFC 2131 Dynamic Host Configuration Protocol (REV)
RFC 3046 DHCP Relay Agent Information Option (Option 82)

### DIFFERENTIATED SERVICES

RFC 2474 Definition of the DS Field the IPv4 and IPv6 Headers (Rev)
RFC 2597 Assured Forwarding PHB Group (rev3260)
RFC 2598 An Expedited Forwarding PHB
RFC 2697 A Single Rate Three Color Marker
RFC 2698 A Two Rate Three Color Marker
RFC 4115 A Differentiated Service Two-Rate, Three-Color Marker with Efficient Handling of in-Profile Traffic

### IPv6

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 2740 OSPF for IPv6
RFC 3587 IPv6 Global Unicast Address Format
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 5095 Deprecation of Type 0 Routing Headers in IPv6
draft-ietf-isis-ipv6-05
draft-ietf-isis-wg-multi-topology-xx.txt

### 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

**MPLS - LDP**

RFC 3037 LDP Applicability
RFC 3478 Graceful Restart Mechanism for LDP — GR helper
RFC 5036 LDP Specification
RFC 5283 LDP extension for Inter-Area LSP
RFC 5443 LDP IGP Synchronization

**MPLS - General**

RFC 3031 MPLS Architecture
RFC 3032 MPLS Label Stack Encoding
RFC 4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures
RFC 4182 Removing a Restriction on the use of MPLS Explicit NULL

**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) [ Only in 7210 SAS-M access-uplink mode ]

**NETWORK MANAGEMENT**

ITU-T X.721: Information technology-OSI-Structure of Management Information
ITU-T X.734: Information technology-OSI-Systems Management: Event Report Management Function
M.3100/3120 Equipment and Connection Models
TMF 509/613 Network Connectivity Model
RFC 1157 SNMPv1
RFC 1215 A Convention for Defining Traps for use with the SNMP
RFC 1907 SNMPv2-MIB
RFC 2011 IP-MIB
RFC 2012 TCP-MIB
RFC 2013 UDP-MIB
RFC 2096 IP-FORWARD-MIB
RFC 2138 RADIUS
RFC 2206 RSVP-MIB
RFC 2571 SNMP-FRAMEWORKMIB
RFC 2572 SNMP-MPD-MIB
RFC 2573 SNMP-TARGET-&-NOTIFICATION-MIB
RFC 2574 SNMP-USER-BASEDSMMIB
RFC 2575 SNMP-VIEW-BASEDACM-MIB
RFC 2576 SNMP-COMMUNITY-MIB
RFC 2665 EtherLike-MIB
RFC 2819 RMON-MIB
RFC 2863 IF-MIB
RFC 2864 INVERTED-STACK-MIB
RFC 3014 NOTIFICATION-LOGMIB
RFC 3164 Syslog
RFC 3273 HCRMON-MI
RFC 3411 An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks
RFC 3412 - Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)
RFC 3413 - Simple Network Management Protocol (SNMP) Applications
RFC 3414 - User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
RFC 3418 - SNMP MIB
draft-ietf-mpls-lsr-mib-06.txt
draft-ietf-mpls-te-mib-04.txt
draft-ietf-mpls-ldp-mib-07.txt

**OSPF**

RFC 1765 OSPF Database Overflow
RFC 2328 OSPF Version 2
RFC 2370 Opaque LSA Support
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 2740 OSPF for IPv6 (OSPFv3) draft-ietf-ospf-ospfv3-update-14.txt
RFC 4203 Shared Risk Link Group (SRLG) sub-TLV

**MPLS - 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 4090 Fast reroute Extensions to RSVP-TE for LSP Tunnels
RFC 5817 Graceful Shutdown in MPLS and GMPLS Traffic Engineering Networks

**PSEUDO-WIRE**

RFC 3985 Pseudo Wire Emulation Edge-to-Edge (PWE3)
RFC 4385 Pseudo Wire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN
RFC 3916 Requirements for Pseudo-Wire Emulation Edge-to-Edge (PWE3)
RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks (draft-ietf-pwe3-ethernet-encap-11.txt)
RFC 4446 IANA Allocations for PWE3

RFC 4447 Pseudowire Setup and Maintenance Using LDP (draft-ietf-pwe3-control-protocol-17.txt)
RFC 5085, Pseudowire Virtual Circuit Connectivity Verification (VCCV): A Control Channel for Pseudowires
RFC 5880 Bidirectional Forwarding Detection
RFC 5881 BFD IPv4 and IPv6 (Single Hop)
RFC 5659 An Architecture for Multi-Segment Pseudowire Emulation Edge-to-Edge
RFC6073, Segmented Pseudowire (draft-ietf-pwe3-segmented-pw-18.txt)
draft-ietf-l2vpn-vpws-iw-oam-02.txt
OAM Procedures for VPWS Interworking
draft-ietf-pwe3-oam-msg-map-14-txt, Pseudowire (PW) OAM Message Mapping
Pseudowire Preferential Forwarding Status bit definition
draft-pwe3-redundancy-02.txt
Pseudowire (PW) Redundancy

