Alcatel-Lucent 7705

SERVICE AGGREGATION ROUTER OS | RELEASE 2.0

INTERFACE CONFIGURATION GUIDE

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List of Acronyms

Acronym	Expansion
2G	second generation wireless telephone technology
3DES	triple DES (data encryption standard)
3G	third generation mobile telephone technology
5620 SAM	5620 Service Aware Manager
7705 SAR	7705 Service Aggregation Router
ABR	available bit rate area border router
AC	alternating current attachment circuit
ACL	access control list
ACR	adaptive clock recovery
AIS	alarm indication signal
ANSI	American National Standards Institute
Apipe	ATM VLL
ARP	address resolution protocol
AS	autonomous system
ASAP	any service, any port
ASBR	autonomous system boundary router
ATM	asynchronous transfer mode
ATM PVC	ATM permanent virtual circuit
Batt A	battery A
B-bit	beginning bit (first packet of a fragment)
Bellcore	Bell Communications Research
BFD	bidirectional forwarding detection

Acronym	Expansion
BITS	building integrated timing supply
BOF	boot options file
BRAS	Broadband Remote Access Server
BSC	Base Station Controller
BSTA	Broadband Service Termination Architecture
BTS	base transceiver station
CAS	channel associated signaling
CBN	common bonding networks
CBS	committed buffer space
CC	control channel
CE	customer edge circuit emulation
CEM	circuit emulation
CES	circuit emulation services
CESoPSN	circuit emulation services over packet switched network
CIDR	classless inter-domain routing
CIR	committed information rate
CLI	command line interface
CLP	cell loss priority
CoS	class of service
CPE	customer premises equipment
Cpipe	circuit emulation (or TDM) VLL
CPM	Control and Processing Module (CPM is used instead of CSM when referring to CSM filtering – to align with CLI syntax used with other SR products)
CPU	central processing unit
CRC	cyclic redundancy check

Acronym	Expansion
CRON	a time-based scheduling service (from chronos = time)
CSM	Control and Switching Module
CSPF	constrained shortest path first
CV	connection verification customer VLAN (tag)
CW	control word
DC	direct current
DC-C	DC return - common
DC-I	DC return - isolated
DCO	digitally controlled oscillator
DDoS	distributed DoS
DES	data encryption standard
DHCP	dynamic host configuration protocol
DNS	domain name server
DoS	denial of service
dot1q	IEEE 802.1q encapsulation for Ethernet interfaces
DPLL	digital phase locked loop
DSCP	differentiated services code point
DSL	digital subscriber line
DSLAM	digital subscriber line access multiplexer
DTE	data termination equipment
DU	downstream unsolicited
e911	enhanced 911 service
E-bit	ending bit (last packet of a fragment)
ECMP	equal cost multi-path
EFM	Ethernet in the first mile

Acronym	Expansion
EGP	exterior gateway protocol
ELER	egress label edge router
Epipe	Ethernet VLL
ERO	explicit route object
ESD	electrostatic discharge
ETE	end-to-end
EVDO	evolution - data optimized
EXP bits	experimental bits
FC	forwarding class
FCS	frame check sequence
FDB	forwarding database
FDL	facilities data link
FEC	forwarding equivalence class
FF	fixed filter
FIB	forwarding information base
FTN	FEC-to-NHLFE
FTP	file transfer protocol
GigE	Gigabit Ethernet
GRE	generic routing encapsulation
GSM	Global System for Mobile Communications (2G)
HEC	header error control
HMAC	hash message authentication code
HSDPA	high-speed downlink packet access
HSPA	high-speed packet access
IBN	isolated bonding networks
ICMP	Internet control message protocol

Acronym	Expansion
ICP	IMA control protocol cells
IEEE	Institute of Electrical and Electronics Engineers
IES	Internet Enhanced Service
IETF	Internet Engineering Task Force
IGP	interior gateway protocol
ILER	ingress label edge router
ILM	incoming label map
IMA	inverse multiplexing over ATM
IOM	input/output module
IP	Internet Protocol
IPCP	Internet Protocol Control Protocol
Ipipe	IP interworking VLL
LCP	link control protocol
LDP	label distribution protocol
LER	label edge router
LIB	label information base
LLID	loopback location ID
LSA	link-state advertisement
LSDB	link-state database
LSP	label switched path
LSR	label switch router
	link-state request
LSU	link-state update
LTN	LSP ID to NHLFE
MAC	media access control
MBB	make-before-break

Acronym	Expansion
MBS	maximum buffer space maximum burst size media buffer space
MD5	message digest version 5 (algorithm)
MDA	media dependent adapter
MEF	Metro Ethernet Forum
MFC	multi-field classification
MIB	management information base
MIR	minimum information rate
MLPPP	multilink point-to-point protocol
MP	merge point multilink protocol
MPLS	multiprotocol label switching
MRRU	maximum received reconstructed unit
MRU	maximum receive unit
MS-PW	multi-segment pseudowire
MTSO	mobile trunk switching office
MTU	maximum transmission unit multi-tenant unit
NBMA	non-broadcast multiple access (network)
NHLFE	next hop label forwarding entry
NNI	network-to-network interface
Node B	similar to BTS but used in 3G networks — term is used in UMTS (3G systems) while BTS is used in GSM (2G systems)
NSSA	not-so-stubby area
OAM	operations, administration, and maintenance
OAMPDU	OAM protocol data units

Acronym	Expansion
OC3	optical carrier, level 3
OS	operating system
OSPF	open shortest path first
OSPF-TE	OSPF-traffic extensions
OSS	operations support system
PDU	protocol data units
PDV	packet delay variation
PDVT	packet delay variation tolerance
PE	provider edge router
PHB	per-hop behavior
PHY	physical layer
PID	protocol ID
PIR	peak information rate
PLR	point of local repair
POP	point of presence
PPP	point-to-point protocol
PSN	packet switched network
PVC	permanent virtual circuit
PVCC	permanent virtual channel connection
PW	pseudowire
PWE3	pseudowire emulation edge-to-edge
QoS	quality of service
RADIUS	Remote Authentication Dial In User Service
RAN	Radio Access Network
RDI	remote defect indication
RED	random early discard

Acronym	Expansion
RIB	routing information base
RNC	Radio Network Controller
RRO	record route object
RSVP-TE	resource reservation protocol - traffic engineering
R&TTE	Radio and Telecommunications Terminal Equipment
RT	receive/transmit
RTM	routing table manager
RTN	battery return
RTP	real-time protocol
SAA	service assurance agent
SAP	service access point
SAR-8	7705 Service Aggregation Router - 8-slot chassis
SAR-F	7705 Service Aggregation Router - fixed form-factor chassis
SAToP	structure-agnostic TDM over packet
SDH	synchronous digital hierarchy
SDP	service destination point
SE	shared explicit
SFP	small form-factor pluggable (transceiver)
SHA-1	secure hash algorithm
SIR	sustained information rate
SLA	Service Level Agreement
SNMP	Simple Network Management Protocol
SNTP	simple network time protocol
SONET	synchronous optical networking
S-PE	switching provider edge router
SPE	source provider edge router

Acronym	Expansion
SPF	shortest path first
SR	service router (includes 7710 SR, 7750 SR)
SSH	secure shell
SSU	system synchronization unit
STM1	synchronous transport module, level 1
SVC	switched virtual circuit
TACACS+	Terminal Access Controller Access-Control System Plus
TCP	transmission control protocol
TDM	time division multiplexing
TLDP	targeted LDP
TLV	type length value
ToS	type of service
T-PE	terminating provider edge router
TPE	target provider edge router
TPID	tag protocol identifier
TTL	time to live
TTM	tunnel table manager
UBR	unspecified bit rate
UDP	user datagram protocol
UMTS	Universal Mobile Telecommunications System (3G)
UNI	user-to-network interface
VC	virtual circuit
VCC	virtual channel connection
VCCV	virtual circuit connectivity verification
VCI	virtual circuit identifier
VLAN	virtual LAN

Acronym	Expansion
VLL	virtual leased line
VoIP	voice over IP
VP	virtual path
VPC	virtual path connection
VPI	virtual path identifier
VPN	virtual private network
VPRN	virtual private routed network
VRF	virtual routing and forwarding table
WCDMA	wideband code division multiple access (transmission protocol used in UMTS networks)
WRED	weighted random early discard

Preface

About This Guide

This guide describes system concepts and provides configuration examples to provision CSM cards, adapter cards, and ports for the Alcatel-Lucent 7705 Service Aggregation Router.

This guide 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.

For hardware information on the 7705 SAR chassis and the adapter cards, including installation, connections, LEDs, and pinouts, refer to:

- 7705 SAR-8 Chassis Installation Guide
- 7705 SAR-F Chassis Installation Guide
- 7705 SAR 16-port T1/E1 ASAP Adapter Card Installation Guide
- 7705 SAR 8-port Ethernet Adapter Card Installation Guide
- 7705 SAR 4-port OC3/STM1 Adapter Card Installation Guide

Audience

This guide is intended for network administrators who are responsible for configuring the 7705 SAR. It is assumed that the network administrators have an understanding of networking principles and configurations, routing processes, and protocols and standards, including:

- CLI concepts
- adapter card and port configuration
- QoS policies
- services

List of Technical Publications

The 7705 SAR OS documentation set is composed of the following guides:

- 7705 SAR OS Basic System Configuration Guide

  This guide describes basic system configurations and operations.
- 7705 SAR OS System Management Guide

  This guide describes system security and access configurations as well as event logging and accounting logs.
- 7705 SAR OS Interface Configuration Guide

  This guide describes card and port provisioning.
- 7705 SAR OS Router Configuration Guide

  This guide describes logical IP routing interfaces, IP-based filtering, and routing policies.
- 7705 SAR OS MPLS Guide

  This guide describes how to configure Multiprotocol Label Switching (MPLS), Resource Reservation Protocol for Traffic Engineering (RSVP-TE), and Label Distribution Protocol (LDP).
- 7705 SAR OS Services Guide

  This guide describes how to configure service parameters such as service access points (SAPs), service destination points (SDPs), customer information, user services, and Operations, Administration and Maintenance (OAM) tools.
- 7705 SAR OS Quality of Service Guide

  This guide describes how to configure Quality of Service (QoS) policy management.
- 7705 SAR OS Routing Protocols Guide

  This guide provides an overview of dynamic routing concepts and describes how to configure them.

Technical Support

If you purchased a service agreement for your 7705 SAR 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 CSM cards, adapter cards, and ports.

Alcatel-Lucent 7705 SAR Interface Configuration Process

Table 1 lists the tasks necessary to provision CSM cards, adapter cards, 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	Configuring the IOM and Card Slot on page 26
	Adapter cards	Configuring Adapter Cards on page 27
	Ports	Configuring Ports on page 29
Reference	List of IEEE, IETF, and other proprietary entities	Standards and Protocol Support on page 221

Notes on 7705 SAR-8 and 7705 SAR-F

The 7705 SAR-8 and the 7705 SAR-F run the same operating system software. The main difference between the products is their hardware configuration. The 7705 SAR-8 has an 8-slot chassis that supports two CSMs, six adapter cards, and a Fan module. The 7705 SAR-F chassis has a fixed hardware configuration, replacing the 7705 SAR-8 physical components (the CSM, Fan module, and adapter cards) with an all-in-one unit that provides comparable functional blocks, as detailed in Table 2.

The fixed configuration of the 7705 SAR-F means that provisioning the router at the "card slot" and "type" levels is preset and is not user-configurable. Operators begin configurations at the port level.

Note: Unless stated otherwise, references to the terms "Adapter card" and "CSM" throughout the 7705 SAR OS documentation set include the equivalent functional blocks on the 7705 SAR-F.

Table 2: 7705 SAR-8 and 7705 SAR-F Comparison

7705 SAR-8	7705 SAR-F	Notes
CSM	Control and switching functions	The control and switching functions include the console and management interfaces, the alarm and fan functions, the synchronization interfaces, system LEDs, and so on.
Fan module	Integrated with the control and switching functions	
16-port T1/E1 ASAP Adapter card	16 individual T1/E1 ports on the faceplate	The T1/E1 ports on the 7705 SAR-F are equivalent to the T1/E1 ports on the 16-port T1/E1 ASAP Adapter card, except that the 16 T1/E1 ports on the 7705 SAR-F support multiple synchronization sources to support two timing references. On the 7705 SAR-8, the CLI indicates the MDA type for the 16-port T1/E1 ASAP Adapter card as `a16-chds1`. On the 7705 SAR-F, the CLI indicates the MDA type for the 7705 SAR-F ports as `a16-chds1v2`.

Table 2: 7705 SAR-8 and 7705 SAR-F Comparison (Continued)

7705 SAR-8	7705 SAR-F	Notes
8-port Ethernet Adapter card	8 individual Ethernet ports on the faceplate	The –48 VDC versions of the 7705 SAR-8 support two versions of the 8-port Ethernet Adapter card, with version 2 having additional support for Synchronous Ethernet. The Ethernet ports on the 7705 SAR-F are equivalent to the Ethernet ports on version 2 of the 8-port Ethernet Adapter card and support multiple synchronization sources to support two timing references. The +24 VDC version of the 7705 SAR-8 only supports version 2 of the 8-port Ethernet Adapter card. On the 7705 SAR-8, the CLI indicates the MDA type for the 8-port Ethernet Adapter card as `a8-eth` or `a8-ethv2`. On the 7705 SAR-F, the CLI indicates the MDA type for the 7705 SAR-F Ethernet ports as `a8-ethv3`, to distinguish it from the actual version 2 of the 8-port Ethernet Adapter card.
Requires user configuration at card (IOM) and MDA (adapter card) levels	Configuration at card (IOM) and MDA (adapter card) levels is preset and users cannot change these types	

7705 SAR Interfaces

In This Chapter

This chapter provides information about configuring chassis slots, cards, and ports.

Topics in this chapter include:

Configuration Overview

This guide uses the term “preprovisioning” in the context of preparing or preconfiguring entities such as chassis slots, the IOM, adapter cards, ports, and interfaces, prior to hardware actually being installed in the chassis. These entities can be installed but not enabled. When the entity is in a `no shutdown` state (administratively enabled), the entity is considered to be provisioned.

Alcatel-Lucent 7705 SAR routers provide the capability to configure chassis slots to accept specific adapter card types and set the relevant configurations before the equipment is actually installed. The preprovisioning ability allows you to plan your configurations as well as monitor and manage your router hardware inventory. Ports and interfaces can also be preprovisioned. When the functionality is needed, the card(s) can be inserted into the appropriate chassis slots as required.

The following sections are discussed:

- Configuring the IOM and Card Slot
- Configuring Adapter Cards
- Configuring Ports

Configuring the IOM and Card Slot

The 7705 SAR card slot ID is always **1** and the card type for the IOM is always **iom-1g**.

On the 7705 SAR-8, the CSM, which can only be installed in slot A or B of the chassis, does not need to be provisioned. However, the IOM, which is virtualized in the 7705 SAR software, must be activated before the adapter cards and ports can be preprovisioned and configured. The IOM is activated by designating it a card slot ID and card type. This enables the chassis slots to accept the adapter cards.

The 7705 SAR-F has a fixed physical configuration and uses only one control and switching functional block, which is referred to on the CLI as CSM A. The CSM and IOM do not need to be provisioned in order to provision the T1/E1 and Ethernet ports.

The slot ID (1) is used as part of the adapter card and port identifier on the CLI.

Configuring Adapter Cards

A chassis slot and card type must be specified and provisioned before an adapter card can be preprovisioned. A chassis slot is a physical slot designated with an MDA ID from 1 to 6. An adapter card is provisioned when a type designated from the allowed adapter card types is inserted. A preprovisioned adapter card slot can remain empty without conflicting with populated slots.

The 7705 SAR-8 supports the following adapter cards:

- 16-port T1/E1 ASAP Adapter card
- 8-port Ethernet Adapter cards (version 1 and version 2)
- 4-port OC3/STM1 Clear Channel Adapter card

The 7705 SAR-8 supports up to six adapter cards: any combination of T1/E1 ASAP Adapter cards, Ethernet Adapter cards, or OC3/STM1 Clear Channel Adapter cards. These cards may be installed in the chassis in any combination that does not exceed the supported number.

Once installed and enabled, the system verifies that the installed adapter card type matches the configured parameters. If the parameters do not match, the adapter card remains offline.

On the CLI, the adapter cards are referred to as MDAs. The adapter card is identified using the format *slot/mda*, where *slot* identifies the IOM card slot ID (always 1) and *mda* identifies the physical slot in the chassis for the adapter card; for example, 1/5.

The 7705 SAR-F has a fixed physical configuration that includes T1/E1 and Ethernet ports based on the 16-port T1/E1 ASAP Adapter card and the 8-port Ethernet Adapter card (version 2). These cards do not need to be provisioned in order to provision the T1/E1 and Ethernet ports.

The following output displays the administrative and operational states of all cards in the 7705 SAR-8 chassis. A similar output for the 7705 SAR-F is also shown.

For the 7705 SAR-8:

```
ALU-1>config# show card state

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-1g           iom-1g           up    up                  6
1/1    a4-oc3                            up    provisioned   4
1/2    a4-oc3                            up    provisioned   4
1/3    a16-chds1        a16-chds1        up    failed        16
1/4    a16-chds1        a16-chds1        up    failed        16
1/5    a8-eth           a8-eth           up    up            8
1/6    a8-eth           a8-eth           up    up            8
A      csm-1g           csm-1g           up    up                      Active
B      csm-1g                            up    down                    Standby
===============================================================================
ALU-1>config#
```

For the 7705 SAR-F:

```
ALU-1# show card

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-1g           iom-1g           up    up            2
1/1    a16-chds1v2      a16-chds1v2      up    provisioned   16
1/2    a8-ethv3         a8-ethv3         up    provisioned   8
A      csm-1g           csm-1g           up    up                      Active
 ===============================================================================
ALU-1#
```

Channelized Adapter Card Support

Each 16-port T1/E1 ASAP Adapter card supports channelization down to DS0. Up to 24 channel groups are supported on a DS1 circuit and up to 32 channel groups on an E1 circuit.

Configuring Ports

Before a port can be configured, the slot must be provisioned with a card type and the adapter card type must be specified.

The 7705 SAR supports the following port types:

- Ethernet — the 8-port Ethernet Adapter cards have six RJ-45 ports for 10/100BASE-T (Ethernet and Fast Ethernet) connections. The cards also have two SFP ports for fiber or copper SFPs. Fast Ethernet and Gigabit (100 Mb/s and 1000 Mb/s) fiber connections and 10/100/1000BASE-T copper connections are supported. This variety of connections enables the Ethernet Adapter card to be connected to different devices at the customer site, including wireless basestations, DSL modems, microwave boxes, and other auxiliary equipment. As well, with fiber connections, the adapter card can be directly connected to the Metro Ethernet Provider (MEP) central office. Version 2 of the 8-port Ethernet Adapter card also supports synchronous Ethernet timing.
- TDM — the 16-port T1/E1 ASAP Adapter card supports TDM ports that can be configured for DS1 or E1 operation. The card supports channelization down to the DS0 level. All ports must be either T1 or E1; there cannot be a mix of the two types. When the first port is configured, all other ports on the card must be set to the same type. To change types, all ports must first be shut down.
- multilink bundles — the 16-port T1/E1 ASAP Adapter card supports multilink bundles. A multilink bundle is a collection of channels on channelized ports that physically reside on the same adapter card. Multilink bundles are used by providers who offer either bandwidth-on-demand services or fractional bandwidth (DS3 or E3) services. Multilink bundles are supported over PPP channels (MLPPP).
- IMA — the 16-port T1/E1 ASAP Adapter card supports Inverse Multiplexing over ATM (IMA). IMA is a standard developed to address the increasing need for bandwidth greater than the DS1 or E1 link speeds (1.544 or 2.048 Mb/s, respectively) but less than higher link speeds such as DS3 (44.736 Mb/s). IMA combines the transport bandwidth of multiple DS1 or E1 channels in a logical link (called an IMA group) to provide scalable bandwidth.
- SONET/SDH ports— the 4-port OC3/STM1 Clear Channel Adapter card has four hot-pluggable SFP-based ports that can be independently configured to be SONET (OC3) or SDH (STM1)

On the CLI, a port is identified using the format *slot/mda/port*, where *slot* identifies the IOM card slot ID (always 1), *mda* identifies the physical slot in the chassis for the adapter card, and *port* identifies the physical port on the adapter card; for example, 1/5/1.

Channelized ports are identified using the format *slot/mda/port.channel-group-id*, where *slot* identifies the IOM card slot ID (always 1), *mda* identifies the physical slot in the chassis for the adapter card, *port* identifies the physical port on the adapter card, and *channel-group-id* identifies the DS1 or E1 channel group ID; for example, 1/5/1.20.

Multilink bundles and IMA groups are identified using the format **bundle**-*type-slot/mda.bundle-num*; for example, bundle-ima-1/5.2.

Access and Network Ports

All ports on adapter cards must be set to either access (customer-facing) or network mode:

- access ports — configured for customer-facing traffic on which services are configured. If a Service Access Point (SAP) is to be configured on the port or channel, the port or channel must be configured as an access port or channel. When a port is configured for access mode, the appropriate encapsulation type must be configured to distinguish the services on the port or channel. Once a port has been configured for access mode, one or more services can be configured on the port or channel depending on the encapsulation value.
- network ports — configured for network-facing traffic. Network ports are used as uplinks for Ethernet, ATM, and TDM pseudowires. For Ethernet cards, the encapsulation type can be set as null or dot1q.

All channel groups on a port must either be all access or all network channel groups; there cannot be a mix. When the first channel group is configured, all other channel groups on that port must be set to the same mode. To change modes, all channel groups must first be shut down.

The default mode for the T1/E1 ASAP Adapter card is access, and the default mode for the Ethernet Adapter card is network. In Release 2.0, the OC3/STM1 Adapter card supports access mode only.

Access Ports

Access ports on the Ethernet Adapter card can transport traffic from sources such as e911 locators, site surveillance equipment, VoIP phones, and video cameras. The Ethernet traffic is transported over the PSN using Ethernet VLLs.

Access ports on the T1/E1 ASAP card can be configured for PPP/MLPPP channel groups. Customer IP traffic can be transported directly over PPP or MLPPP links. The access ports can also be configured for TDM to transport 2G traffic from BTSs or ATM/IMA to transport 3G UMTS traffic from Node Bs. All member links of the IMA group must reside on the same card. The 2G traffic is transported across the PSN encapsulated in a TDM VLL. The 3G traffic is transported using ATM VLLs.

For PPP/MLPPP channel groups, the encapsulation type must be ipcp. For TDM VLLs, the encapsulation type must be cem. For ATM VLLs, the encapsulation type must be atm.

Note: For information on VLLs, refer to the 7705 SAR OS Services Guide.

In access mode, PPP channels on the T1/E1 ASAP Adapter card can be associated with n × DS0 channel groups. Although multiple PPP channel groups are supported per T1/E1 port, all the channel groups must be the same encapsulation type. For example, if one channel group on a given port is set for ipcp encapsulation, another channel group on the same port cannot be set to cem.

If MLPPP channels are used, an MLPPP channel group fills up an entire DS1 or E1 link.

SONET/SDH ports in access mode on a 4-port OC3/STM1 Clear Channel Adapter card can be configured for ATM (such as for 3G UMTS Node Bs). The encapsulation type is atm.

Network Ports

For network uplinks on the T1/E1 ASAP card, standalone PPP ports can be used or MLPPP can be configured on a number of T1/E1 ports. For MLPPP groups, all member links of an MLPPP group must reside on the same card and be of the same type (either E1 or DS1). The encapsulation type for MLPPP must be ppp-auto.

Ethernet uplinks can also be used as a cost-effective alternative to T1/E1 links.

The 7705 SAR supports both copper and fiber uplinks on the Ethernet Adapter card.

Rate Limiting on Network Ethernet Ports

The 7705 SAR supports egress rate limiting on uplink Ethernet ports. Rate limiting sets a hard limit on the amount of traffic that can leave the Ethernet port, which is useful when a mobile operator has leased a fixed amount of bandwidth.

Port Features

Multilink Point-to-Point Protocol

Multilink point-to-point protocol (MLPPP) is a method of splitting, recombining, and sequencing packets across multiple logical data links. MLPPP is defined in the IETF RFC 1990, *The PPP Multilink Protocol (MP)*.

MLPPP allows multiple PPP links to be bundled together, providing a single logical connection between two routers. Data can be distributed across the multiple links within a bundle to achieve high bandwidth. As well, MLPPP allows for a single frame to be fragmented and transmitted across multiple links. This capability allows for lower latency and also for a higher maximum receive unit (MRU).

Multilink protocol is negotiated during the initial LCP option negotiations of a standard PPP session. A system indicates to its peer that it is willing to perform MLPPP by sending the MP option as part of the initial LCP option negotiation. The system indicates the following capabilities.

- The system offering the option is capable of combining multiple physical links into one logical link.
- The system is capable of receiving upper layer protocol data units (PDUs) that are fragmented using the MP header and then reassembling the fragments back into the original PDU for processing.
- The system is capable of receiving PDUs of size N octets, where N is specified as part of the option, even if N is larger than the maximum receive unit (MRU) for a single physical link.

Once MLPPP has been successfully negotiated, the sending system is free to send PDUs encapsulated and/or fragmented with the MP header.

MP introduces a new protocol type with a protocol ID (PID) of 0x003d. Figure 1 and Figure 2 show the MLPPP fragment frame structure. Framing to indicate the beginning and end of the encapsulation is the same as that used by PPP and described in RFC 1662, *PPP in HDLC-like framing*.

MP frames use the same HDLC address and control pair value as PPP: Address – 0xFF and Control – 0x03. The 2-octet protocol field is also structured the same way as in PPP encapsulation.

Figure 1: MLPPP 24-bit Fragment Format

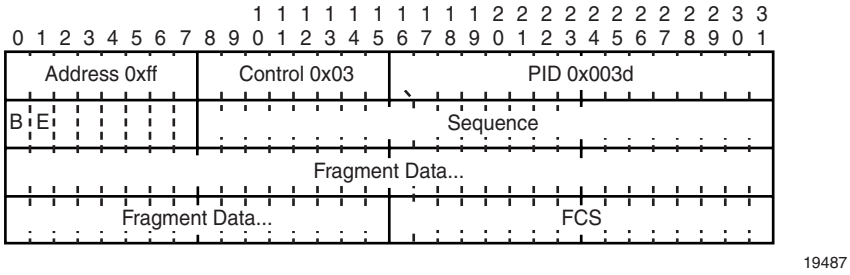
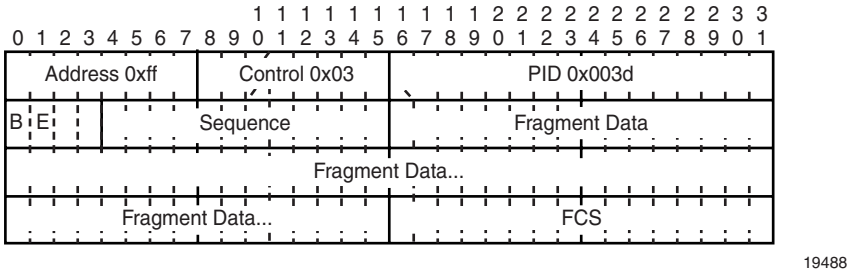


Figure 2: MLPPP 12-bit Fragment Format



The required and default format for MP is the 24-bit format. During the LCP state, the 12-bit format can be negotiated. The 7705 SAR is capable of supporting and negotiating the alternate 12-bit frame format.

The maximum differential delay supported for MLPPP is 25 ms.

Protocol Field (PID)

The protocol field is two octets. Its value identifies the datagram encapsulated in the Information field of the packet. In the case of MP, the PID also identifies the presence of a 4-octet MP header (or 2-octet, if negotiated).

A PID of 0x003d identifies the packet as MP data with an MP header.

The LCP packets and protocol states of the MLPPP session follow those defined by PPP in RFC 1661. The options used during the LCP state for creating an MLPPP NCP session are described below.

B&E Bits

The B&E bits are used to indicate the start and end of a packet. Ingress packets to the MLPPP process will have an MTU, which may or may not be larger than the maximum received reconstructed unit (MRRU) of the MLPPP network. The B&E bits manage the fragmentation of ingress packets when the packet exceeds the MRRU.

The B-bit indicates the first (or beginning) packet of a given fragment. The E-bit indicates the last (or ending) packet of a fragment. If there is no fragmentation of the ingress packet, both B&E bits are set to true (=1).

Sequence Number

Sequence numbers can be either 12 or 24 bits long. The sequence number is 0 for the first fragment on a newly constructed bundle and increments by one for each fragment sent on that bundle. The receiver keeps track of the incoming sequence numbers on each link in a bundle and reconstructs the desired unbundled flow through processing of the received sequence numbers and B&E bits. For a detailed description of the algorithm, refer to RFC 1990.

Information Field

The Information field is zero or more octets. The Information field contains the datagram for the protocol specified in the protocol field.

The MRRU will have the same default value as the MTU for PPP. The MRRU is always negotiated during LCP.

Padding

On transmission, the Information field of the ending fragment may be padded with an arbitrary number of octets up to the MRRU. It is the responsibility of each protocol to distinguish padding octets from real information. Padding must only be added to the last fragment (E-bit set to true).

FCS

The FCS field of each MP packet is inherited from the normal framing mechanism from the member link on which the packet is transmitted. There is no separate FCS applied to the reconstituted packet as a whole if it is transmitted in more than one fragment.

LCP

The Link Control Protocol (LCP) is used to establish the connection through an exchange of configure packets. This exchange is complete, and the LCP opened state entered, once a Configure-Ack packet has been both sent and received.

LCP allows for the negotiation of multiple options in a PPP session. MP is somewhat different from PPP, and therefore the following options are set for MP and are not negotiated:

- no async control character map
- no magic number
- no link quality monitoring
- address and control field compression
- protocol field compression
- no compound frames
- no self-describing padding

Any non-LCP packets received during this phase must be silently discarded.

T1/E1 Link Hold Timers

T1/E1 link hold timers (or MLPPP link flap dampening) guard against the node reporting excessive interface transitions. Timers can be set to determine when link up and link down events are advertised; that is, up-to-down and down-to-up transitions of the interface are not advertised to upper-layer protocols (are dampened) until the configured timer has expired.

Inverse Multiplexing Over ATM (IMA)

IMA is a cell-based protocol where an ATM cell stream is inverse-multiplexed and demultiplexed in a cyclical fashion among ATM-supporting channels to form a higher bandwidth logical link. This logical link is called an IMA group. By grouping channels into an IMA group, customers gain bandwidth management capability at in-between rates (for example, between DS1 and DS3 or between E1 and E3) through the addition or removal of channels to or from the IMA group.

The 7705 SAR supports the IMA protocol as specified by the *Inverse Multiplexing for ATM (IMA) Specification* version 1.1.

In the ingress direction, traffic coming over multiple ATM channels configured as part of a single IMA group is converted into a single ATM stream and passed for further processing to the ATM layer, where service-related functions (for example, Layer 2 traffic management or feeding into a pseudowire) are applied. In the egress direction, a single ATM stream (after service functions are applied) is distributed over all paths that are part of an IMA group after ATM layer processing takes place.

An IMA group interface compensates for differential delay and allows for only a minimal cell delay variation. The maximum differential delay supported for IMA is 75 ms.

The interface deals with links that are added or deleted, or that fail. The higher layers see only an IMA group and not individual links; therefore, service configuration and management is done using IMA groups, and not individual links that are part of it.

The IMA protocol uses an IMA frame as the unit of control. An IMA frame consists of a series of 128 consecutive cells. In addition to ATM cells received from the ATM layer, the IMA frame contains IMA OAM cells. Two types of cells are defined: IMA Control Protocol (ICP) cells and IMA filler cells. ICP cells carry information used by the IMA protocol at both ends of an IMA group (for example, IMA frame sequence number, link stuff indication, status and control indication, IMA ID, Tx and Rx test patterns, version of the IMA protocol). A single ICP cell is inserted at the ICP cell offset position (the offset may be different on each link of the group) of each frame. Filler cells are used by the transmitting side to fill up each IMA frame in case there are not enough ATM stream cells from the ATM layer, so a continuous stream of cells is presented to the physical layer. Those cells are then discarded by the receiving end. IMA frames are transmitted simultaneously on all paths of an IMA group, and when they are received out of sync at the other end of the IMA group link, the receiver compensates for differential link delays among all paths.

Network Synchronization on Ports

The 7705 SAR provides network synchronization on T1/E1, SONET/SDH, and Ethernet ports as described in the sections that follow.

Network Synchronization on T1/E1 and Ethernet Ports

T1/E1 ports or synchronous Ethernet ports configured for line timing provide the best synchronization performance through a synchronization distribution network. Line timing mode derives an 8 KHz clock from the framing of T1/E1 that can be used as an accurate reference for nodes in a network. This mode is immune to any packet delay variation (PDV) occurring on Layer 2 or Layer 3 links. Line timing is supported on the 7705 SAR-F T1/E1 ports and Ethernet SFP ports with SFPs that support Synchronous Ethernet. On the 7705 SAR-8, line timing is supported by the 16-port ASAP Adapter card and by the 8-port Ethernet v2 card on two Ethernet SFP ports with SFPs that support Synchronous Ethernet**.**

Synchronous Ethernet is a variant of line timing supported on the 7705 SAR-8 with an Ethernet v2 Adapter card and on the 7705 SAR-F on Ethernet SFP ports with SFPs that support Synchronous Ethernet. When synchronous Ethernet is enabled, the operator can select an Ethernet port as a candidate timing reference. The recovered timing from this port is then used to time the system. This ensures that any of the system outputs are locked to a stable, traceable frequency source.

Network Synchronization on SONET/SDH Ports

Each SONET/SDH port can be looped-timed (that is, recovered from an Rx line) or node-timed (that is, recovered from the SSU in the active CSM).

A SONET/SDH port’s receive clock rate can be used as a synchronization source for the node.

Flow Control on Ethernet Ports

IEEE 802.3x Flow Control, which is the process of pausing the transmission based on received pause frames, is supported on Fast Ethernet and Gigabit Ethernet ports. In the transmit direction, the Ethernet ports generate pause frames if the buffer occupancy reaches critical values or if port FIFOs are overloaded. Pause frame generation is automatically handled by the Ethernet Adapter card when the system-wide constant thresholds are exceeded. The generation of pause frames ensures that newly arriving frames still can be processed and queued, mainly to maintain the SLA agreements.

If autonegotiation is on for an Ethernet port, enabling and disabling of IEEE 802.3x Flow Control is autonegotiated for receive and transmit directions separately. If autonegotiation is turned off, the reception and transmission of IEEE 802.3x Flow Control is enabled by default and cannot be disabled.

Ethernet OAM

802.3ah Clause 57 (EFM OAM) defines the Operations, Administration, and Maintenance (OAM) sublayer, which is a link level Ethernet OAM that is supported on 7705 SAR Ethernet ports configured as network ports. It provides mechanisms for monitoring link operations such as remote fault indication and remote loopback control. Ethernet OAM gives network operators the ability to monitor the health status of Ethernet links and quickly determine the location of failing links or fault conditions.

Because some of the sites where the 7705 SAR will be deployed will only have Ethernet uplinks, this OAM functionality is mandatory. For example, mobile operators must be able to request remote loopbacks from the peer router at the Ethernet layer in order to debug any connectivity issues. EFM OAM provides this capability.

EFM OAM is supported on network Ethernet ports only. The access ports can be configured to tunnel the OAM traffic originated by the far-end devices.

EFM OAM has the following characteristics.

- All EFM OAM, including loopbacks, operate on point-to-point links only.
- EFM loopbacks are always line loopbacks (line Rx to line Tx).
- When a port is in loopback, all frames (except EFM frames) are discarded. If dynamic signaling and routing is used (dynamic LSPs, OSPF routing), all services also go down. If all signaling and routing protocols are static (static routes, LSPs, and service labels), the frames are discarded but services stay up.

The following EFM OAM functions are supported:

- OAM capability discovery
- configurable transmit interval with an Information OAM PDU
- active or passive mode
- OAM loopback
- OAM PDU tunneling (for Epipe service)

For information on Epipe service, refer to the 7705 SAR OS Services Guide.

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.

OAM PDUs are slow protocol frames that contain appropriate control and status information used to monitor, test, and troubleshoot OAM-enabled links.

When a port is in local loopback mode (the far end requested an Ethernet OAM loopback), any packets received on the port will be looped back, except for EFM OAM PDUs. No data will be transmitted from the node; only data that is received on the node will be sent back out.

When the node is in remote loopback mode, local data from the CSM is transmitted, but any data received on the node is dropped, except for EFM OAM PDUs.

Remote loopbacks should be used with caution; if dynamic signaling and routing protocols are used, all services go down when a remote loopback is initiated. If only static signaling and routing is used, the services stay up. On the 7705 SAR, the Ethernet port can be configured to accept or reject the remote-loopback command.

802.3ah OAM PDU Tunneling for Epipe Service

Customers who subscribe to Epipe service might have customer equipment running 802.3ah at both ends. That is why the 7705 SAR is configured to tunnel received OAM PDUs to the other end through the existing network using MPLS or GRE. This is the default functionality and is not user-configurable.

Note: This feature applies only to port-based Epipe SAPs because 802.3ah runs at port level, not at VLAN level.

For example, the OAM PDU could be generated by a tester or end-user device at the MTSO end to test the whole circuit. The only way to ensure that the OAM traffic is transported from the MTSO to the site is through the use of Ethernet pseudowires to tunnel the OAM traffic.

MTU Configuration Guidelines

Because of all the services overhead (that is, pseudowire/VLL, MPLS tunnel, dot1q and dot1p overhead), it is crucial that configurable variable frame size be supported for end-to-end service delivery.

Observe the following general rules when planning your service and physical Maximum Transmission Unit (MTU) configurations.

- The 7705 SAR must contend with MTU limitations at many service points. The physical (access and network) port, service, and SDP MTU values must be individually defined.
- The ports that will be designated as network ports intended to carry service traffic must be identified.
- MTU values should not be modified frequently.
- 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

For information on configuring the MTU for access and network ports, SDP path, and service, refer to the 7705 SAR OS Services Guide.

For the Ethernet Adapter card, all received frames on an ingress network or access port are policed against 1576 bytes (1572 + 4 bytes of FCS), regardless of the port MTU. Any frames longer than 1576 bytes are discarded and the “Too Long Frame” and “Error Stats” counters in the port statistics menu are incremented.

At network egress, Ethernet frames are policed against the configured port MTU. If the frame exceeds the configured port MTU, the “interface out discards” counter in the port statistics menu is incremented.

IP Fragmentation

IP fragmentation is used to fragment a packet that is larger than the MTU of the egress interface, so that the packet can be transported over that interface.

The router fragments or discards the IP packets based on whether the DF (Do not fragment) bit is set in the IP header. If the packet that exceeds the MTU cannot be fragmented, the packet is discarded and an ICMP message “Fragmentation Needed and Don’t Fragment was Set” is sent back to the source IP address.

Default MTU Values

Table 3 displays the default and maximum port MTU values that are dependent upon the port type, mode, and encapsulation type.

Table 3: MTU Default Values

Port Type	Mode	Encap Type	Default (bytes)	Max MTU (bytes)
10/100 Ethernet	Access/Network	null	1514	1514 (access) 1572 (network)
10/100 Ethernet	Access/Network	dot1q	1518	1518 (access) 1572 (network)
GigE SFP	Access/Network	null	1572	1572
GigE SFP	Access/Network	dot1q	1572	1572
TDM (PW)	Access	cem	1572	1572
TDM (ATM PW)	Access	atm	1572	1572
TDM (PPP/MLPPP)	Network	ppp-auto	1572	1572
TDM (PPP/MLPPP)	Access	ipcp	1572	1572

For more information on MTU (in particular, as they apply to services), refer to the 7705 SAR OS Services Guide. For information on encapsulation, refer to the 7705 SAR OS Quality of Service Guide.

Deploying Preprovisioned Components

When a CSM or adapter card is installed in a preprovisioned slot, the system tests for discrepancies between the preprovisioned card and card type configurations and the types actually installed. Error messages display if there are inconsistencies, and the card will not initialize.

When the proper preprovisioned cards are installed into the appropriate chassis slot, alarm, status, and performance details will be displayed on the CLI.

Configuration Notes

The following information describes provisioning caveats.

- The IOM can only be designated slot 1 of the chassis.
- An IOM must be preprovisioned to accept specific adapter card types; the card type is always iom-1g.

  If an adapter card type is installed in a slot provisioned for a different type, the card will not initialize.
- An adapter card installed in an unprovisioned slot remains administratively and operationally down until the IOM software is activated and the MDA slot and type is specified.
- Ports cannot be provisioned until the IOM software is activated and the MDA type is specified.

Reference Sources

For information on supported IETF drafts and standards as well as standard and proprietary MIBS, refer to Standards and Protocol Support on page 221.

Configuring Physical Components with CLI

This section provides information to configure cards, adapter cards, and ports.

Topics in this section include:

Preprovisioning Guidelines

The 7705 SAR has two ports on the chassis to connect terminals for management access: a console port for a terminal connection and a management port for a Telnet connection.

The console port is used to configure parameters locally through a direct connection from a system console. The management port is used to configure parameters remotely through a connection to a remote workstation, using Telnet or SSH to open a secure shell connection.

For more information on management connections, refer to the 7705 SAR Chassis Installation Guide.

Predefining Entities

In order to initialize an adapter card, the IOM type and adapter card type must match the preprovisioned parameters. In this context, preprovisioning means to configure the entity type (IOM type, adapter card type, port, and interface) that is planned for an adapter card. 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 preprovision ports and interfaces after the IOM is activated (card slot and card type are designated) and adapter card types are specified.

Preprovisioning a Port

Before a port can be configured, the slot must be preprovisioned with an allowed card type and the adapter card slot must be preprovisioned with an allowed adapter card type.