**RADIUS**

RFC 2865 Remote Authentication Dial In User Service
RFC 2866 RADIUS Accounting

**SSH**

draft-ietf-secsh-architecture.txt SSH Protocol Architecture
draft-ietf-secsh-userauth.txt SSH Authentication Protocol
draft-ietf-secsh-transport.txt SSH Transport Layer Protocol
draft-ietf-secsh-connection.txt SSH Connection Protocol
draft-ietf-secsh- newmodes.txt SSH Transport Layer Encryption Modes

**TACACS+**

draft-grant-tacacs-02.txt

**TCP/IP**

RFC 768 UDP
RFC 1350 The TFTP Protocol
RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 826 ARP
RFC 854 Telnet
RFC 1519 CIDR
RFC 1812 Requirements for IPv4 Routers
RFC 2347 TFTP option Extension
RFC 2328 TFTP Blocksize Option
RFC 2349 TFTP Timeout Interval and Transfer Size option
draft-ietf-bfd-mib-00.txt Bidirectional Forwarding Detection Management Information Base

**Timing**

ITU-T G.781 Telecommunication Standardization Section of ITU, Synchronization layer functions, issued 09/2008
ITU-T G.813 Telecommunication Standardization Section of ITU, Timing characteristics of SDH equipment slave clocks (SEC), issued 03/2003.
GR-1244-CORE Clocks for the Synchronized Network: Common Generic Criteria, Issue 3,May 2005
ITU-T G.8261 Telecommunication Standardization Section of ITU, Timing and synchronization aspects in packet networks, issued 04/2008.
ITU-T G.8262 Telecommunication Standardization Section of ITU, Timing characteristics of synchronous Ethernet equipment slave clock (EEC), issued 08/2007.
ITU-T G.8264 Telecommunication Standardization Section of ITU, Distribution of timing information through packet networks, issued 10/2008.
IEEE Std 1588™-2008, IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems.

**VPLS**

RFC 4762 Virtual Private LAN Services Using LDP (previously draft-ietf-l2vpn-vpls-ldp-08.txt)

**VRRP**

RFC 2787 Definitions of Managed Objects for the Virtual Router Redundancy Protocol
RFC 3768 Virtual Router Redundancy Protocol

**Proprietary MIBs**

ALCATEL-IGMP-SNOOPING-MIB.mib
TIMETRA-CAPABILITY-7210-SAS-M-V5v0.mib
(7210 SAS-M Only)
TIMETRA-CAPABILITY-7210-SAS-X-V5v0.mib (7210 SAS-X Only)
TIMETRA-CHASSIS-MIB.mib
TIMETRA-CLEAR-MIB.mib
TIMETRA-DOT3-OAM-MIB.mib
TIMETRA-FILTER-MIB.mib
TIMETRA-GLOBAL-MIB.mib
TIMETRA-IEEE8021-CFM-MIB.mib
TIMETRA-LAG-MIB.mib
TIMETRA-LOG-MIB.mib
TIMETRA-MIRROR-MIB.mib
TIMETRA-NTP-MIB.mib
TIMETRA-OAM-TEST-MIB.mib
TIMETRA-PORT-MIB.mib
TIMETRA-QOS-MIB.mib
TIMETRA-SAS-ALARM-INPUT-MIB.mib
TIMETRA-SAS-FILTER-MIB.mib
TIMETRA-SAS-IEEE8021-CFM-MIB.mib
TIMETRA-SAS-IEEE8021-PAE-MIB.mib
TIMETRA-SAS-GLOBAL-MIB.mib
TIMETRA-SAS-LOG-MIB.mib.mib
TIMETRA-SAS-MIRROR-MIB.mib
TIMETRA-SAS-MPOINT-MGMT-MIB.mib (Only for 7210 SAS-X)
TIMETRA-SAS-PORT-MIB.mib
TIMETRA-SAS-QOS-MIB.mib
TIMETRA-SAS-SDP-MIB.mib
TIMETRA-SAS-SYSTEM-MIB.mib
TIMETRA-SAS-SERV-MIB.mib
TIMETRA-SAS-VRTR-MIB.mib
TIMETRA-SCHEDULER-MIB.mib
TIMETRA-SECURITY-MIB.mib
TIMETRA-SERV-MIB.mib
TIMETRA-SYSTEM-MIB.mib
TIMETRA-TC-MIB.mib
TIMETRA-ISIS-MIB.mib
TIMETRA-ROUTE-POLICY-MIB.mib
TIMETRA-MPLS-MIB.mib
TIMETRA-RSVP-MIB.mib
TIMETRA-LDP-MIB.mib

TIMETRA-VRRP-MIB.mib
TIMETRA-VRTR-MIB.mib

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