Other recommendations include:

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

    An encapsulation type must be specified in order to distinguish services on the access port. Encapsulation types must also be specified for network ports. By default, the encapsulation type for Ethernet ports in network mode is null.

- Channelized
  - → Channelized ports can only be configured on the T1/E1 ASAP Adapter card.
  - → Configure an access port for customer-facing traffic on which services are configured.
  - → Configure a network port for uplink traffic.

    An encapsulation type must be specified in order to distinguish services on the access port or channel. For network mode, the encapsulation type is set to ppp-auto and cannot be changed.

Maximizing Bandwidth Use

For T1/E1 ASAP Adapter cards, once ports are preprovisioned, multilink bundles (MLPPP) or IMA groups can be configured to increase the bandwidth available between two nodes. Up to eight links can be bundled in an IMA group or MLPPP bundle. All physical links or channels in a given bundle or group combine to form one logical connection. A bundle or group also provides redundancy in case one or more links that participate in the bundle fail. For command syntax, see Configuring Multilink PPP Bundles on page 61. To configure channelized ports for TDM, see Configuring Channelized Ports on page 56.

Basic Configuration

The basic 7705 SAR OS interface configuration must include the following tasks:

- identify chassis slot (step in activating the IOM)
- specify card type (step in activating the IOM)
- identify adapter card (MDA) slot
- specify adapter card type (must be an allowed adapter card type)
- identify specific port to configure

The following example displays some card and port configurations.

```
ALU-A>config# info
. . .
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
    card 1
        card-type iom-1g
        mda 1
            mda-type a4-oc3
            no fabric-stats-enabled
            network
                ingress
                    fabric-policy 1
                    queue-policy "default"
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
            no shutdown
        exit
        mda 2
            mda-type a4-oc3
            no fabric-stats-enabled
            network
                ingress
                    fabric-policy 1
                    queue-policy "default"
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
            no shutdown
        exit
        mda 4
            mda-type a16-chds1
            clock-mode adaptive
```

```
            no fabric-stats-enabled
            network
                ingress
                    fabric-policy 1
                    queue-policy "default"
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
            no shutdown
        exit
        mda 5
            mda-type a8-eth
            no fabric-stats-enabled
            network
                ingress
                    fabric-policy 1
                    queue-policy "default"
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
            no shutdown
        exit
        mda 6
            mda-type a8-eth
            no fabric-stats-enabled
            network
                ingress
                    fabric-policy 1
                    queue-policy "default"
                exit
            exit
            access
                ingress
                    fabric-policy 1
                exit
            exit
            no shutdown
        exit
        no shutdown
    exit
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
    port 1/1/1
        shutdown
        description "OC-3 SONET/SDH"
        sonet-sdh
            framing sonet
            clock-source node-timed
            no hold-time
            no loopback
```

```
            report-alarm loc lrdi lb2er-sf slof slos
            no report-alarm lais lb2er-sd lrei
            threshold ber-sd rate 6
            threshold ber-sf rate 3
            section-trace byte 0x1
            no single-fiber
        exit
        ddm-events
    exit
    port 1/1/2
        shutdown
        description "OC-3 SONET/SDH"
        sonet-sdh
            framing sonet
            clock-source node-timed
            no hold-time
            no loopback
            report-alarm loc lrdi lb2er-sf slof slos
            no report-alarm lais lb2er-sd lrei
            threshold ber-sd rate 6
            threshold ber-sf rate 3
            section-trace byte 0x1
            no single-fiber
        exit
        ddm-events
    exit
    port 1/1/4
        shutdown
        description "SONET/SDHAccessPort"
        sonet-sdh
            framing sonet
            clock-source node-timed
            no hold-time
            no loopback
            report-alarm loc lrdi lb2er-sf slof slos
            no report-alarm lais lb2er-sd lrei
            threshold ber-sd rate 6
            threshold ber-sf rate 3
            section-trace byte 0x1
            no single-fiber
            path
                description "STS3"
                encap-type atm
                no mtu
                crc 32
                scramble
                trace-string "ALU 7705 SAR"
                report-alarm plop pplm puneq
                no report-alarm pais prdi prei
                signal-label 0x13
                atm
                    cell-format uni
                    min-vp-vpi 0
                exit
                no shutdown
            exit
        exit
        ddm-events
    exit
```

```
port 1/3/1
    shutdown
    description "DS1/E1"
    tdm
        e1
            shutdown
            framing g704
            no loopback
            clock-source node-timed
            no signal-mode
            report-alarm ais los
            no report-alarm oof rai looped ber-sd ber-sf
            no hold-time
                shutdown
                description "DS0GRP"
                encap-type ipcp
                no mtu
                timeslots 2-5
                crc 16
                idle-cycle-flag flags
                no scramble
                ppp
                    keepalive 10 dropcount 3
                exit
            exit
        exit
        line-impedance 120
    exit
exit
port 1/3/2
    shutdown
    description "DS1/E1"
    tdm
        e1
            shutdown
            framing no-crc-g704
            no loopback
            clock-source node-timed
            no signal-mode
            report-alarm ais los
            no report-alarm oof rai looped ber-sd ber-sf
            no hold-time
            channel-group 1
                shutdown
                description "DS0GRP"
                encap-type ipcp
                mtu 512
                timeslots 2-32
                crc 16
                idle-cycle-flag flags
                no scramble
                ppp
                    no keepalive
                exit
            exit
        exit
        line-impedance 120
    exit
```

Common Configuration Tasks

The following basic system tasks must be performed.

- Configuring Cards and Adapter Cards
  - → Configuring Adapter Card Network Parameters
  - → Configuring Adapter Card Clock Mode
  - → Configuring Adapter Card Fabric Port Counters
  - → Configuring Adapter Card Fabric Profile
- Configuring Ports
  - → Configuring Ethernet Port Parameters
  - → Configuring Channelized Ports
  - → Configuring SONET/SDH Port Parameters
  - → Configuring ATM Interface Parameters
  - → Configuring Multilink PPP Bundles
  - → Configuring Multilink ATM Inverse Multiplexing (IMA) Groups

Configuring Cards and Adapter Cards

Card configurations must include a chassis slot designation. A slot must be preconfigured with the type of card and adapter cards that are allowed to be provisioned.

The following CLI syntax shows an example of configuring a chassis slot and card (to activate the IOM) and adapter card.

Example:

```
ALU-1>config# card 1
ALU-1>config>card# card-type iom-1g
ALU-1>config>card# mda 1
ALU-1>config>card>mda# mda-type a4-oc3
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 2
ALU-1>config>card>mda# mda-type a4-oc3
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 3
ALU-1>config>card>mda# mda-type a16-chds1
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 4
ALU-1>config>card>mda# mda-type a16-chds1
ALU-1>config>card>mda# exit
ALU-1>config>card# mda 5
ALU-1>config>card>mda# mda-type a8-eth
ALU-1>config>card>mda# exit
```

```
ALU-1>config>card# mda 6
ALU-1>config>card>mda# mda-type a8-eth
ALU-1>config>card>mda# exit
```

Use the `config info` command to display card configuration information.

```
ALU-A>config# info
. . .
#--------------------------------------------------
echo "Card Configuration"
#--------------------------------------------------
    card 1
        card-type iom-1g
        mda 1
            mda-type a4-oc3
        exit
        mda 2
            mda-type a4-oc3
        exit
        mda 3
            mda-type a16-chds1
        exit
        mda 4
            mda-type a16-chds1
        exit
        mda 5
            mda-type a8-eth
        exit
        mda 6
            mda-type a8-eth
        exit
    exit
#--------------------------------------------------
ALU-A> config#
```

Configuring Adapter Card Network Parameters

Network policies can optionally be applied to adapter cards. Network queue policies define the ingress network queuing at the adapter card node level. Network queue policies are configured in the `config>qos` context. For more information, refer to the 7705 SAR OS Quality of Service Guide.

Use the following CLI syntax to configure network queue policies on an adapter card.

CLI Syntax:

```
config>card>mda#
        network
            ingress
                queue-policy name
        no shutdown
    no shutdown
```

Use the `config mda info` command to display adapter card configuration information.

```
ALU-B>config>card>mda# info
----------------------------------------------
            mda-type a16-chds1
            network
                ingress
                    queue-policy default
                    exit
                exit
            exit
----------------------------------------------
ALU-B>config>card>mda#
```

Configuring Adapter Card Clock Mode

Clocking mode is defined at the adapter card level. In Release 2.0 of the 7705 SAR, only the T1/E1 ASAP Adapter card supports configuration of clocking mode and the only supported clocking mode is adaptive.

Use the following CLI syntax to configure clocking mode on an adapter card.

CLI Syntax:
```
config>card>mda#
        clock-mode adaptive
        no shutdown
```

Configuring Adapter Card Fabric Port Counters

Use the following syntax to configure fabric port counters on an adapter card.

CLI Syntax:
```
config>card>mda#
        [no] fabric-stats-enabled
```

Configuring Adapter Card Fabric Profile

Use the following CLI syntax to assign a fabric profile on an adapter card.

CLI Syntax:

```
config>card>mda#
      mda-type {a16-chds1|a8-eth|a8-ethv2|a4-oc3}
      [no] fabric-stats-enabled
      network
         ingress
            fabric-policy <fabric-policy-id>
            queue-policy <name>
      access
         ingress
            fabric-policy <fabric-policy-id>
      no shutdown
```

Configuring Ports

This section provides the CLI syntax and examples to configure the following:

- Configuring Ethernet Port Parameters
  - → Ethernet Network Port
  - → Ethernet Access Port
- Configuring Channelized Ports
  - → Verifying the Adapter Card Type
- Configuring SONET/SDH Port Parameters
  - → SONET/SDH Access Port
- Configuring ATM Interface Parameters
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- Configuring Multilink PPP Bundles
- Configuring Multilink ATM Inverse Multiplexing (IMA) Groups
  - → IMA Groups
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Configuring Ethernet Port Parameters

Use the following CLI syntax to configure Ethernet network and access port parameters.

CLI Syntax:
```
config# port port-id
ethernet
    autonegotiate limited
    dot1q-etype 0x0600 to 0xffff
    duplex {full|half}
    efm-oam
       [no]accept-remote-loopback
       mode {active|passive}
       [no]shutdown
       [no]transmit-interval interval [multiplier
         multiplier]
       [no]tunneling
    egress-rate sub-rate
    encap-type {dot1q|null}
    hold-time hold-time [up hold-time-up | down
       hold-time-down]
    mac ieee-address
    mode {access|network}
    mtu mtu-bytes
    network
       queue-policy name
    report-alarm [signal-fail] [remote] [local] [no-
       frame-lock] [high-ber]
    speed {10|100|1000}
```

Ethernet Network Port

A network port is network facing and participates in the service provider transport or infrastructure network processes.

Use the following basic CLI syntax to configure Ethernet network mode port parameters.

CLI Syntax:
```
port port-id
ethernet
    mode {access | network}
    network
       queue-policy name
```

The following CLI syntax shows an example of configuring an Ethernet port for network mode.

Example:
```
config# port 1/1/1
config>port# description "Ethernet network port"
config>port# ethernet
config>port>ethernet# mode network
config>port>ethernet# exit
config>port>#  no shutdown
```

Use the `config port info` command to display port configuration information.

```
ALU-B>config>port# info
----------------------------------------------
        description "Ethernet network port"
        ethernet
        exit
        no shutdown
----------------------------------------------
ALU-B>config>port#
```

Ethernet Access Port

Services are configured on access ports used for customer-facing traffic. If a Service Access Point (SAP) is to be configured on a port, it must be configured for 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.

Use the following basic CLI syntax to configure Ethernet access mode port parameters

CLI Syntax:
```
port port-id
     mode {access | network}
     encap-type {dot1q | null}
```

The following CLI syntax shows an example of configuring an Ethernet port for access mode.

Example:
```
config# port 1/1/2
config>port# description "Ethernet access port"
config>port# ethernet
config>port>ethernet# mode access
config>port>ethernet# encap-type dot1q
config>port>ethernet# exit
config>port# no shutdown
```

Use the `config port info` command to display port configuration information.

```
ALU-A>config>port# info
----------------------------------------------
        description "Ethernet access port"
        ethernet
            mode access
            encap-type dot1q
        exit
        no shutdown
----------------------------------------------
ALU-A>config>port#
```

Configuring Channelized Ports

Channelized ports are supported on the 16-port T1/E1 ASAP Adapter card. Ethernet ports and OC3/STM1 ports cannot be channelized.

When configuring channelized ports, the port ID is specified in different ways depending on the TDM type and level of channelization, as follows:

N × DS0 in DS1port.*channel-group, where channel-group is* {1 to 24}

N × DS0 in E1port.*channel-group, where channel-group is* {1 to 32}

Verifying the Adapter Card Type

To ensure that you have a channel-capable adapter card, verify the adapter card you are configuring by entering a `show mda` *`slot-id`* command.

In the following example, MDA 3 and MDA 4 show a channelized DS1 adapter card.

```
*A:7705:Dut-C# show mda

===============================================================================
MDA Summary
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     a4-oc3                                      up        provisioned
      2     a4-oc3                                      up        provisioned
      3     a16-chds1             a16-chds1             up        up
      4     a16-chds1             a16-chds1             up        up
      5     a8-eth                a8-eth                up        up
      6     a8-eth                a8-eth                up        up
===============================================================================
*A:7705:Dut-C#
```

```
*A:7705:Dut-C# show mda 1/3 detail

===============================================================================
MDA 1/3 detail
===============================================================================
Slot  Mda    Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     3      a16-chds1             a16-chds1             up        up


MDA Specific Data
    Maximum port count            : 16
    Number of ports equipped      : 16
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : TDM, PPP, ATM, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : PDH DS1
    Max number of channels        : 256
    Channels in use               : 3


CEM MDA Specific Data
    Clock Mode                    : adaptive

Hardware Data
    Part number                   : Sim Part#
    CLEI code                     : Sim CLEI
    Serial number                 : mda-3
    Manufacture date              : 01012003
    Manufacturing string          : Sim MfgString mda-3
    Manufacturing deviations      : Sim MfgDeviation mda-3
    Administrative state          : up
    Operational state             : up
    Software version              : N/A
    Time of last boot             : N/A
    Current alarm state           : alarm active
    Base MAC address              : a4:58:01:03:00:01
===============================================================================
*A:7705:Dut-C#
```

DS0 channel groups and their parameters are configured in the DS1 or E1 context. For a DS1 channel group, up to 24 timeslots can be assigned (numbered 1 to 24). For an E1 channel group, up to 31 timeslots can be assigned (numbered 1 to 32). For ATM, all timeslots are auto-configured when a channel group gets created.

Note: Encapsulation type is configured at the DS1 or E1 level; however, a port can only support one encapsulation type. When the first channel group is configured for encap-type, all other channel groups on the port are automatically configured with that encap-type.

The following is an example of an E1 channel group configuration.

```
ALU-A>config>port>tdm# e1
ALU-A>config>port>tdm>e1# channel-group 1
ALU-A>config>port>tdm>e1>channel-group# timeslots 2
ALU-A>config>port>tdm>e1>channel-group# no shutdown
ALU-A>config>port>tdm>e1>channel-group#
ALU-A>config>port>tdm>e1# no shutdown
ALU-A>config>port>tdm>e1# channel-group 2
ALU-A>config>port>tdm>e1>channel-group# timeslots 3,4
ALU-A>config>port>tdm>e1>channel-group# encap-type cem
ALU-A>config>port>tdm>e1>channel-group# no shutdown
ALU-A>config>port>tdm>e1>channel-group# exit

-------------------------------------------
ALU-A>config>port>tdm#
```

Services can now be applied to the configured channelized ports.

Configuring SONET/SDH Port Parameters

Use the following CLI syntax to configure SONET/SDH port parameters.

CLI Syntax:

```
[no] port {port-id}
     sonet-sdh
        clock-source {loop-timed | node-timed}
        framing {sonet | sdh}
        hold-time {[up hold-time-up] [down hold-time-
          down]}
        no hold-time
        loopback {line | internal}
        no loopback
        [no] path [sonet-sdh-index]
           atm
              cell-format cell-format
              min-vp-vpi value
           crc {32}
           description description
           no description
           encap-type {atm}
           mtu mtu
           no mtu
           [no] report-alarm [pais] [plop] [prdi] [pplm]
           [prei] [puneq]
           [no] scramble
           [no] shutdown
           signal-label value
           no signal-label
           trace-string [trace-string]
```

```
   no trace-string
[no] report-alarm [loc] [lais] [lrdi][lb2er-sd]
  [lb2er-sf] [slof][slos] [lrei]
section-trace {increment-z0 | byte value | string
  string}
speed {oc3}
no speed
threshold {ber-sd | ber-sf} rate threshold
```

SONET/SDH Access Port

Use the following CLI syntax to configure a SONET/SDH access port.

CLI Syntax:
```
port {port-id}
     sonet-sdh
        path [sonet-sdh-index]
           encap-type {atm}
           [no] shutdown
```

The following CLI syntax shows an example of configuring a SONET/SDH port.

Example:
```
config# port 1/1/3
config>port# sonet-sdh
config>port>sonet-sdh# path
config>port>sonet-sdh>path# encap-type atm
config>port>sonet-sdh>path# no shutdown
config>port>sonet-sdh>path# exit
config>port>sonet-sdh# exit
config>port# exit
config#
```

Use the `config info` command to display port configuration information.

```
ALU-B>config>info
....
#------------------------------------------------
echo "Port Configuration"
#------------------------------------------------

port 1/1/3
        sonet-sdh
            path
                encap-type atm
                no shutdown
            exit
        exit
----------------------------------------------
```

Configuring ATM Interface Parameters

ATM interface parameters can be configured for SONET/SDH ports in access mode, TDM ports or channels supporting ATM encapsulation, and for IMA multilink bundles.

ATM interface parameters allow users to configure characteristics of an ATM interface. The 7705 SAR supports configuration of the following ATM interface characteristics:

- cell-format — allows the user to select the ATM cell format to be used on a given interface: UNI or NNI (NNI is not supported on SONET/SDH interfaces)
- min-vp-vpi — allows the user to set the minimum allowable virtual path identifier (VPI) value that can be used on the ATM interface for a VPC

ATM Interface Commands

Use the following CLI syntax to configure ATM interface parameters for SONET/SDH ports.

CLI Syntax:
```
port {port-id}
     sonet-sdh
        path [sonet-sdh-index]
           atm
              cell-format cell-format
              min-vp-vpi value
```

Use the following CLI syntax to configure ATM interface parameters for TDM channels.

CLI Syntax:
```
port {port-id}
     tdm
        ds1
           channel-group 1
              atm
                 cell-format cell-format
                 min-vp-vpi value
        e1
           channel-group 1
              atm
                 cell-format cell-format
                 min-vp-vpi value
```

Use the following CLI syntax to configure ATM interface parameters for IMA multilink bundles.

CLI Syntax:
```
port>multilink-bundle
     ima
        atm
           cell-format cell-format
           min-vp-vpi value
```

Configuring Multilink PPP Bundles

Multilink PPP bundles can be created with as few as one, or as many as eight members. Up to eight multilink bundles can be configured per 16-port T1/E1 ASAP Adapter card, and each bundle represents a single connection between two routers. The bundles aggregate channelized ports to define the bandwidth between the routers over the DS1 links.

Multilink bundling is based on a link control protocol (LCP) option negotiation that permits a system to indicate to its peer that it is capable of combining multiple physical links into a bundle.

Multilink bundling operations are modeled after a virtual PPP link-layer entity where packets received over different physical link-layer entities are identified as belonging to a separate PPP network protocol (the Multilink Protocol, or MP) and recombined and sequenced according to information present in a multilink fragmentation header. All packets received over links identified as belonging to the multilink arrangement are presented to the same network-layer protocol processing machine, whether they have multilink headers or not.

When you configure multilink bundles, consider the following guidelines:

- a multilink bundle configuration should include at least two ports
- a maximum of eight ports can be included in a multilink bundle
- multilink bundles can only be aggregated on a single adapter card
- on the network side, assigning a channel to a multilink bundle automatically assigns all channels on the port
- on the access side, assigning a channel to a multilink bundle does not automatically assign all channels; you must manually specify all channels on the port to be part of the multilink bundle

Configuring Multilink ATM Inverse Multiplexing (IMA) Groups

IMA groups are supported on channelized T1/E1 ASAP Adapter cards. The groups aggregate E1 or DS1 ATM channel into a single logical ATM interface. Up to eight links can be bundled in an IMA group, and up to eight IMA groups can be configured on the T1/E1 ASAP Adapter card.

IMA Groups

Use the following CLI syntax to configure IMA group parameters.

CLI Syntax:
```
configure# port bundle-ima-slot/port.bundle-num
description description-string
multilink-bundle
     ima
        atm
           cell-format {uni|nni}
           min-vp-vpi vp-vpi-value
        exit
        link-delay {activate | deactivate} milliseconds
        version IMA-version
member port-id
minimum-links minimum-links
red-differential-delay red-diff-delay [down]
```

Configuration Notes

An IMA group has common interface characteristics (for example, configuration that applies to a logical ATM interface either configured via the IMA group context or taken from the primary link). The following list details the common IMA group interface characteristics:

- ATM interface characteristics (under the ATM menu context)
- interface mode type (only access is supported)
- MTU value (derived from the primary link)

Member links inherit these common characteristics from the IMA group that they are part of and as long as they are part of the IMA group. Characteristics derived from the primary link (MTU, interface mode type) can be changed on the primary link only and not on other links in the group or on the group itself.

The primary link is the member that has the lowest ifindex. When a member is added or deleted, the primary member may be changed based on ifindicies of all member links.

Once a path becomes part of an IMA group logical link, the path ceases to exist as a physical ATM path interface. This means that:

- ATM interface characteristics enforced over the link are those of a group. When a link is removed from an IMA group, the link's ATM characteristics are reset to ATM interface defaults.
- no services can be configured on the member link itself

After the primary member has been added, each additional member added to the group will only be accepted if it matches the configuration of the IMA group. ATM interface characteristics are not part of this verification as they are overwritten or reset to defaults when a link is added to or removed from an IMA group.

When a member is assigned to an IMA group, it is automatically assigned an IMA link ID. IMA link IDs are in range from 0 to 7 and stay constant as long as the router does not reboot.

When configuring IMA groups, consider the following guidelines.

- IMA groups should contain at least two members.
- A maximum of eight members can be included in an IMA group.
- A maximum of eight IMA groups can be configured on a single adapter card.
- IMA bundles can only be aggregated on a single adapter card.
- IMA group maximum bandwidth and minimum link settings allow, by default, for oversubscription of shaped services. When that occurs, however, scheduling of traffic over an IMA group ATM interface degrades to round-robin between shaped services. To preserve full ATM traffic management even during a member link failure, it is recommended that maximum bandwidth be set to minimum links.
- When configuring the red differential delay for IMA groups on the 16-port T1/E1 ASAP Adapter card, the value configured is converted into an acceptable frame sequence number delay on a link since delay is granular to IMA frame sequence number difference. For E1 channels (receiving frame time 27 ms), configured values map to the enforced values as follows: 0 ms maps to 0 frame sequence number difference (27 ms delay), 1 to 27 ms maps to 1 frame sequence number difference (54 ms delay), 28 to 50 ms maps to 2 frame sequence number difference (81 ms delay). Similarly, for DS1 channels (receiving frame time 35 ms), configured values map to enforced values as follows: 0 ms maps to 0 frame sequence number difference (35 ms delay), 1 to 27 ms maps to 1 frame sequence number difference (70 ms delay), 28 to 50 ms maps to 2 frame sequence number difference (105 ms delay).

- When a channel is deleted from an IMA group, it is recommended that a deletion take place at the far end first if the far end supports graceful deletion. This is to ensure no cell loss takes place on the 7705 SAR Rx end of the channel. When a channel is deleted on the 7705 SAR end first, a small data loss will take place on the 7705 SAR Rx side (depending on the time required for the far end to deactivate its Tx on the link being deleted).
- If no member links are configured on an IMA group, the speed of an E1 channel will be used to compute the maximum IMA group bandwidth that may be allocated to shaped services.
- When adding member links to an IMA group, the clock-source of the E1 or DS1 link must be set to node-timed.

The following example illustrates creation of an IMA group with three group members residing on a channelized 16-port T1/E1 ASAP Adapter card in slot 1/3/1:

```
ALU-A>config# port bundle-ima-1/3.1
ALU-A>config>port# multilink-bundle
ALU-A>config>port>ml-bundle# member 1/3/1.1
ALU-A>config>port>ml-bundle# member 1/3/2.1
ALU-A>config>port>ml-bundle# member 1/3/3.1
```

IMA Test Procedure

Use the following CLI syntax to perform an IMA Test Pattern Procedure on a member link of an IMA group.

CLI Syntax:
```
configure# port bundle-ima-slot/port.bundle-num
multilink-bundle
     ima
     test-pattern-procedure
        test-link port-id
        test-pattern [pattern]
        no shutdown
```

An operator can deploy IMA test procedures to verify operations of an IMA group and its member links. The following is a list of key points about the test pattern procedure.

1. The test procedure is performed as defined by the IMA specification version 1.1. That is, a test pattern is sent over the specified link and is expected to be looped back over all the links in the group. ICP cells are used to perform the test.
2. The test procedure is not traffic-affecting; that is, data traffic will not be affected by the ongoing test.
3. There can only be a single test executed per IMA group at any given time.
4. The IMA member link must exist in the specified group for the command to be accepted.

5. The test pattern procedure must be shut down before a new test-link value or test pattern is accepted.
6. The current IMA group test pattern configuration and result of a given IMA test can be seen by executing a show command for the IMA group. A test-link result can have three values:
   - Disabled: the test-link is currently not running
   - Operating: the test pattern procedure is `no shutdown` and there are currently no failed links for this running test-pattern procedure
   - Link-Failed: one or more links have failed the test-pattern procedure. Execute a `show port <slot/mda/port> ima-link` command to see the failed link and received pattern value.
7. Deleting a member link that is the same as the specified test-link, to stay in compliance with key point 4, will result in the test-link value being reset to default.
8. IMA test procedure configurations are not saved when the admin `save` command is executed.

Service Management Tasks

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

- Modifying or Deleting an Adapter Card
- Deleting a Card
- Deleting Port Parameters

Modifying or Deleting an Adapter Card

To change an adapter card type already provisioned for a specific slot/card, you must first shut down the slot/MDA/port configuration and then delete the adapter card from the configuration.

Use the following CLI syntax to modify an adapter card.

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

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

The following CLI syntax shows an example of modifying an adapter card.

Example:
```
config# port 1/1/1
config>port# shutdown
config>port# exit
config# port 1/1/2
config>port# shutdown
config>port# exit
config# card 1
config>card# mda 1
config>card>mda# shutdown
config>card>mda# exit
config>card# no mda 1
config>card# mda 1
config>card# mda-type a8-eth
config>card>mda# no shutdown
```

Deleting a Card

To delete a CSM or adapter card provisioned for a specific slot, you must shut down existing port configurations and shut down and remove all adapter card configurations.

Use the following CLI syntax to delete a card provisioned for a specific slot.

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
```

The following CLI syntax shows an example of deleting a card.

Example:
```
config# port 1/1/1
config>port# shutdown
config>port# exit
config# port 1/1/2
config>port# shutdown
config>port# exit
config> card 1
config>card# mda 1
config>card>mda# shutdown
config>card>mda# no mda 1
config>card>mda# exit
config>card# no card 1
config>card# exit
```

Deleting Port Parameters

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

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

The following CLI syntax shows an example of deleting a port.

Example:
```
config# port 1/1/1
config>port# shutdown
config>port# no port 1/1/1
```

Card, Adapter Card, and Port Command Reference

Command Hierarchies

- Configuration Commands
  - → Card Commands
  - → Adapter Card Commands
  - → Port Configuration Commands
  - → Ethernet Commands
  - → SONET/SDH Commands
  - → Multilink Bundle and IMA Group Commands
  - → TDM Commands
  - → DS1 Commands
  - → E1 Commands
- Show Commands
- Monitor Commands
- Clear Commands

Configuration Commands

Card Commands

```
config
    — [no] card slot-number
            — card-type card-type
            — no card-type
            — [no] shutdown
```

Adapter Card Commands

```
config
    — [no] card slot-number
            — [no] mda mda-slot
                    — mda-type mda-type
                    — no mda-type
                    — [no] fabric-stats-enabled
                    — clock mode adaptive
                    — network
                            — ingress
                                    — fabric-policy fabric-policy-id
                                    — no fabric-policy
                                    — queue-policy name
                                    — no queue-policy
                    — access
                            — ingress
                                    — fabric-policy fabric-policy-id
                                    — no fabric-policy
                    — [no] sync-e
                    — [no] shutdown
```

Port Configuration Commands

```
config
    — port {port-id | bundle-id}
    — no port {port-id | bundle-id}
            — [no] ddm-events
            — description description-string
            — no description
            — ethernet
            — sonet-sdh
            — multilink-bundle
            — tdm
            — [no] shutdown
```

Ethernet Commands

```
config
    — [no] port {port-id}
        — ethernet
            — autonegotiate [limited]
            — [no] autonegotiate
            — dot1q-etype 0x0600 to 0xffff
            — no dot1q-etype
            — duplex {full | half}
            — efm-oam
                — [no] accept-remote-loopback
                — mode {active | passive}
                — [no] shutdown
                — [no] transmit-interval interval [multiplier multiplier]
                — [no] tunneling
            — egress-rate sub-rate
            — no egress-rate
            — encap-type {dot1q | null}
            — no encap-type
            — hold-time [up hold-time-up | down hold-time-down]
            — no hold-time
            — mac ieee-address
            — no mac
            — mode {access | network}
            — no mode
            — mtu mtu-bytes
            — no mtu
            — network
                — queue-policy name
            — [no] report-alarm [signal-fail] [remote] [local] [no-frame-lock] [high-ber]
            — speed {10 | 100 | 1000}
```

SONET/SDH Commands

```
config
    — [no] port {port-id}
        — sonet-sdh
            — clock-source {loop-timed | node-timed}
            — framing {sonet | sdh}
            — hold-time {[up hold-time-up] [down hold-time-down]}
            — no hold-time
            — loopback {line | internal}
            — no loopback
            — [no] path [sonet-sdh-index]
                — atm
                    — cell-format cell-format
                    — min-vp-vpi value
                — crc {32}
                — description description-string
                — no description
                — encap-type {atm}
                — no encap-type
                — mtu mtu
                — no mtu
                — [no] report-alarm [pais] [plop] [prdi] [pplm] [prei] [puneq]
                — [no] scramble
                — [no] shutdown
                — signal-label value
                — no signal-label
                — trace-string [trace-string]
                — no trace-string
            — [no] report-alarm [loc] [lais] [lrdi] [lb2er-sd] [lb2er-sf] [slof] [slos] [lrei]
            — section-trace {increment-z0 | byte value | string string}
            — speed {oc3}
            — no speed
            — threshold {ber-sd | ber-sf} rate threshold-rate
            — no threshold {ber-sd | ber-sf}
```

Multilink Bundle and IMA Group Commands

```
config
    — [no] port {bundle-id}
        — multilink-bundle
            — fragment-threshold fragment-threshold
            — [no] fragment-threshold fragment-threshold
            — ima
                — atm
                    — cell-format cell-format
                    — min-vp-vpi value
                — link-delay {activate | deactivate} milliseconds
                — no link-delay {activate | deactivate}
                — test-pattern-procedure
                    — [no] shutdown
                    — test-link port-id
                    — no test-link
                    — test-pattern pattern
                    — no test-pattern
                — version IMA-version
                — no version
            — [no] member port-id
            — minimum-links minimum-links
            — no minimum-links
            — mrru mrru
            — no mrru
            — red-differential-delay red-diff-delay [down]
            — no red-differential-delay
            — [no] short-sequence
            — yellow-differential-delay yellow-diff-delay
            — no yellow-differential-delay
```

TDM Commands

```
config
    — [no] port {port-id}
            — tdm
                    — buildout short
                    — [no] ds1
                    — [no] e1
                    — length {133 | 266 | 399 | 533 | 655}
                    — line-impedance {75 | 100 | 120}
```

DS1 Commands

```
config
    — [no] port {port-id}
        — tdm
            — [no] ds1
                — [no] channel-group channel-group-id
                    — atm
                        — cell-format cell-format
                        — min-vp-vpi value
                    — crc {16 | 32}
                    — description description-string
                    — no description
                    — encap-type {atm | cem | ipcp | ppp-auto}
                    — no encap-type
                    — idle-cycle-flag {flags | ones}
                    — no idle-cycle-flag
                    — idle-payload-fill {all-ones | pattern pattern}
                    — no idle-payload-fill
                    — idle-signal-fill {all-ones | pattern pattern}
                    — no idle-signal-fill
                    — mode {access | network}
                    — no mode
                    — mtu mtu-bytes
                    — no mtu
                    — network
                        — queue-policy name
                    — [no] ppp
                        — keepalive time-interval [dropcount drop-count]
                        — no keepalive
                    — [no] scramble
                    — [no] shutdown
                    — timeslots timeslots
                    — no timeslots
                — clock-source {adaptive-timed | loop-timed | node-timed}
                — framing (DS1) {esf | sf | ds1-unframed}
                — hold-time [up hold-time-up] [down hold-time-down]
                — no hold-time
                — loopback (DS1) {line | internal | fdl-ansi | fdl-bellcore | payload-ansi}
                — no loopback (DS1)
                — [no] remote-loop-respond (DS1)
                — [no] report-alarm {ais | los | oof | rai | looped}
                — [no] signal-mode {cas}
                — [no] shutdown
```

E1 Commands

```
config
    — [no] port {port-id}
        — tdm
            — [no] e1
                — [no] channel-group channel-group-id
                    — atm
                        — cell-format cell-format
                        — min-vp-vpi value
                    — crc {16 | 32}
                    — description description-string
                    — no description
                    — encap-type {atm | cem | ipcp | ppp-auto}
                    — no encap-type
                    — idle-cycle-flag {flags | ones}
                    — no idle-cycle-flag
                    — idle-payload-fill {all-ones | pattern pattern}
                    — no idle-payload-fill
                    — idle-signal-fill {all-ones | pattern pattern}
                    — no idle-signal-fill
                    — mode {access | network}
                    — no mode
                    — mtu mtu-bytes
                    — no mtu
                    — network
                        — queue-policy name
                    — [no] ppp
                        — keepalive time-interval [dropcount drop-count]
                        — no keepalive
                    — [no] scramble
                    — [no] shutdown
                    — timeslots timeslots
                    — no timeslots
                — clock-source {adaptive-timed | loop-timed | node-timed}
                — framing (E1) {no-crc-g704 | g704 | e1-unframed}
                — loopback (E1) {line | internal}
                — hold-time [up hold-time-up] [down hold-time-down]
                — no hold-time
                — no loopback (E1)
                — [no] report-alarm {ais | los | oof | rai | looped}
                — [no] signal-mode {cas}
                — [no] shutdown
```

Show Commands

show
- — **card** [*slot-number*] [**detail**]
- — **card state**
- — **mda** *slot* [*/mda*] [**detail**]
- — **mda** [*slot* [*/mda*]] **statistics** [**source-mda** | **dest-mda**]
- — **mda with-fabric-stats**
- — **multilink-bundle** [*bundle-id* | *slot/mda* | **type** {**mlppp** | **ima-grp**}] [**detail**]
- — **multilink-bundle** [*bundle-id* | *slot/mda* | [**ppp** | **ima**]]
- — **multilink-bundle** *bundle-id*
  - — **ima**
    - — **atm** [**detail**]
    - — **connections**
    - — **pvc** [*vpi/vci*] [**detail**]
    - — **pvp** [*vpi*] [**detail**]
- — **port** *port-id* [**count**] [**detail**]
- — **port** *port-id* **acr** [**detail**]
- — **port** *port-id* **description**
- — **port** *port-id* **associations**
- — **port** *port-id* **ppp** [**detail**]
- — **port** *port-id* **atm**
- — **port** *port-id* **atm connections**
- — **port** *port-id* **atm pvc** [*vpi/vci*] [**detail**]
- — **port** *port-id* **atm pvp** [*vpi*] [**detail**]

Monitor Commands

monitor
- — **port** *port-id* [*port-id*...(up to 5 max)] [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
- — **port** *port-id* **atm** [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]
- — **fabric-profile mda** {*mda-id* | **with-stats-enabled**} {**dest-mda** | **source-mda**} [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Clear Commands

clear
- — **mda** *mda-id*
- — **mda** *mda-id* **statistics** [**source-mda** | **destination-mda** | **fabric-port** | **fabric-global** | **all**]
- — **port** *port-id* **statistics**
- — **port** *port-id* **atm pvc** [*vpi*[*/vci*]] **statistics**
- — **port** *port-id* **atm pvp** [*vpi*] **statistics**

Command Descriptions

Configuration Commands

Generic Commands

description

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

Context config>port
config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group
config>port>sonet-sdh>path

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 **None**

Parameters *description-string* — description character string. Allowed values are any string up to 80 characters long composed of printable, 7-bit ASCII characters. If the string contains special characters (#, $, spaces, etc.), the entire string must be enclosed within double quotes.

shutdown

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

Context config>card
config>card>mda
config>port
config>port>tdm>ds1
config>port>tdm>ds1>channel-group
config>port>tdm>e1
config>port>tdm>e1>channel-group
config>port>ethernet>efm-oam
config>port>sonet-sdh>path

Description This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics.

The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they can be deleted.

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

Default **card — no shutdown**

mda — no shutdown

port — shutdown

Card Commands

card

Syntax **card** *slot-number*
no card *slot-number*

Context config

Description This mandatory command is the first step in activating the IOM software: designating it a slot position in the chassis. On the 7705 SAR, the slot number is always **1**.

The IOM software must be activated before the adapter cards and ports can be configured.

The **no** form of this command removes the card from the configuration. All associated ports, services, and adapter cards must be shut down.

Default **None**

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

Values 1

card-type

Syntax **card-type** *card-type*
no card-type

Context config>card

Description This mandatory command is the second step in activating the IOM software: designating the card type. The card type can be preprovisioned, meaning that the card does not need to be installed in the chassis. On the 7705 SAR, the card type is always **iom-1g**.

A card must be provisioned (configured) before an adapter card or port can be configured.

A card can only be provisioned in a slot that is vacant, which means that no other card can be provisioned for that particular slot. To reconfigure a slot position, use the **no** form of this command to remove the current information. Port and adapter card information must be shut down.

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.

The **no** form of this command removes the card from the configuration. This operation requires that the card be administratively shut down. All dependencies to ports on this card must be shut down and removed from the configuration before issuing the **no card-type** command.

Default **None**

Parameters *card-type* — the type of card to be configured and installed in the slot

Values iom-1g

Adapter Card 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 adapter cards.

Default **None**

Parameters *mda-slot* — the adapter card slot number to be configured

Values 1 to 6

mda-type

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

Context config>card>mda

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

A maximum of six 16-port T1/E1 ASAP Adapter cards, 8-port Ethernet Adapter cards, or 4-port OC3/STM1 Clear Channel Adapter cards can be installed in a 7705 SAR chassis. Only one adapter card can be provisioned per MDA slot. To modify an MDA slot, shut down all port associations.

A medium severity alarm is generated if an adapter card is inserted that does not match the adapter card type configured for the slot. This alarm is cleared when the correct adapter card is inserted or the configuration is modified. A high severity alarm is raised if an administratively enabled adapter card is removed from the chassis. This alarm is cleared if either the correct adapter card type is inserted or the configuration is modified. A low severity trap is issued if an administratively disabled adapter card is removed.

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

The **no** form of this command deletes the adapter card from the configuration. The adapter card must be administratively shut down before it can be deleted from the configuration. Before an adapter card can be shut down, all port associations with this adapter card, for example SAPs and IP interfaces, must be shut down first.

fabric-stats-enabled

Syntax [**no**] **fabric-stats-enabled**

Context config>card>mda

Description This command enables the fabric port statistics counter to count egress traffic toward a specified adapter card. The CSM allows the collection of fabric statistics from only one fabric port at any given time.

To change the port statistics counter to a different adapter card, turn off statistics collection on the assigned adapter card by using **no fabric-stats-enabled** and then enabling statistics collection on another adapter card.

clock mode

Syntax **clock mode adaptive**

Context config>card>mda

Description This command defines the clocking mode on the T1/E1 ASAP Adapter card. In Release 2.0 of the 7705 SAR, clocking mode configuration is only supported on the T1/E1 Adapter card and only adaptive mode is supported.

Default **adaptive**

sync-e

Syntax **sync-e**
no sync-e

Context config>card>mda

Description This command enables Synchronous Ethernet on the 8-port Ethernet v2 Adapter card and on optical SFP ports on the 7705 SAR-F. When Synchronous Ethernet is enabled, the transmit timing of all optical SFPs that support synchronous Ethernet is derived from the node's SSU. Additionally, these SFP ports can be used to provide timing for the SSU. When Synchronous Ethernet is disabled, the optical SFP ports are timed from a local oscillator. Refer to the 7705 SAR OS Basic System Configuration Guide for more information about Synchronous Ethernet.

Default **no sync-e**

Interface QoS Commands

network

Syntax **network**

Context config>card>mda

Description This command enables the network context to configure QoS policy parameters for the specified adapter card.

ingress

Syntax **ingress**

Context config>card>mda>network
config>card>mda>access

Description This command enables the context to configure the QoS policy parameters for ingress traffic, in either a network or access context, for the specified adapter card.

access

Syntax **access**

Context config>card>mda

Description This command enables the access context to configure QoS policy parameters for the specified adapter card.

fabric-policy

Syntax **fabric-policy** *fabric-policy-id*
no fabric-policy

Context config>card>mda>network>ingress
config>card>mda>access>ingress

Description This command configures the ingress fabric policy, in either a network or access context, for the specified adapter card. The **no** form of this command reverts the *fabric-policy-id* to the default value.

Default **1**

Parameters *fabric-policy-id* — an existing fabric policy ID

queue-policy

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

Context config>card>mda>network>ingress

Description This command specifies the network ingress queue policy that 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. Refer to the 7705 SAR OS Quality of Service Guide for more information.

Default **default**

Parameters *name* — specifies an existing network queue policy name

General Port Commands

port

Syntax **port** {*port-id* | *bundle-id*}
no port {*port-id* | *bundle-id*}

Context config

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

Default **None**

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

bundle-id — specifies the multilink bundle to be associated with this IP interface. The command syntax must be configured as follows:

Syntax: bundle-*type-slot/mda.bundle-num*
bundle[-**ppp**]-*slot/mda.bundle-num* (Creates a multilink PPP bundle)
bundle-ima-*slot/mda.bundle-num* (Creates an IMA group)
bundle: keyword
slot: card/adapter card slot numbers
bundle-num: 1 to 16 (up to 8 for MLPPP and IMA)

For example:
router1>config# port bundle-1/1.1 (multilink PPP bundle)
router1>config# port bundle-ima-1/1.2 (IMA group bundle)

ddm-events

Syntax [**no**] **ddm-events**

Context **port** {*port-id* | *bundle-id*}

Description This command enables or disables digital diagnostic monitoring (DDM) events for the port. DDM is supported on Ethernet SFP ports and OC3 SONET SFP ports.

Default **no ddm-events**

Ethernet Port Commands

ethernet

Syntax **ethernet**

Context config>port

Description This command enables access to the context to configure Ethernet port attributes on an 8-port Ethernet Adapter card.

autonegotiate

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

Context config>port>ethernet

Description This command enables speed autonegotiation and duplex autonegotiation on Ethernet 10/100BASE-T RJ-45 ports.

The command enables speed autonegotiation on the two SFP ports (10, 100, or 1000 Mb/s). Duplex autonegotiation is only supported on SFP ports using 100 Mb/s fiber SFPs or 10/100/1000BASE-T copper SFPs. Duplex autonegotiation is not supported for Gigabit Ethernet SFPs; the mode is always full duplex.

Speed autonegotiation takes place automatically — all ports are configured for speed autonegotiation by default. Speed autonegotiation might need to be disabled (for example, if a port must be forced to a certain speed or to avoid speed negotiation loops between the Ethernet Adapter card and other devices). To turn off speed autonegotiation for a port, the user configures the port speed manually.

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: Disabling autonegotiation on Gigabit Ethernet ports is not allowed, as the IEEE 802.3 specification for Gigabit Ethernet requires that autonegotiation be enabled for far-end fault indication.

If the **autonegotiate limited** keyword option is specified, the port will autonegotiate but will only advertise a specific speed and duplex mode. The speed and duplex mode advertised are the 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.

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

Default **autonegotiate**

dot1q-etype

Syntax **dot1q-etype** *0x0600* to *0xffff*
no dot1q-etype

Context config>port>ethernet

Description This command specifies the EtherType expected when the port's encapsulation type is dot1q. Dot1q encapsulation is supported only on Ethernet interfaces.

IEEE 802.1q (also known as VLAN tagging) defines a process to channelize a single Ethernet port into VLANs. Each VLAN can represent a customer or an application. Up to 4096 VLANs can be configured per port.

The EtherType specifies the protocol being carried in an Ethernet frame. In 802.1q, the EtherType is set to the Tag Protocol Identifier (TPID) value of 0x8100, which identifies the frame as an IEE 802.1Q-tagged frame. As well, 2 bytes of Tag Control Information (TCI), followed by 2 bytes containing the frame's original EtherType are added to the frame. Together, the TPID and TCI make up the VLAN tag.

The **no** form of this command reverts the dot1q-etype value to the default.

For more information on VLANs and VLAN tagging, refer to the 7705 SAR OS Services Guide.

Default **0x8100**

Parameters *0x0600* to *0xffff* — specifies the EtherType to expect

duplex

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

Context config>port>ethernet

Description This command configures the duplex mode of an Ethernet or Fast Ethernet port when autonegotiation is disabled.

SFP slots hosting Ethernet or Fast Ethernet SFPs can be configured to full or half duplex mode when autonegotiation is disabled.

Duplex autonegotiation is automatically turned off when the user sets the mode with this command.

SFP slots hosting GigE SFPs only support full duplex mode. Duplex autonegotiation is not supported, and the mode is always full duplex.

Default **full**

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.

mode

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

Context config>port>ethernet>efm-oam

Description This command configures the mode of OAM operation for this Ethernet port.

Active mode causes the port to initiate the negotiation process and continually send out efm-oam information PDUs. **Passive** mode waits for the peer to initiate the negotiation process. A passive mode port cannot initiate monitoring activities (such as loopback) with the peer.

Default **active**

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.

Parameters *interval* — specifies the transmit interval

Values 1 to 600 (in 100 ms)

multiplier — specifies the multiplier for the transmit-interval to set the local link down timer

Values 2 to 5

tunneling

Syntax **[no] tunneling**

Context config>port>ethernet>efm-oam

Description This command enables EFM OAM PDU tunneling. OAM PDU tunneling is required when a loopback is initiated from a router end and needs to be transported over the existing network infrastructure to the other end. Enabling tunneling will allow the PDUs to be mapped to Epipes so that the OAM frames can be tunneled over MPLS to the far end.

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

egress-rate

Syntax **egress-rate** *sub-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**

Parameters *sub-rate* — the egress rate in kb/s

Values 1 to 10000000 kb/s

encap-type

Syntax **encap-type** {**dot1q** | **null**}
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.

See also dot1q-etype for information on IEEE 802.1q tagging and encapsulation.

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.

hold-time

Syntax **hold-time** [**up** *hold-time-up* | **down** *hold-time-down*]
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, but subsequent interface down transitions are not advertised to upper layers until the **hold-time-down** interval has expired. Likewise, when an interface transitions from a down state to an up state, it is immediately advertised as up to the rest of the system, but subsequent 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 or up 0—** no port link dampening is enabled; link transitions are immediately reported to upper layer protocols

Parameters **down** *seconds* **—** the interval, in tenths of seconds, used when an interface transitions from a down state to an up state

Values 0 to 50

up *seconds* **—** the interval, in tenths of seconds, used when an interface transitions from an up state to a down state

Values 0 to 50

mac

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

Context config>port>ethernet

Description This command assigns a specific MAC address to an Ethernet port. When the command is issued while the port is operational, IP will issue an ARP, if appropriate, and BPDUs 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**

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.

mode

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

Context config>port>ethernet

Description This command configures an Ethernet port for access or network mode operation.

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 or channel.

Once an Ethernet port has been configured for access mode, multiple services can be configured on the Ethernet port.

A **network** port participates in the service provider transport or infrastructure network when a network mode is selected.

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

Default **network**

Parameters **access —** configures the port as service access

network — configures the port for transport network use

mtu

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

Context config>port>ethernet

Description This command configures the maximum payload MTU size for an Ethernet 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 to be transmitted over a given port that are larger than the MTU of the port will be fragmented or discarded, depending on whether the DF bit is set in the packet header.

If the port mode or encapsulation type is changed, the MTU assumes the default values of the new mode or encapsulation type.

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

Default The default MTU value depends on the port type, mode, and encapsulation as listed in the following table.

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

Values 512 to 1572 bytes (see the following table)

Type	Mode	Encap Type	Default (Bytes)	Max MTU (bytes)
10/100 Ethernet	Access/Network	null	1514	1514 (access) 1572 (network)
10/100 Ethernet	Access/Network	dot1q	1518	1518 (access) 1572 (network)
GigE SFP	Access/Network	null	1572	1572
GigE SFP	Access/Network	dot1q	1572	1572

report-alarm

Syntax **[no] report-alarm [signal-fail] [remote] [local] [no-frame-lock] [high-ber]**

Context config>port>ethernet

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

Parameters **signal-fail —** reports an Ethernet signal lost alarm

remote — reports remote faults

local — reports local faults

no-frame-lock — reports a "not locked on the ethernet framing sequence" alarm

high-ber — reports a high bit error rate alarm

speed

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

Context config>port>ethernet

Description This command configures the port speed of an Ethernet port when autonegotiation is disabled.

Setting the speed turns off autonegotiation.

Default **100**

Parameters **10 —** sets the link to 10 Mb/s speed

100 — sets the link to 100 Mb/s speed

1000 — sets the link to 1000 Mb/s speed (only supported on GigE SFPs)

SONET/SDH Port Commands

sonet-sdh

Syntax **sonet-sdh**

Context config>port

Description This command enables access to the context to configure SONET/SDH ports. This context can only be used when configuring an OC3 or STM1 port on an appropriate adapter card.

clock-source

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

Context config>port>sonet-sdh

Description This command configures the clock for transmitted data from either the internal clock or from a clock recovered from the line's receive data stream.

Default **node-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

framing

Syntax **clock-source** {**sonet** | **sdh**}

Context config>port>sonet-sdh

Description This command specifies the SONET/SDH framing to be either SONET or SDH.

Default **sonet**

Parameters **sonet —** configures the port for SONET framing

sdh — configures the port for SDH framing

hold-time

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

Context config>port>sonet-sdh

Description This command configures SONET link dampening timers in 100s of milliseconds, to guard against reporting excessive interface transitions. This is implemented by not advertising subsequent transitions of the interface to upper layer protocols until the configured timer has expired.

Default **no hold-time**

Parameters **up** *hold-time-up* — configures the hold-timer for link up event dampening. A value of zero (0) indicates that an up transition is reported immediately.

Values 0 to 100 (in 100 ms)

down *hold-time-down* — configures the hold-timer for link down event dampening. A value of zero (0) indicates that a down transition is reported immediately.

Values 0 to 100 (in 100 ms)

loopback

Syntax **loopback** {**line** | **internal**}
no loopback

Context config>port>sonet-sdh

Description This command activates a loopback on the SONET/SDH port. The SONET port must be in a shutdown state to activate any type of loopback. The loopback setting is never saved to the generated/saved configuration file.

Notes: Loopback mode changes on a SONET/SDH port can affect traffic on the remaining ports.

Default **no loopback**

Parameters **line** — sets the port into line loopback state

internal — sets the port into internal loopback state

report-alarm

Syntax [**no**] **report-alarm** [**loc**] [**lais**] [**lrdi**] [**lb2er-sd**] [**lb2er-sf**] [**slof**] [**slos**] [**lrei**]

Context config>port>sonet-sdh

Description This command enables logging of SONET/SDH line and section alarms for a SONET/SDH port.

The **no** form of this command disables logging of the specified alarms.

Parameters **loc** — reports a loss of clock that causes the operational state of the port to be shut down

Default loss of clock alarms are issued

lais — reports line alarm indication signal errors. When configured, line alarm indication signal alarms are raised and cleared.

Default line alarm indication signal alarms are not issued

lrdi — reports line remote defect indication errors. Line remote defect indication errors are caused by remote loss of frame (LOF), loss of clock (LOC), and loss of signal (LOS) conditions. When configured, line remote defect indication alarms are raised and cleared.

Default line remote defect indication alarms are issued

lb2er-sd — reports line signal degradation BER (bit interleaved parity) errors. When configured, line signal degradation BER alarms are raised and cleared.

Default line signal degradation BER alarms are not issued

lb2er-sf — reports line signal failure BER errors. When configured, line signal failure BER alarms are raised and cleared.

Default line signal failure BER alarms are issued

slof — reports section loss of frame errors. When configured, section loss of frame alarms are raised and cleared.

Default section loss of frame alarms are issued

slos — reports a section loss of signal error on the transmit side. When configured, section loss of signal alarms are raised and cleared.

Default section loss of signal alarms are issued

lrei — reports a line error condition raised by the remote end as a result of b1 errors received from this node. When configured, line error traps are raised but not cleared.

Default line error traps are not issued

section-trace

Syntax **section-trace** {**increment-z0** | **byte** *value* | **string** *string*}

Context config>port>sonet-sdh

Description This command configures the section trace bytes in the SONET section header to interoperate with some older versions of ADMs or regenerators that require an incremental STM ID. You can explicitly configure an incremental STM value rather than a static one in the SDH overhead by specifying an **increment-z0** value.

Default **byte** 0x1

Parameters **increment-z0 —** configures an incremental STM ID instead of a static value

byte *value* — sets values in SONET header bytes

Values 0 to 255 or 0x00 to 0xFF

Default 0x1

string *string* — specifies a text string that identifies the section

Values a string up to 16 bytes

speed

Syntax **speed** {**oc3**}
no speed

Context config>port>sonet-sdh

Description This command configures the speed of a SONET/SDH port. To change the port speed, the port must be administratively shut down and all channels must be removed. When the port speed is changed, the default channel configuration is recreated.

For Release 2.0, this option is available, but may not be configured, since only one speed type is supported.

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

Default **oc3**

Parameters **oc3 —** sets the speed of the port to OC3

threshold

Syntax **threshold** {**ber-sd** | **ber-sf**} **rate** *threshold-rate*
no threshold {**ber-sd** | **ber-sf**}

Context config>port>sonet-sdh

Description This command configures the line signal (b2) degradation bit error rate (BER) and line signal failure thresholds.

Alarms are raised if the line signal bit interleaved parity error rates exceed either the degradation or failure thresholds. If the failure threshold is crossed, the link will be set to operationally down.

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

Default **threshold ber-sf 6 —** signal degrade BER threshold of 10^{-6}

threshold ber-sf 3 — signal failure BER threshold of 10^{-3}

Parameters **ber-sd —** specifies the BER for signal degradation

ber-sf — specifies the BER for signal failure

rate *threshold-rate* **—** specifies the BER negative exponent (n in 10^{-n}), expressed as a decimal integer

Values 3 to 9 (10^{-3} to 10^{-9})

SONET/SDH Path Commands

path

Syntax [**no**] **path** [*sonet-sdh-index*]

Context config>port>sonet-sdh

Description This command defines the SONET/SDH path.

The **no** form of this command removes the specified SONET/SDH path.

Default no index

Parameters *sonet-sdh-index* — specifies the components making up the specified SONET/SDH path

On the 4-port OC3/STM1 Clear Channel Adapter card, *sonet-sdh-index* is optional; if used, the value must be sts3.

Syntax: sts1-x.x

crc

Syntax **crc** {**32**}

Context config>port>sonet-sdh>path

Description This command specifies a cyclic redundancy check on the SONET/SDH path.

Default **32** (the default is 32 when the encap-type is set to ATM; this default cannot be changed)

Parameters **32 —** use 32 bit checksum for the associated port/channel

encap-type

Syntax **encap-type** {**atm**}
no encap-type

Context config>port>sonet-sdh>path

Description This command configures the encapsulation method used to distinguish customer traffic on an access SONET/SDH channel sub-port (**encap-type** is only required when configuring a SONET/SDH path for access mode).

When **encap-type** is **atm,** the crc default cannot be changed.

When **encap-type** is **atm**, ATM sub-layer verification specified in GR-1248-CORE, Generic Requirements for Operations of ATM Network Elements, is automatically enabled. The result of the verification includes:

- Out of Cell Delineation (OCD) event count — the OCD event count is described in RFC 2515, Definitions of Managed Objects for ATM Management. Multiple events occurring within 1 second will be counted as one event for ATM and ASAP adapter cards as a result of a hardware limit.
- Loss of Cell Delineation (LCD) defect/alarm — the LCD defect/alarm is defined in RFC 2515, Definitions of Managed Objects for ATM Management. When a path is in an LCD defect state, the path's operational status is down. When a path exits the LCD state, the path's operational status will change to up (assuming nothing else causes the path to stay down). A trap is raised to indicate the LCD status change, and a Path Remote Defect Indicator (PRDI) is sent to indicate the defect to the remote end.

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

Default **atm**

Parameters **atm —** specifies that the encapsulation on the port is ATM

mtu

Syntax **mtu** *mtu*
no mtu

Context config>port>sonet-sdh>path

Description This command configures the maximum payload MTU size for a SONET/SDH port.

When **encap-type** is **atm**, the path MTU value cannot be changed. Refer to the 7705 SAR OS Services Guide for information on configuring the path MTU.

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

Default 1524 bytes

Parameters *mtu* — sets the maximum allowable size of the MTU, expressed as an integer

Values 512 to 1524 (in bytes)

report-alarm

Syntax [**no**] **report-alarm** [**pais**] [**plop**] [**prdi**] [**pplm**] [**prei**] [**puneq**]

Context config>port>sonet-sdh>path

Description This command enables logging of SONET/SDH path alarms for a SONET/SDH port.

The **no** form of this command disables logging of the specified alarms.

Parameters **pais —** reports path alarm indication signal errors. When configured, path alarm indication signal alarms are raised and cleared.

Default path alarm indication signal alarms are not issued

plop — reports path loss of pointer errors, per tributary. When configured, path loss of pointer traps are raised but not cleared.

Default path loss of pointer traps are issued

prdi — reports path remote defect indication errors. When configured, path remote defect indication alarms are raised and cleared.

Default path remote defect indication alarms are not issued

pplm — reports a path payload mismatch, which places the channel operationally down. When configured, path payload mismatch traps are raised but not cleared.

Default path payload mismatch traps are issued

prei — reports a path error condition raised by the remote end as a result of b3 errors received from this node. When configured, path error traps are raised but not cleared.

Default path error traps are not issued

puneq — reports path unequipped errors

Default path unequipped traps are issued

scramble

Syntax [**no**] **scramble**

Context config>port>sonet-sdh>path

Description This command enables SONET/SDH payload scrambling.

Scrambling randomizes the pattern of 1s and 0s carried in a SONET frame. Scrambling, or rearranging, the pattern prevents continuous strings of all 1s or all 0s and meets the needs of physical layer protocols that rely on sufficient transitions between 1s and 0s to maintain clocking.

For ATM, this command enables or disables ATM cell-level payload scrambling/descrambling using the x43+1 polynomial as defined in ITU-T I.432.1. Scrambling is enabled by default for the ATM path/channel. This scrambling is done in addition to SONET/SDH frame scrambling/descrambling, which is always enabled in the framer.

The **no** form of this command disables scrambling.

Default **scramble**

signal-label

Syntax **signal-label** *value*
no signal-label

Context config>port>sonet-sdh>path

Description This command sets the C2 byte value. The purpose of this byte is to communicate the payload type being encapsulated by SONET framing.

Default **0xcf**

Parameters *value* — specifies the C2 byte value, expressed as a decimal integer or a hexadecimal value

Values 1 to 254 or 0x01 to 0xfe

trace-string

Syntax **trace-string** [*trace-string*]
no trace-string

Context config>port>sonet-sdh>path

Description This command specifies that a J1-path-trace that identifies the circuit be continuously inserted at source. The specified trace string can be checked against the expected value by the receiver. If no trace string is entered, a null string is used.

The **no** form of this command resets the string to its default.

Default The default J1 value is **ALU 7705 SAR**. The value does not change when the encap-type changes. The J1 string contains all zeros for a non-provisioned path.

Parameters *trace-string* — specifies an alphanumeric string value. If the string contains spaces, enclose it in quotation marks.

Values 1 to 62 bytes for SONET or 1 to 15 bytes for SDH

Network Port Commands

network

Syntax **network**

Context config>port>ethernet
config>port>tdm>ds1
config>port>tdm>e1

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

queue-policy

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

Context config>port>ethernet>network
config>port>tdm>ds1>network
config>port>tdm>e1>network

Description This command specifies the network queue policy that 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. Refer to the 7705 SAR OS Quality of Service Guide for more information.

Default **default**

Parameters *name* — specifies an existing network queue policy name

Multilink Bundle and IMA Group Commands

Note: Unless otherwise specified, references to multilink bundles refer to both multilink (MLPPP) bundles and IMA groups.

multilink-bundle

Syntax [**no**] **multilink-bundle**

Context config>port

Description This command creates the context to configure bundle properties for this bundle port.

Default **None**

fragment-threshold

Syntax **fragment-threshold** *fragment-threshold*
no fragment-threshold

Context config>port>multilink-bundle

Description This command sets the maximum length (in bytes) of a fragment transmitted across the specified MLPPP bundle or sets the length of a Tx frame across the specified IMA group bundle in ATM cells.

The **no** form of this command resets the fragment threshold back to the default value.

Default **128**

Parameters *fragment threshold* — specifies the maximum fragment length in bytes (for MLPPP bundles) or the Tx frame size (for IMA bundles)

Values 128, 256, or 512 bytes (MLPPP)

128 cells (IMA)

member

Syntax **[no] member** *port-id*

Context config>port>multilink-bundle

Description This command binds a channel group that fills up the entire DS1 or E1 link to a multilink bundle.

Up to eight channel groups can be bound to a given multilink bundle. All channel groups must be from the same adapter card and of the same type (either E1 or DS1).

Up to eight IMA groups can be configured on a 16-port T1/E1 ASAP Adapter card. Up to eight MPLPPP bundles can be configured on a 16-port T1/E1 ASAP Adapter card.

The **no** form of this command removes the specified channel group from the multilink bundle.

Default **None**

Parameters *port-id* — the physical port ID

Syntax: *slot/mda/port.channel*

minimum-links

Syntax **minimum-links** *minimum-links*
no minimum-links

Context config>port>multilink-bundle

Description This command sets the minimum number of links that must be active for the bundle to be active.

If the number of active links drops below the configured minimum, then the multilink bundle will transition to an operationally down state.

The **no** form of this command removes the minimum link limit.

Default **1**

Parameters *minimum-link* — the minimum link limit, expressed as an integer

Values 1 to 8

mrru

Syntax **mrru** *mrru*
no mrru

Context config>port>multilink-bundle

Description This command specifies the maximum received reconstructed unit (MRRU), which is similar to a maximum transmission unit (MTU) but applies only to MLPPP multilink bundles. The MRRU is the maximum frame size that can be reconstructed from multilink fragments. This command is only valid for MLPPP bundles.

The **no** form of this command resets the MRRU to the default.

Default **1524**

Parameters *bytes* — the maximum received reconstructed unit size, expressed as an integer

Values 1500 to 1572 bytes

red-differential-delay

Syntax **red-differential-delay** *red-diff-delay* [**down**]
no red-differential-delay

Context config>port>multilink-bundle

Description This command sets the maximum acceptable differential delay for individual circuits within a multilink bundle.

The **no** form of this command restores the red-differential-delay defaults.

Default **None**

Parameters *red-diff-delay* — the maximum red differential delay value, in milliseconds

Values 0 to 25 ms for MLPPP bundles
0 to 75 ms for IMA bundles

down — transition the circuit that exceeded the differential delay to a down state (for example, remove it from the multilink bundle from an operational perspective)

short-sequence

Syntax [**no**] **short-sequence**

Context config>port>multilink-bundle

Description This command specifies that the MLPPP bundle should use short (12 bit) sequence numbers instead of the default 24-bit sequence number. This command is only valid for MLPPP bundles.

The **no** form of this command disables the short-sequence feature.

Default **no short-sequence**

yellow-differential-delay

Syntax **yellow-differential-delay** *yellow-diff-delay*
no yellow-differential-delay

Context config>port>multilink-bundle

Description This command sets the yellow warning threshold for the differential delay for members within a multilink bundle. If circuit's delay exceeds the yellow-differential delay value, a log message and SNMP trap is sent. This command is only valid for MLPPP bundles.

The **no** form of this command removes the yellow-differential-delay.

Default **None**

Parameters *yellow-diff-delay* — the maximum yellow differential delay threshold value, in milliseconds

Values 1 to 25 ms

ima

Syntax **ima**

Context config>port>multilink-bundle

Description This command enables the context to configure parameters for an IMA group. An IMA group is a collection of physical links bundled together and assigned to an ATM port. IMA enables a high-speed channel that is composed of ATM cells to be transported as a number of lower-speed circuits. They are then reassembled as the original high-speed ATM channel.

This command is only valid for IMA bundles.

link-delay

Syntax **link-delay** {**activate** | **deactivate**} *milliseconds*
no link-delay {**activate** | **deactivate**}

Context config>port>multilink-bundle>ima

Description This command specifies the time delay between detection of a link activation/deactivation condition and acting upon it (going in/out of the Rx failure state on a link).

Parameters **activate** *milliseconds* — the time, in milliseconds, used to clear an existing LIF, LODS, or FRI-IMA alarm. The time specified determines how long is needed for member links to stabilize before being activated.

Values 1 to 30000 ms

Default 1000

deactivate *milliseconds* — the time, in milliseconds, used to raise an LIF, LODS, or FRI-IMA alarm. The time specified determines how long before a member link is declared in error and is deactivated.

Values 1 to 30000 ms

Default 2000

test-pattern-procedure

Syntax **test-pattern-procedure**

Context config>port>ml-bundle>ima

Description This command enables the context to configure IMA test pattern procedures. Note that this command and sub-commands are not saved in the router configuration between reboots.

test-link

Syntax **test-link** *port-id*
no test-link

Context config>port>ml-bundle>ima>test-pattern-procedure

Description This command specifies IMA members on which an IMA test pattern procedure is to be performed.

The **no** form of this command deletes the link from the test-pattern procedure. The test-pattern procedure must be shut down first.

Default **no test-link**

Parameters *port-id* — the port ID to be used to verify link connectivity within an IMA group

test-pattern

Syntax **test-pattern** *pattern*
no test-pattern

Context config>port>ml-bundle>ima>test-pattern-procedure

Description This command specifies the transmit test pattern in an IMA group loopback operation. This value can only be changed when the **test-pattern-procedure** command is shut down.

The **no** form of this command restores the test pattern to the default.

Default **0**

Parameters *pattern* — specifies an integer taking the following values:

Values 0 to 255

shutdown

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

Context config>port>ml-bundle>ima>test-pattern-procedure

Description This command enables a configured IMA test pattern procedure.

The **no** form of this command disables the IMA test pattern procedure.

version

Syntax **version** *IMA-version*
no version

Context config>port>ml-bundle>ima>

Description This command configures the IMA version for the multilink bundle group. If there is a version mismatch between this IMA group and the far-end IMA group, the IMA group will go operationally down. In Release 2.0 of the 7705 SAR, only IMA version 1.1 is supported.

Default **1-1**

Parameters *IMA-version* — specifies the IMA version for this group

Values 1-1 — IMA version 1.1

ATM Interface Commands

atm

Syntax **atm**

Context config>port>multilink-bundle>ima
config>port>tdm>ds1>channel-group
config>port>tdm>e1>channel-group
config>port>sonet-sdh>path

Description This command enables the context to configure ATM interface properties.

cell-format

Syntax **cell-format** *cell-format*

Context config>port>multilink-bundle>ima>atm
config>port>tdm>ds1>channel-group>atm
config>port>tdm>e1>channel-group>atm
config>port>sonet-sdh>path>atm

Description This command configures the ATM cell format.

Parameters *cell-format* — the ATM cell format, either UNI or NNI (SONET/SDH ports do not support the NNI format)

Values uni (user-to-network interface)
nni (network-to-network interface cell format)

min-vp-vpi

Syntax **min-vp-vpi** *value*

Context config>port>multilink-bundle>ima>atm
config>port>tdm>ds1>channel-group>atm
config>port>tdm>e1>channel-group>atm
config>port>sonet-sdh>path>atm

Description This command sets the minimum allowable virtual path identifier (VPI) value that can be used on the ATM interface for a VPC.

Default **0**

Parameters *value* — the minimum allowable VPI value that can be used on the ATM interface for a VPC

Values 0 to 4095 (NNI) (not supported on SDH/SONET ports)
0 to 255 (UNI)

TDM Commands

tdm

Syntax **tdm**

Context config>port

Description This command enables the context to configure DS1/E1 parameters for a port on a channelized T1/E1 ASAP Adapter card.

TDM is a mechanism that divides the bandwidth of a stream into separate channels or timeslots by assigning each stream a different timeslot in a set. TDM repeatedly transmits a fixed sequence of timeslots over a single transmission channel. Each individual data stream is reassembled at the receiving end based on the timing.

Default **None**

buildout

Syntax **buildout short**

Context config>port>tdm

Description This command specifies the line buildout (cable length) for DS1 interfaces on the T1/E1 ASAP Adapter card.

Default **short**

Parameters **short** — sets the line buildout for length runs up to 655 ft.

ds1

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

Context config>port>tdm

Description This command enables the context to configure digital signal level 1 (DS1) frame parameters.

T1 transmits DS1-formatted data at 1.544 Mb/s through the network.

Once a channel has been configured for DS1, all ports on the T1/E1 ASAP Adapter card can only be configured for DS1. There cannot be a mix of DS1 and E1 channels on the same card.

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

Default **None**

e1

Syntax **[no] e1**

Context config>port>tdm

Description This command enables the context to configure E1 parameters. E1 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 Mb/s.

Once a channel has been configured for E1, all ports on the T1/E1 ASAP Adapter card can only be configured for E1. There cannot be a mix of DS1 and E1 channels on the same card.

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

Default **None**

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 ASAP Adapter 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 **Values** 100 for DS1

120 or 75 for E1

DS1 and E1 Commands

clock-source

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

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 if the port is used for TDM pseudowires.

The clock source setting also determines the node sync reference if the port is configured as one of the node sync references (**config>system>sync-if-timing>{ref1 | ref2}> source-port** command). Refer to the 7705 SAR OS Basic System Configuration Guide for more information.

Note: If BITS is used as a timing reference on a dedicated T1/E1 port, the port must be configured as loop-timed.

Default **loop-timed**

Parameters **adaptive-timed** — clocking is derived from the incoming pseudowire packets from the MPLS network

loop-timed — the link recovers the clock from the received data stream

node-timed — the link uses the internal clock when transmitting data

framing (DS1)

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 ASAP Adapter card. When a DS1 unframed channel is shut down, it sends the AIS pattern to the far-end DS1. The far end does not react to the AIS pattern if the far-end DS1 is configured as unframed. If the far-end DS1 is configured as framed, the far end declares AIS. The operational status remains up and no alarms are generated while the near end is operationally down. This is normal behavior for unframed G.703 mode.

Default **esf**

Parameters **esf** — configures the DS1 port for extended superframe framing

sf — configures the DS1 port for superframe framing

ds1-unframed — specifies DS1 unframed (G.703) mode for DS1 interfaces. DS1 unframed mode is only applicable if the encapsulation type is set to cem or ppp-auto.

framing (E1)

Syntax **framing** {**no-crc-g704** | **g704** | **e1-unframed**}

Context config>port>tdm>e1

Description This command specifies the E1 framing to be used for the port.

The **e1-unframed** parameter allows the configuration of an unstructured E1 channel on a T1/E1 ASAP Adapter card. When an E1 unframed channel is shut down, it sends the AIS pattern to the far-end E1. The far end does not react to the AIS pattern if the far-end E1 is configured as unframed. If the far-end E1 is configured as framed, the far end declares AIS. The operational status remains up and no alarms are generated while the near end is operationally down. This is normal behavior for unframed G.703 mode.

Default **no-crc-g704**

Parameters **g704** — configures the E1 port for G.704 framing

no-crc-g704 — configures the E1 port for G.704 framing 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.

hold-time

Syntax **hold-time** [**up** *hold-time-up*] [**down** *hold-time-down*]

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

Description This command configures the DS1/E1 link dampening timers in 100s of milliseconds, by guarding against reporting excessive interface transitions. This is implemented by not advertising subsequent transitions of the interface to upper layer protocols until the configured timer has expired.

Default **no hold-time**

Parameters **up** *hold-time-up* — configures the hold-timer for link-up event dampening. A value of zero (0) indicates that an up transition is reported immediately.

Values 0 to 100 (in 100 ms)

down *hold-time-down* — configures the hold-timer for link-down event dampening. A value of zero (0) indicates that a down transition is reported immediately.

Values 0 to 100 (in 100 ms)

loopback (DS1)

Syntax **loopback {line | internal | fdl-ansi | fdl-bellcore | payload-ansi}**
no loopback

Context config>port>tdm>ds1

Description This command puts the specified port or channel in 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 at the framer. This is usually referred to as an equipment loopback. The Tx signal is looped back and received by the interface.

The **fdl-ansi** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network line loopback. The **ansi** keyword enables the remote line FDL ANSI bit loopback on the T1 line, in accordance with the ANSI T1.403 specification.

The **fdl-bellcore** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network line loopback. The **bellcore** keyword enables the remote line FDL Bellcore bit loopback on the T1 line, in accordance with the Bellcore TR-TSY-000312 specification.

The **payload-ansi** loopback command sends a repeating 16-bit ESF data link code word to the remote end requesting that it enter into a network payload loopback. A payload loopback loops frames back towards the transmit (egress) direction after reaching the framer. The bit stream is reframed. The electrical signal is regenerated by the Tx LIU and the timing is provided by the Rx LIU.

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 line loopback mode

internal — places the associated port or channel into internal loopback mode

fdl-ansi — requests an FDL line loopback in accordance with the ANSI T1.403 specification

fdl-bellcore — requests an FDL line loopback in accordance with the Bellcore TR-TSY-000312 specification

payload-ansi — requests a payload loopback using ANSI signaling

loopback (E1)

Syntax **loopback** {**line** | **internal**}
no loopback

Context config>port>tdm>e1

Description This command puts the specified port or channel in a loopback mode.

A line loopback loops frames received on the corresponding port or channel back towards the transmit direction.

An internal loopback loops the frames from the local router back at the framer. This is usually referred to as an equipment loopback. The Tx signal is looped back and received by the interface.

The loopback command is not saved to the system configuration.

The **no** form of this command disables the specified type of loopback.

Default **no loopback**

Parameters **line** — places the associated port or channel into line loopback mode

internal — places the associated port or channel into internal loopback mode

remote-loop-respond (DS1)

Syntax [**no**] **remote-loop-respond**

Context config>port>tdm>ds1

Description This command configures the DS1 channel response to remote loopbacks. When enabled, the channel responds to remote loopbacks; when disabled, the channel does not respond.

Default **no remote-loop-respond**

report-alarm

Syntax [**no**] **report-alarm** {ais | los | oof | rai | looped}

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

Description This command enables logging of DS1 or E1 alarms for a DS1 or E1 port.

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 remote alarm indication signal errors. When configured, **rai** alarms 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 signal mode before configuring the Cpipe service to support T1 or E1 with CAS. Refer to the 7705 SAR OS Services Guide for information on configuring Cpipe service.

This command is valid only when T1 framing is set to **esf** or **sf**, or E1 framing is set to **g704** or **no-crc-g704**.

Parameters **cas** — specifies channel associated signaling

DS1 and E1 Channel Group Commands

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**

Parameters *channel-group-id* — identifies the channel-group ID number

Values DS1: 1 to 24
E1: 1 to 32

crc

Syntax **crc** {**16** | **32**}

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

Description This command configures the precision of the cyclic redundancy check (CRC). The command is applicable only if the encapsulation type is ppp-auto.

Default **16**

Parameters **16** — use 16-bit checksum for the associated port/channel

32 — use 32-bit checksum for the associated port/channel

encap-type

Syntax **encap-type** {**atm** | **cem** | **ipcp** | **ppp-auto**}
no encap-type

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

Description This command configures the encapsulation method used for the port on the T1/E1 ASAP Adapter card. This parameter can be set on both access and network ports.

For access mode, the supported encapsulation types are cem, atm, and ipcp. For network mode, only ppp-auto encapsulation is supported. The ppp-auto encapsulation type does not support fractional DS1 or E1.

Default **cem**

Parameters **atm** — specifies the encapsulation type as atm for ATM pseudowires

cem — specifies the encapsulation type as circuit emulation mode for TDM pseudowires

ipcp — specifies the encapsulation type as IPCP for a PPP/MLPPP channel group in access mode

ppp-auto — specifies the encapsulation type as PPP for PPP/MLPPP bundles in network mode

idle-cycle-flag

Syntax **idle-cycle-flag** {**flags** | **ones**}
no idle-cycle-flag

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

Description This command configures the value that the DS0, DS1, or E1 interface transmits during idle cycles. This command is applicable only if the encapsulation type is ppp-auto.

The **no** form of this command changes the idle cycle flag to the default value.

Default **flags** (0x7E)

Parameters **flags** — use 0x7E as the idle cycle flag

ones — use 0xFF as the idle cycle flag

idle-payload-fill

Syntax **idle-payload-fill** {**all-ones** | **pattern** *pattern*}
no idle-payload-fill

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

Description This command defines the data pattern to be transmitted (8-bit value) when the circuit emulation service is not operational or temporarily experiences underrun conditions. This command is only valid for CESoPSN services.

Note: See the 7705 SAR OS Services Guide for information on CESoPSN services.

Default **all-ones**

Parameters **all-ones** — transmits 11111111

pattern — transmits the user-defined pattern

Values 1 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 (8-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 7705 SAR OS Services Guide for information on CESoPSN services.

Default **all-ones**

Parameters **all-ones** — transmits 11111111

pattern — transmits the user-defined pattern

Values 1 to 255 (can be entered in decimal, binary, or hexadecimal format)

mode

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

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

Description This command configures a TDM channel 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** (atm, cem or ipcp) must be specified to distinguish the services on the port. Once a TDM channel has been configured for access mode, multiple services can be configured on the TDM channel.

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, only the ppp-auto **encap-type** can be configured for the port/channel.

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

Default **access**

Parameters **access —** configures the channel as service access

network — configures the channel for transport network use

mtu

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

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

Description This command configures the maximum payload MTU size for a port.

Packets received that are larger than the MTU will be fragmented or discarded, depending on whether the DF bit is set in the packet header.

If the port mode or encapsulation type is changed, the MTU assumes the default values of the new mode or encapsulation type.

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

Default The default MTU value depends on the port type, mode and encapsulation as listed in the following table:

Type	Mode	Encap Type	Default (Bytes)
TDM (PW)	Access	cem	1572
TDM (ATM PW)	Access	atm	1572
TDM (PPP/MLPPP)	Network	ppp-auto	1572
TDM (PPP/MLPPP)	Access	ipcp	1572

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

Values 512 to 1572 bytes

ppp

Syntax **[no] ppp**

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

Description This command enables access to the context to configure the LCP operational parameters for a DS1 or E1 channel or a DS0 channel.

The **no** form of the command removes the LCP operational parameters.

Default **no ppp**

keepalive

Syntax **keepalive** *time-interval* [**dropcount** *drop-count*]
no keepalive

Context config>port>tdm>ds1>channel-group>ppp
config>port>tdm>e1>channel-group>ppp

Description This command sets the keepalive interval.

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

Default **10**

Parameters *time-interval* — the time in seconds between keepalive messages, expressed as a decimal integer

Values 1 to 60 seconds

drop-count — the number of consecutive keepalive failed request attempts or remote replies that can be missed after which the port is operationally downed

Values 1 to 255

scramble

Syntax **scramble**
no scramble

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

Description This command enables payload scrambling on channel groups. The command is applicable only if the encapsulation type is atm.

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 DS0 timeslots to be used in the DS1 or E1 channel group. The timeslots do not need to be consecutive.

The **no** form of this command removes DS0 timeslots from a channel group.

Default **1 to 24** — channel groups configured under DS1
2 to 16, 18 to 32 — channel groups configured under E1 (ATM)
2 to 32 — channel groups configured under E1 (PPP)

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 to 24 for DS1 interfaces
2 to 32 for E1 interfaces

Show Commands

Note: Outputs for the show commands are examples only. Actual screen output may differ depending on card and port type, port mode (network or access) and encapsulation type configured.

Show Card Commands

card

Syntax **card** [*slot-number*] [**detail**]
card state

Context show

Description This command displays IOM information.

Parameters *slot-number* — displays information for the specified card slot (always 1)

Values 1

state — displays provisioned and equipped card and adapter card information

detail — displays detailed card information

Default **Displays summary information only**

Output **Card Output —** The following tables list card output fields:

- Table 4: "Show Card Output Fields"
- Table 5: "Show Card State Output Fields"
- Table 6: "Show Card Detailed Output Fields"
- Table 7: "Show CSM Card Output Fields"

Table 4: 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
	Down — the card is administratively down
Operational State	Up — the card is operationally up

Sample Output

```
*A:ALU-1># show card 1

===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-1g              iom-1g              up         up
===============================================================================
*A:ALU-1>#
```

Table 5: Show Card State Output Fields

Label	Description
Slot/Id	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 Down — the card is operationally down Provisioned — there is no card in the slot but it has been preconfigured Failed — the installed card has operationally failed
Num Ports	The number of ports available on the provisioned card

Table 5: Show Card State Output Fields (Continued)

Label	Description
Num MDA	The number of adapter cards installed
Comments	Indicates which CSM is the active card and which is in standby mode (for redundancy)

Sample Output

The following examples display the card state for a 7705 SAR-8 and a 7705 SAR-F.

Note: The `show card` command for the 7705 SAR-F will always appear as shown because it has a fixed physical configuration.

For the 7705 SAR-8:

```
ALU-1>config# show card state

Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-1g           iom-1g           up    up                  6
1/1    a4-oc3                            up    provisioned   4
1/2    a4-oc3                            up    provisioned   4
1/3    a16-chds1        a16-chds1        up    failed        16
1/4    a16-chds1        a16-chds1        up    failed        16
1/5    a8-eth           a8-eth           up    up            8
1/6    a8-eth           a8-eth           up    up            8
A      csm-1g           csm-1g           up    up                      Active
B      csm-1g                            up    down                    Standby
===============================================================================
```

For the 7705 SAR-F:

```
ALU-2# show card

===============================================================================
Card State
===============================================================================
Slot/  Provisioned      Equipped         Admin Operational   Num   Num Comments
Id     Type             Type             State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-1g           iom-1g           up    up            2
1/1    a16-chds1        a16-chds1        up    provisioned   16
1/2    a8-ethv2         a8-ethv2         up    provisioned   8
A      csm-1g           csm-1g           up    up                      Active
===============================================================================
ALU-2>#
```

Table 6: Show Card Detailed Output Fields

Label	Description
Clock source	The system's clock source
Available MDA slots	The number of card slots available
Installed MDAs	The number of cards installed
Part number	The chassis part number
CLEI code	The Common Language Equipment Identifier (CLEI) code string for the router
Serial number	The chassis serial number
Manufacture date	The chassis manufacture date
Manufacturing string	Factory-inputted manufacturing text string
Manufacturing deviations	A record of changes done to the hardware or software that 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 Provisioned — there is no card in the slot but it has been preconfigured Failed — the provisioned card has operationally failed
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 (rom) version	The version of the boot rom image
Software boot version	The version of the boot image
Software version	The software version number
Time of last boot	The date and time the most recent boot occurred
Current alarm state	The alarm conditions for the adapter card

Table 6: Show Card Detailed Output Fields (Continued)

Label	Description
Base MAC address	The base MAC address of the hardware component
Memory capacity	The memory capacity of the adapter card

Sample Output

```
*A:ALU-1># show card 1 detail

===============================================================================
Card 1
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
1         iom-1g              iom-1g              up         up
IOM Card Specific Data
    Clock source                : none
    Available MDA slots         : 6
    Installed MDAs              : 4
Hardware Data
    Part number                 : Sim Part#
    CLEI code                   : Sim CLEI
    Serial number               : card-1
    Manufacture date            : 01012003
    Manufacturing string        : Sim MfgString card-1
    Manufacturing deviations    : Sim MfgDeviation card-1
    Administrative state        : up
    Operational state           : up
    Temperature                 : 34C
    Temperature threshold       : 75C
    Software boot (rom) version : simulated
    Software version            : TiMOS-B-0.0.I536 both/i386 ALCATEL-LUCENT *
    Time of last boot           : 2008/10/30 15:01:12
    Current alarm state         : alarm cleared
    Base MAC address            : a4:58:01:00:00:00
    Memory capacity             : 2,039 MB
===============================================================================
```

Table 7: Show CSM Card Output Fields

Label	Description
Slot	The slot of the card in the chassis
Provisioned Card-type	The CSM type that is configured for the slot
Equipped Card-type	The CSM type that is actually populated in the slot
Admin State	Up — the CSM is administratively up
	Down — the CSM is administratively down
Operational State	Up/active — the CSM is operationally up and active
	Down — the CSM 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 saved	The date and time of the most recent config file save
M/S clocking ref state	primary — the card is acting as the primary (active) CSM in a redundant system
	secondary — the card is acting as the standby (secondary) CSM in a redundant system
Admin State	Up — the compact flash is administratively up
	Down — the compact flash is administratively down
Operational State	Up — the compact flash is operationally up
	Down — the compact flash is operationally down
Serial number	The compact flash serial number
Firmware revision	The compact flash firmware version number
Model number	The compact flash model number
Size	The memory capacity on the compact flash, in bytes
Free space	The amount of free space on the compact flash, in bytes
Part number	The CSM part number
CLEI code	The code used to identify the router
Serial number	The CSM serial number

Table 7: Show CSM Card Output Fields (Continued)

Label	Description
Manufacture date	The chassis manufacture date
Manufacturing string	Factory-inputted manufacturing text string
Manufacturing deviations	A record of changes done to the hardware or software that is outside the normal revision control process
Administrative state	Up — the CSM is administratively up
	Down — the CSM is administratively down
Operational state	Up — the CSM is operationally up
	Down — the CSM 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 (rom) version	The version of the boot image
Software version	The software version number
Time of last boot	The date and time the most recent boot occurred
Current alarm state	The alarm conditions for the specific card
Base MAC address	The base MAC address of the hardware component
Memory capacity	The total amount of memory on the CSM, in bytes

Sample Output

```
*A:ALU-1># show card a detail

===============================================================================
Card A
===============================================================================
Slot      Provisioned         Equipped            Admin      Operational
          Card-type           Card-type           State      State
-------------------------------------------------------------------------------
A         csm-1g              csm-1g              up         up/active

BOF last modified                 : N/A
Config file version               : WED SEP 01 15:49:15 2004 UTC
Config file last modified         : 2009/01/12 21:08:27
Config file last saved            : 2008/11/14 18:14:07
M/S clocking ref state            : primary

Flash - cf3:
    Administrative State          : up
    Operational state             : up
    Serial number                 : serial-3
    Firmware revision             : v1.0
    Model number                  : PC HD 3
    Size                          : 18,432 Bytes
    Free space                    : 8,192 Bytes

Hardware Data
    Part number                   : Sim Part#
    CLEI code                     : Sim CLEI
    Serial number                 : card-2
    Manufacture date              : 01012003
    Manufacturing string          : Sim MfgString card-2
    Manufacturing deviations      : Sim MfgDeviation card-2
    Administrative state          : up
    Operational state             : up
    Temperature                   : 25C
    Temperature threshold         : 75C
    Software boot (rom) version   : simulated
    Software version              : TiMOS-B-0.0.I536 both/i386 ALCATEL-LUCENT *
    Time of last boot             : 2008/10/30 15:01:08
    Current alarm state           : alarm cleared
    Base MAC address              : a4:58:02:00:00:00
    Memory capacity               : 2,039 MB
===============================================================================
*A:ALU-1>#
```

mda

Syntax **mda** [*slot* [/*mda*]] [**detail**]
mda [*slot* [/*mda*]] **statistics** [**source-mda** | **dest-mda**]
mda with-fabric-stats

Context show

Description This command displays adapter card information and statistics collected from a specified adapter card and associated fabric ports.

If no command line options are specified, a summary output of all adapter cards is displayed.

Parameters *slot* — the slot number of the CSM/IOM

Values 1

mda — the slot number of the adapter card

Values 1 to 6

detail — displays detailed adapter card information, including the fabric policy associated with the specified adapter card

statistics — displays statistics collected from the specified adapter card and associated fabric ports

source-mda — displays network ingress traffic statistics from the specified adapter card going towards the fabric and towards a destination adapter card. The sum of traffic forwarded or dropped is also displayed.

dest-mda — displays network ingress statistics for all adatper cards going towards the fabric and destined for the specified destination adapter card. Global fabric statistics are also displayed, as well as the fabric port statistics if the destination adapter card has the collection of fabric statistics is enabled.

with-fabric-stats — displays all adapter cards that have been configured to collect fabric port statistics

Output **MDA Output —** The following tables list adapter card output fields:

- Table 8: "Show MDA Output Fields"
- Table 9: "Show Detailed MDA Output Fields"
- Table 10: "Show MDA Fabric Statistics"
- Table 11: "Show MDA With Fabric Statistics"

Table 8: Show MDA Output Fields

Label	Description
Slot	The chassis slot number
MDA	The adapter card slot number
Provisioned MDA-type	The provisioned adapter card type
Equipped MDA-type	The adapter card type actually installed
Admin State	Up — the adapter card is administratively up Down — the adapter card is administratively down
Operational State	Up — the adapter card is operationally up Down — the adapter card is operationally down Provisioned — there is no adapter card in the slot but it has been preconfigured Failed — the provisioned adapter card has operationally failed

Sample Output

```
*A:ALU-1># show mda 1/1

MDA 1/1
===============================================================================
Slot  Mda   Provisioned          Equipped             Admin     Operational
            Mda-type             Mda-type             State     State
-------------------------------------------------------------------------------
1     1     a4-oc3                                    up        provisioned
===============================================================================
*A:ALU-1>#

*A:ALU-1># show mda 1/4

===============================================================================

MDA 1/4
===============================================================================
Slot  Mda   Provisioned          Equipped             Admin     Operational
            Mda-type             Mda-type             State     State
-------------------------------------------------------------------------------
1     4     a16-chds1            a16-chds1            up        up
===============================================================================

*A:ALU-1>#
```

Table 9: Show Detailed MDA Output Fields

Label	Description
Slot	The chassis slot number
Mda	The adapter card slot number
Provisioned Mda-type	The provisioned adapter card type
Equipped Mda-type	The adapter card type actually installed
Admin State	Up — the adapter card is administratively up
	Down — the adapter card is administratively down
Operational State	Up — the adapter card is operationally up
	Down — the adapter card is operationally down
	Provisioned — there is no adapter card in the slot but it has been preconfigured
	Failed — the provisioned adapter card has operationally failed
Maximum port count	The maximum number of ports that can be equipped on the adapter card
Number of ports equipped	The number of ports that are actually equipped on the adapter card
Network Ingress Queue Policy	The network ingress queue policy applied to the adapter card to define the queuing structure for this object (For mda-type = a4-oc3, this option has no effect in Release 2.0)
Network ingress fabric policy	The network ingress fabric policy applied to the adapter card (For mda-type = a4-oc3, this option has no effect in Release 2.0)
Access ingress fabric policy	The access ingress fabric policy applied to the adapter card
Fabric Stats Enabled	TRUE — the collection of fabric statistics is enabled on the adapter card
	FALSE — the collection of fabric statistics is disabled on the adapter card
Capabilities	Indicates the protocols that can be run on the adapter card
Min channel size	The minimum channel size on the adapter card
Max channel size	The maximum channel size on the adapter card

Table 9: Show Detailed MDA Output Fields (Continued)

Label	Description
Max number of channels	The maximum number of channels supported on the adapter card
Channels in use	The number of channels being used on the adapter card
Clock mode	The clocking mode used on the adapter card (Not applicable if mda-type = a4-oc3)
Part number	The hardware part number
CLEI code	The code used to identify the adapter card
Serial number	The adapter card part number
Manufacture date	The adapter card manufacture date
Manufacturing string	Factory-inputted manufacturing text string
Manufacturing deviations	A record of changes done to the hardware or software that is outside the normal revision control process
Administrative state	Up — the adapter card is administratively up
	Down — the adapter card is administratively down
Operational State	Up — the adapter card is operationally up
	Down — the adapter card is operationally down
	Provisioned — there is no adapter card in the slot but it has been preconfigured
	Failed — the provisioned adapter card has operationally failed
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 version	The software version number
Time of last boot	The date and time the most recent boot occurred
Current alarm state	The alarm conditions for the specific adapter card
Base MAC address	The base MAC address of the hardware component

Sample Output

The following example shows the details of an adapter card in slot 1.

```
*A:ALU-1># show mda 1/1 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     1     a4-oc3                                      up        provisioned

MDA Specific Data
    Maximum port count            : 4
    Number of ports equipped      : 4
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : Sonet, ATM
    Min channel size              : Sonet STS-3
    Max channel size              : Sonet STS-3
    Max number of channels        : 4
    Channels in use               : 2

Hardware Data
    Part number                   :
    CLEI code                     :
    Serial number                 :
    Manufacture date              :
    Manufacturing string          :
    Manufacturing deviations      :
    Administrative state          : up
    Operational state             : provisioned
    Software version              : N/A
    Time of last boot             : N/A
    Current alarm state           : alarm cleared
    Base MAC address              :
===============================================================================
*A:ALU-1>#
```

The following example shows the details of an adapter card in slot 4.

```
*A:ALU-1># show mda 1/4 detail

===============================================================================
MDA 1/4 detail
===============================================================================
Slot  Mda   Provisioned           Equipped              Admin     Operational
            Mda-type              Mda-type              State     State
-------------------------------------------------------------------------------
1     4     a16-chds1             a16-chds1             up        failed

MDA Specific Data
    Maximum port count            : 16
    Number of ports equipped      : 16
    Network ingress queue policy  : default
    Network ingress fabric policy : 1
    Access ingress fabric policy  : 1
    Fabric Stats Enabled          : FALSE
    Capabilities                  : TDM, PPP, ATM, CEM
    Min channel size              : PDH DS0 Group
    Max channel size              : PDH DS1
    Max number of channels        : 256
    Channels in use               : 0

CEM MDA Specific Data
    Clock Mode                    : adaptive

Hardware Data
    Part number                   : Sim Part#
    CLEI code                     : Sim CLEI
    Serial number                 : mda-4
    Manufacture date              : 01012003
    Manufacturing string          : Sim MfgString mda-4
    Manufacturing deviations      : Sim MfgDeviation mda-4
    Administrative state          : up
    Operational state             : failed
    Failure Reason                : Mda initialisation complete failed mda 4
    Software version              : N/A
    Time of last boot             : N/A
    Current alarm state           : alarm active
    Base MAC address              : a4:58:01:04:00:01
===============================================================================
*A:ALU-1>#
```

Table 10: Show MDA Fabric Statistics

Label	Description
Statistic of Source MDA	If the source-mda keyword is specified in the show command, displays the network ingress traffic statistics from the specified adapter card towards the fabric and towards a destination adapter card. The sum of traffic forwarded or dropped is also displayed.
Destination MDA Packets/Octets	In Profile forwarded — the number of in-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card (Destination MDA in the output field) In Profile dropped — the number of in-profile packets/octets dropped from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card (Destination MDA in the output field) Out Profile forwarded — the number of out-of-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card (Destination MDA in the output field) Out Profile dropped — the number of out-of-profile packets/octets dropped from the adapter card specified in the show mda command towards the fabric, then to the output destination adapter card (Destination MDA in the output field)
Total forwarded Packets/Octets	The number of in-profile and out-profile packets/octets forwarded or dropped
Statistic of Destination MDA	If the dest-mda keyword is specified in the show command, displays the network ingress statistics from the specified adapter card going towards the fabric and destined for a specified adapter card. Global fabric statistics are also displayed, as well as the fabric port statistics if the destination adapter card has the collection of fabric statistics enabled.
Source MDA Packets/Octets	The network ingress traffic statistics from the specified source adapter card towards the fabric and then towards an output adapter card In Profile forwarded — the number of in-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output adapter card (Source MDA in the output field)

Table 10: Show MDA Fabric Statistics (Continued)

Label	Description
	`In Profile dropped` — the number of in-profile packets/octets dropped from the adapter card specified in the `show mda` command towards the fabric, then to the output adapter card (Source MDA in the output field)
	`Out Profile forwarded` — the number of out-profile packets/octets forwarded from the adapter card specified in the show mda command towards the fabric, then to the output adapter card (Source MDA in the output field)
	`Out Profile dropped` — the number of out-profile packets/octets dropped from the adapter card specified in the `show mda` command towards the fabric, then to the output adapter card (Source MDA in the output field)
`Total forwarded Packets/Octets`	The number of in-profile and out-profile packets/octets forwarded or dropped
`Fabric Port Stats`	If the `dest-mda` keyword is specified in the `show` command and `fabric-stats-enabled` is configured on an adapter card, displays the egress traffic statistics toward the specified adapter card
	`Forwarded Packets/Octets` — the number of forwarded packets/octets switched from the fabric toward an adapter card
	`Dropped Packets/Octets` — the number of dropped packets/octets switched from the fabric toward an adapter card
`Fabric Global Stats`	If the `dest-mda` keyword is specified in the `show` command, displays the global fabric statistics collected from the fabric. The statistics include all traffic switched over the fabric, which includes traffic to all adapter cards and all internal traffic such as traffic destined for the CSM.
	`Forwarded Packets/Octets` — the number of forwarded packets/octets switched over the fabric
	`Dropped Packets/Octets` — the number of dropped packets/octets switched over the fabric

Note: The following octet counts are not supported: Fabric Port Dropped, Fabric Global Forwarded, and Fabric Global Dropped. N/A is displayed in these fields.

Sample Output

The following example shows the display if the `source-mda` keyword is used.

```
*A:7705:Dut-C# show mda 1/5 statistics source-mda

===============================================================================
Statistic of Source MDA 1/5
===============================================================================

-------------------------------------------------------------------------------
Destination MDA  1/1          Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Destination MDA  1/2          Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Destination MDA  1/3          Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Destination MDA  1/4          Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Destination MDA  1/5          Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Destination MDA  1/6          Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
-------------------------------------------------------------------------------
     Total forwarded :          0                       0
     Total dropped   :          0                       0
===============================================================================
*A:7705:Dut-C#
```

The following example shows the display if the `dest-mda` keyword is used.

```
*A:7705:Dut-C# show mda 1/5 statistics dest-mda

===============================================================================
Statistic of Destination MDA 1/5
===============================================================================

-------------------------------------------------------------------------------
Source MDA    1/1             Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Source MDA    1/2             Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Source MDA    1/3             Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Source MDA    1/4             Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Source MDA    1/5             Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
Source MDA    1/6             Packets                 Octets
     In Profile  forwarded :    0                       0
     In Profile  dropped   :    0                       0
     Out Profile forwarded :    0                       0
     Out Profile dropped   :    0                       0
-------------------------------------------------------------------------------
     Total forwarded :          0                       0
     Total dropped   :          0                       0

Fabric Port Stats              Packets                 Octets
     Forwarded :                1                       64
     Dropped   :                0                       N/A
Fabric Global Stats            Packets                 Octets

     Forwarded :                941                     N/A
     Dropped   :                0                       N/A

===============================================================================
===============================================================================
*A:7705:Dut-C
```

Table 11: Show MDA With Fabric Statistics

Label	Description
Fabric Port Stats enabled	The adapter card slot numbers that have been configured to collect fabric port statistics

Sample Output

The following example shows the display if the `with-fabric-stats` keyword is used.

```
*A:7705:Dut-C# show mda with-fabric-stats

Fabric Port Stats enabled    : MDA 1/1

*A:7705:Dut-C#
```

Show Port Commands

port

Syntax **port** *port-id* [**count**] [**detail**]
port *port-id* **acr** [**detail**]
port *port-id* **description**
port *port-id* **associations**
port *port-id* **ppp** [**detail**]
port *port-id* **ethernet** [**efm-oam** | **detail**]

Context show

Description This command displays port or channel information.

If no command line options are specified, the command **port** displays summary information for all ports on provisioned adapter cards.

Parameters *port-id* — Specifies the physical port ID

Syntax	port-id	*slot*[/*mda*[/*port*]] or *slot*/*mda*/*port*[.*channel*]
Values	slot	1
	mda	1 to 6
	port	1 to 4 (4-port OC3/STM1 Clear Channel Adapter card ports)
		1 to 16 (T1/E1 ASAP Adapter card ports)
		1 to 8 (Ethernet Adapter card ports)
	channel	ds1 or e1 (for **config>port>tdm** information)
		1 to 24 (DS1) or 1 to 32 (E1) (for **config>port>tdm>channel-group** information

acr — displays ACR-capable port information

associations — displays a list of current router interfaces to which the port is associated

count — displays only port counter summary information

description — displays port description strings

ethernet — displays Ethernet port information

efm-oam — displays EFM OAM information

detail — displays detailed information about the Ethernet port

ppp — displays PPP protocol information for the port

detail — provides detailed information

Output **Port Output —** The following tables describe port output fields:

- Table 12: "Show General Port Output Fields"
- Table 13: "Show Port Count Output Fields"
- Table 14: "Show Specific Port Output Fields (SONET/SDH Port)"
- Table 15: "Show Specific Port Output Fields (Ethernet Port)"
- Table 16: "Show Port Detail Output Fields (SONET/SDH Port)"
- Table 17: "Show Port Detail Output Fields (Ethernet - Access Mode)"
- Table 18: "Show Port Detail Output Fields (TDM DS1 Interface)"
- Table 19: "Show Port Channel Group Output Fields"
- Table 20: "Show Port ACR Detail Output Fields"
- Table 21: "Show Port Descriptions Output Fields"
- Table 22: "Show Port Associations Output Fields"
- Table 23: "Show Port PPP Output Fields"

Table 12: Show General Port Output Fields

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
`Link`	`Yes` — a physical link is present
	`No` — a physical link is not present
`Port State`	`Up` — the port is physically present and has a physical link
	`Down` — the port is physically present but does not have a link
	`Ghost` — the port is not physically present
	`None` — the port is in its initial creation state or about to be deleted
	`Link Up` — the port is physically present and has a physical link. When `Link Up` appears at the lowest level of a TDM tributary, it means the physical connection is active but the port is waiting before data traffic can flow. It is a waiting state and indicates that data traffic will not flow until it transitions to the `Up` state.
	`Link Down` — the port is physically present but does not have a link
`Cfg MTU`	The configured MTU
`Oper MTU`	The negotiated size of the largest packet that can be sent on the port or channel specified in octets

Table 12: Show General Port Output Fields (Continued)

Label	Description
LAG/Bndl	The Link Aggregation Group (LAG) or multilink bundle to which a TDM port is assigned
Port Mode	network — the port is configured for transport network use
	access — the port is configured for service access
Port Encp	The encapsulation type on the port (null or dot1q for Ethernet; atm, cem, ipcp, or ppp-auto for TDM; atm for SONET/SDH)
Port Type	The type of port or optics installed
SFP/MDI MDX	The SFP type on an Ethernet port (Ethernet, Fast Ethernet, or GigE)

Sample Output

```
*A:ALU-1># show port 1/1

===============================================================================
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   Ghost
1/1/2       Down  No   Ghost
1/1/3       Down  No   Ghost
1/1/3.sts3  Up    No   Ghost   1572 1572    - accs atm  sonet
1/1/4       Down  No   Ghost
1/1/4.sts3  Up    No   Ghost   1572 1572    - accs atm  sonet
===============================================================================
*A:ALU-1>#

A:ALU-1># show port 1/3

===============================================================================
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
-------------------------------------------------------------------------------
1/3/1       Down  No   Ghost
1/3/1.1     Down  No   Ghost   1572 1572    - accs ipcp tdm
1/3/2       Down  No   Ghost
1/3/2.1     Down  No   Ghost    512  512    1 accs ipcp tdm
1/3/3       Down  No   Ghost
1/3/4       Down  No   Ghost
1/3/5       Down  No   Ghost
1/3/6       Down  No   Ghost
1/3/6.6     Down  No   Ghost   1572 1572    - accs cem  tdm

*A:ALU-1>#
```

Table 13: Show Port Count Output Fields

Label	Description
Port ID	The port ID configured or displayed in the *slot/mda/port* format
Ingress Packets	The number of ingress packets coming into the port
Ingress Octets	The number of ingress octets coming into the port
Egress Packets	The number of egress packets transmitted from the port
Egress Octets	The number of egress octets transmitted from the port

Sample Output

```
*A:ALU-1># show port 1/1 count detail

===============================================================================
Port Statistics on Slot 1
===============================================================================
Port                    Ingress         Ingress         Egress          Egress
Id                      Packets          Octets         Packets         Octets
-------------------------------------------------------------------------------
1/1/1                         0               0               0               0
1/1/2                         0               0               0               0
1/1/3                         0               0               0               0
1/1/3.sts3                    0               0               0               0
1/1/4                         0               0               0               0
1/1/4.sts3                    0               0               0               0
===============================================================================
*A:ALU-1>#


*A:ALU-1># show port 1/5 count detail

===============================================================================
Port Statistics on Slot 1
===============================================================================
Port                    Ingress         Ingress         Egress          Egress
Id                      Packets          Octets         Packets         Octets
-------------------------------------------------------------------------------
1/5/1                         0               0               0               0
1/5/2                         0               0               0               0
1/5/3                         0               0               0               0
1/5/4                         0               0               0               0
1/5/5                         0               0               0               0
1/5/6                         0               0               0               0
1/5/7                         0               0               0               0
1/5/8                         0               0               0               0
===============================================================================
*A:ALU-1>#
```

Table 14: Show Specific Port Output Fields (SONET/SDH Port)

Label	Description
SONET/SDH interface	
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Speed	The speed of a SONET/SDH port
Admin Status	Up — the administrative state is up
	Down — the administrative state is down
Oper Status	Up — the operational state is up
	Down — the operational state is down
Physical Link	Yes — a physical link is present
	No — a physical link is not present
Loopback Mode	The loopback mode on the port
Single Fiber Mode	Yes — single fiber mode No — not single fiber mode
Ing. Pool % Rate	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
Egr. Pool % Rate	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
Clock Source	node — the link uses the internal clock when transmitting data loop — the link recovers the clock from the received data stream
Framing	sonet — the port is configured for SONET framing sdh — the port is configured for SDH framing
Last State Change	The last time that the operational status of the port changed state
Port IfIndex	The interface's index number, which reflects its initialization sequence
Last Cleared Time	The time since the last clear
DDM Events	Enabled — digital diagnostic monitoring events is enabled for the port Disabled — digital diagnostic monitoring events is disabled for the port

Table 14: Show Specific Port Output Fields (SONET/SDH Port) (Continued)

Label	Description
J0 String	The section trace value that is sent to the far-end port
Section Trace Mode	byte — the section trace in the SONET section header is set in bytes string — a text string is used to identify the SONET section header increment-z0 — an incremental STM ID is configured instead of a static value
Rx S1 Byte	The value of the received SONET/SDH S1 byte
Rx K1/K2 Byte	The value of the received SONET/SDH K1/K2 byte
Rx J0 String (Hex)	The hex value of the received J0
Cfg Alarm	The type of alarms to be logged and reported for the SONET/SDH port
Alarm Status	The current alarm state
BER SD Threshold	The configured threshold for line signal degradation BER error rate, that when crossed determines the signal degradation and signal failure
BER SF Threshold	The configured threshold for line signal failure BER error rate, that when crossed determines the signal degradation and signal failure
Hold time up	The hold-timer value for link-up event dampening
Hold time down	The hold-timer value for link-down event dampening
Port Statistics	
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.
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 at 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 at 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.

Sample Output

```
*A:ALU-1># show port 1/1/1

===============================================================================
SONET/SDH Interface
===============================================================================
Description        : OC-3 SONET/SDH
Interface          : 1/1/1                  Speed                : oc3
Admin Status       : down                   Oper Status          : down
Physical Link      : No                     Loopback Mode        : none
Single Fiber Mode  : No
Ing. Pool % Rate   : 100                    Egr. Pool % Rate     : 100
APS Group          : none                   APS Role             : none
Clock Source       : node                   Framing              : sonet
Last State Change  : 12/23/2008 20:22:25    Port IfIndex         : 35684352
Last Cleared Time  : N/A                    DDM Events           : Enabled
J0 String          : 0x01                   Section Trace Mode   : byte
Rx S1 Byte         : 0x00                   Rx K1/K2 Byte        : 0x00/0x00
Rx J0 String (Hex) : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Cfg Alarm          : loc lrdi lb2er-sf slof slos
Alarm Status       :
BER SD Threshold   : 6                      BER SF Threshold     : 3
Hold time up       : 500 milliseconds
Hold time down     : 0 milliseconds

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                                 0                     0
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
*A:ALU-1>#
```

Table 15: Show Specific Port Output Fields (Ethernet Port)

Label	Description
Ethernet Interface	
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Link-level	The type of link for which the port is configured
Admin State	Up — the administrative state is up
	Down — the administrative state is down
Oper State	Up — the operating state is up
	Down — the operating state is down
Physical Link	Yes — a physical link is present
	No — a physical link is not present
IfIndex	The interface's index number, which reflects its initialization sequence
Last State Change	The last time that the operational status of the port changed state
Last Cleared Time	The time since the last clear
Configured Mode	network — the port is configured for transport network use
	access — the port is configured for service access
Dot1Q Ethertype	The Ethertype expected when the port's encapsulation type is dot1q
Ing. Pool % Rate	The amount of ingress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port or channel for ingress buffering
Net. Egr. Queue Pol	default — the default policy is used
	network — the network egress queue policy is used
Egr. Sched. Pol	The egress scheduling policy
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
Egress Rate	The maximum amount of egress bandwidth (in kilobits per second) that this Ethernet interface can generate

Table 15: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
Configured Address	The base chassis Ethernet MAC address
Hardware Address	The interface's hardware or system assigned MAC address at its protocol sub-layer
Cfg Alarm	The type of alarms to be logged and reported for the Ethernet port
Alarm Status	The current alarm state
Oper Speed	The operating speed of the interface
Config Speed	The configured speed of the interface
Oper Duplex	Full — the link is operating at full duplex mode Half — the link is operating at half duplex mode
Config Duplex	Full — the link is set at full duplex mode Half — the link is set at half duplex mode
MTU	The size of the largest packet that can be sent/received on the Ethernet physical interface, specified in octets
Hold time up	The link-up dampening time in seconds
Hold time down	The link-down dampening time in seconds
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
Egr. Pool % Rate	The amount of egress buffer space, expressed as a percentage of the available buffer space, that will be allocated to the port or channel for egress buffering
MDI/MDX	Ethernet type
Ingress Rate	The maximum amount of ingress bandwidth (in kilobits per second) that this Ethernet interface can generate
Traffic Statistics	
Octets Input/Output	The total number of octets received and transmitted on the port

Table 15: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
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.
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. 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.
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.
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

Table 15: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
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.
Port Discard Statistics	
Unk L2 Packets Input/Output	The number of packets discarded due to an unknown L2 ID
CSM Ingress Queues Input/Output	The number of incoming control packets discarded
CSM Egress Queues Output	The number of outgoing control packets discarded
Ethernet-like Medium Statistics	
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

Table 15: Show Specific Port Output Fields (Ethernet Port) (Continued)

Label	Description
Late Collisions	The number of times that a collision is detected later than one slotTime into the transmission of a packet
Excess Collisns	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 sublayer transmit error
Int MAC Rx Errs	The number of frames for which a reception fails due to an internal MAC sublayer receive error

Sample Output

```
*A:ALU-1># show port 1/5/1

===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100 Ethernet TX
Interface          : 1/5/1                       Oper Speed       : N/A
Link-level         : Ethernet                    Config Speed     : 100 mbps
Admin State        : down                        Oper Duplex      : N/A
Oper State         : down                        Config Duplex    : full
Physical Link      : No                          MTU              : 1514
IfIndex            : 44072960                    Hold time up     : 0 seconds
Last State Change  : 10/30/2008 14:40:56         Hold time down   : 0 seconds
Last Cleared Time  : N/A

Configured Mode    : access                      Encap Type       : null
Dot1Q Ethertype    : 0x8100
Ing. Pool % Rate   : 100                         Egr. Pool % Rate : 100
Net. Egr. Queue Pol: default
Egr. Sched. Pol    : n/a
Auto-negotiate     : true                        MDI/MDX          : unknown
Egress Rate        : Default                     Ingress Rate     : n/a

Configured Address : a4:58:01:05:00:01
Hardware Address   : a4:58:01:05:00:01
Cfg Alarm          :
Alarm Status       :

===============================================================================
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
===============================================================================

===============================================================================
Port Discard Statistics
===============================================================================
                                 Input                                  Output
Unk L2 Packets   :                   0

CSM Ingress Queues                      CSM Egress Queues
  Hi             :                   0    Common          :                   0
  Low            :                   0
  Ftp            :                   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:ALU-1>#
```

Table 16: Show Port Detail Output Fields (SONET/SDH Port)

Label	Description
SONET/SDH interface	
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Speed	The speed of a SONET/SDH port
Admin Status	Up — the administrative state is up
	Down — the administrative state is down
Oper Status	Up — the operational state is up
	Down — the operational state is down
Physical Link	Yes — a physical link is present
	No — a physical link is not present
Loopback Mode	The loopback mode on the port
Single Fiber Mode	Yes — single fiber mode No — not single fiber mode
Ing. Pool % Rate	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
Egr. Pool % Rate	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
Clock Source	node — the link uses the internal clock when transmitting data loop — the link recovers the clock from the received data stream
Framing	sonet — the port is configured for SONET framing sdh — the port is configured for SDH framing
Last State Change	The last time that the operational status of the port changed state
Port IfIndex	The interface's index number, which reflects its initialization sequence
Last Cleared Time	The time since the last clear
DDM Events	Enabled — digital diagnostic monitoring events is enabled for the port Disabled — digital diagnostic monitoring events is disabled for the port

Table 16: Show Port Detail Output Fields (SONET/SDH Port) (Continued)

Label	Description
J0 String	The section trace value that is sent to the far-end port
Section Trace Mode	byte — the section trace in the SONET section header is set in bytes string — a text string is used to identify the SONET section header increment-z0 — an incremental STM ID is configured instead of a static value
Rx S1 Byte	The value of the received SONET/SDH S1 byte
Rx K1/K2 Byte	The value of the received SONET/SDH K1/K2 byte
Rx J0 String (Hex)	The hex value of the received J0
Cfg Alarm	The type of alarms to be logged and reported for the SONET/SDH port
Alarm Status	The current alarm state
BER SD Threshold	The configured threshold for line signal degradation BER error rate, that when crossed determines the signal degradation and signal failure
BER SF Threshold	The configured threshold for line signal failure BER error rate, that when crossed determines the signal degradation and signal failure
Hold time up	The hold-timer value for link-up event dampening
Hold time down	The hold-timer value for link-down event dampening
Sonet Section	SONET section statistics
ES-S	The number of Errored Seconds errors
SES-S	The number of Severely Errored Seconds errors
SEFS-S	The number of Severely Errored Framing Seconds errors
CV-S	The number of Code Violations errors
LOS	The number of Loss of Signal errors
LOC	The number of Loss of Clock errors
LOF	The number of Loss of Frame errors
OOF	The number of Out of Frame errors
B1 Error	The number of B1 errors

Table 16: Show Port Detail Output Fields (SONET/SDH Port) (Continued)

Label	Description
Sonet Line	SONET line statistics
ES-L	The number of Errored Seconds errors, at the near end and far end
SES-L	The number of Severely Errored Seconds errors, at the near end and far end
UAS-L	The number of Unavailable Seconds errors, at the near end and far end
CV-L	The number of Code Violations errors, at the near end and far end
AIS-L	The number of Alarm Indication Signal errors
RDI-L	The number of Remote Defect Indication errors
B2 Error	The number of B2 errors
S1 Error	The number of S1 errors
M1 Error	The number of M1 errors
Port Statistics	
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.
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 at 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 at 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.

Sample Output

```
*A:7705:Dut-C# show port 1/1/1 detail

===============================================================================
SONET/SDH Interface
===============================================================================
Description        : OC-3 SONET/SDH
Interface          : 1/1/1                  Speed                : oc3
Admin Status       : down                   Oper Status          : down
Physical Link      : No                     Loopback Mode        : none
Single Fiber Mode  : No
Ing. Pool % Rate   : 100                    Egr. Pool % Rate     : 100
APS Group          : none                   APS Role             : none
Clock Source       : node                   Framing              : sonet
Last State Change  : 12/23/2008 20:22:25    Port IfIndex         : 35684352
Last Cleared Time  : N/A                    DDM Events           : Enabled
J0 String          : 0x01                   Section Trace Mode   : byte
Rx S1 Byte         : 0x00                   Rx K1/K2 Byte        : 0x00/0x00
Rx J0 String (Hex) : 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Cfg Alarm          : loc lrdi lb2er-sf slof slos
Alarm Status       :
BER SD Threshold   : 6                      BER SF Threshold     : 3
Hold time up       : 500 milliseconds
Hold time down     : 0 milliseconds

=========================
Sonet Section
=========================
ES-S     :             0
SES-S    :             0
SEFS-S   :             0
CV-S     :             0
LOS      :             0
LOC      :             0
LOF      :             0
OOF      :             0
B1 Error :             0
=========================

=========================================
Sonet Line
=========================================
                                  Far End
-----------------------------------------
ES-L     :             0               0
SES-L    :             0               0
UAS-L    :             0               0
CV-L     :             0               0
AIS-L    :             0
RDI-L    :             0
B2 Error :             0
S1 Error :             0
M1 Error :             0
=========================================
```

```
===============================================================================
Port Statistics
===============================================================================
                                                    Input                 Output
-------------------------------------------------------------------------------
Packets                                                 0                      0
Discards                                                0                      0
Unknown Proto Discards                                  0
===============================================================================

*A:7705:Dut-C#
```

Table 17: Show Port Detail Output Fields (Ethernet - Access Mode)

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
	Down — the port is administratively down
Oper Duplex	The operating duplex mode of the interface
Oper State	Up — the port is operationally up
	Down — the port is operationally down
Config Duplex	Full — the link is configured to full duplex mode
	Half — the link is configured to half duplex mode
Physical Link	Yes — a physical link is present
	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, which reflects its initialization sequence
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

Table 17: Show Port Detail Output Fields (Ethernet - Access Mode) (Continued)

Label	Description
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 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
	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.	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
	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
Configured Address	The base chassis Ethernet MAC address
Hardware Address	The interface's hardware or system assigned MAC address at its protocol sub-layer
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 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.

Table 17: Show Port Detail Output Fields (Ethernet - Access Mode) (Continued)

Label	Description
	`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. 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. `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)

Table 17: Show Port Detail Output Fields (Ethernet - Access Mode) (Continued)

Label	Description
	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 — 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. 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

Table 17: Show Port Detail Output Fields (Ethernet - Access Mode) (Continued)

Label	Description
	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.
Port Discard Statistics	Unk VLAN Id input/output — number of packets discarded due to an unknown VLAN ID

Note: The 7705 SAR counts both Ethernet packets with errors and valid Ethernet packets under Ethernet port statistics. For each received errored packet, both aggregate Ethernet statistics and the errored Ethernet statistics are incremented.

Sample Output

```
*A:ALU-1># show port 1/2/1 detail
===============================================================================
Ethernet Interface
===============================================================================
Description        : 10/100 Ethernet TX
Interface          : 1/2/1                       Oper Speed       : N/A
Link-level         : Ethernet                    Config Speed     : 100 mbps
Admin State        : down                        Oper Duplex      : N/A
Oper State         : down                        Config Duplex    : full
Physical Link      : No                          MTU              : 1514
IfIndex            : 37781504                    Hold time up     : 0 seconds
Last State Change  : 04/07/2008 15:41:21         Hold time down   : 0 seconds
Last Cleared Time  : N/A
Last Cleared Time  : N/A

Configured Mode    : access                      Encap Type       : null
Dot1Q Ethertype    : 0x8100
Ing. Pool % Rate   : 100                         Egr. Pool % Rate : 100
Net. Egr. Queue Pol: default
Egr. Sched. Pol    : n/a
Auto-negotiate     : true                        MDI/MDX          : unknown
Egress Rate        : Default                     Ingress Rate     : n/a

Configured Address : 68:83:01:02:00:01
Hardware Address   : 68:83:01:02:00:01
Cfg Alarm          :
Alarm Status       :
```

```
===============================================================================
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
===============================================================================
===============================================================================
Port Statistics
===============================================================================
                                                  Input                  Output
-------------------------------------------------------------------------------
Unicast Packets                                       0                       0
Multicast Packets                                     0                       0
Broadcast Packets                                     0                       0
Discards                                              0                       0
Unknown Proto Discards                                0
===============================================================================

===============================================================================
Port Discard Statistics
===============================================================================
                                 Input                                  Output
Unk VLAN Id
===============================================================================:
```

Table 18: Show Port Detail Output Fields (TDM DS1 Interface)

Label	Description
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Type	The type of interface
Admin Status	Up — the port is administratively up
	Down — the port is administratively down
Physical Link	Yes — a physical link is present
	No — a physical link is not present
Signal Mode	The port signaling mode
Last State Change	The last time that the operational status of the port changed state
Loopback	The port loopback mode
Remote Loop respond	The DS1 channel response to remote loopbacks
Load-balance-algo	The load balance algorithm used on the port
Cfg Alarm	The type of alarms to be logged and reported for the port
Alarm Status	The current alarm state
Hold time up	The hold-timer value for link-up event dampening
Hold time down	The hold-timer value for link-down event dampening
Framing	The DS1 framing to be used for the port
Oper Status	up — the port is operationally up
	down — the port is operationally down
Clock Source	adaptive-timed — clocking is derived from the incoming pseudowire packets loop-timed — the link recovers the clock from the received data stream node-timed — the link uses the internal clock when transmitting data
Channel IfIndex	The channel interface index number
In Remote Loop	Specifies whether incoming remote loopback is enabled
Egr. Sched. Pol	The egress scheduling policy
Traffic Statistics	Traffic statistics

Table 18: Show Port Detail Output Fields (TDM DS1 Interface) (Continued)

Label	Description
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 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.
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. 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.
DS1/E1 Line	DS1/E1 Line statistics
ES	The number of Errored Seconds errors
SES	The number of Severely Errored Seconds errors
SEFS	The number of Severely Errored Framing Seconds errors
UAS	The number of Unavailable Seconds errors
CSS	The number of Controlled Slip Seconds errors
PCV	The number of Path Code Violations errors
LES	The number of Line Errored Seconds errors
BES	The number of Bursty Errored Seconds alarms
LCV	The number of Line Code Violations errors
Transmit	Transmit statistics: FE-LOF — the number of far-end loss of frame errors AIS — the number of alarm indication signal errors
Receive	Receive statistics: FE-LOF — the number of far-end loss of frame errors AIS — the number of alarm indication signal errors LOS — the number of loss of signal errors LOF — the number of loss of frame errors

Table 18: Show Port Detail Output Fields (TDM DS1 Interface) (Continued)

Label	Description
Looped	The number of looped packet errors
DS1/E1 CAS Signalling Bits	CAS signaling bit information
Timeslot	The timeslot number (1 to 24 for DS1, 1 to 32 for E1)
Rx ABCD	The signaling bits received in the timeslot, where each signaling bit is represented by a 1 (set) or a 0 (not set), and 0000 represents a timeslot that is in use but not receiving any signaling bits (for example, 1000 means that the A bit is set); "n/a" indicates timeslots not in use
Port Statistics	Port statistics
Packets input/output	The number of packets, delivered by this sub-layer to a higher (sub-) layer, which were not addressed to a unicast, multicast, or broadcast address at this sub-layer
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:ALU-1>config# show port 1/3/1.e1 detail

===============================================================================
TDM DS1 Interface
===============================================================================
Description        : E1
Interface          : 1/3/1.e1
Type               : e1                        Framing              : g704
Admin Status       : down                      Oper Status          : down
Physical Link      : no                        Clock Source         : node-timed
Signal Mode        : cas
Last State Change  : 10/30/2008 14:40:26       Channel IfIndex      : 576749569
Loopback           : none
Remote Loop respond: N/A                       In Remote Loop       : N/A
Load-balance-algo  : default                   Egr. Sched. Pol      : N/A
Cfg Alarm          : ais los
Alarm Status       :
Hold time up       : 0 milliseconds
Hold time down     : 0 milliseconds

===============================================================================
Traffic Statistics
===============================================================================
                                                      Input                Output
-------------------------------------------------------------------------------
Octets                                                    0                     0
Packets                                                   0                     0
Errors                                                    0                     0
============================
DS1/E1 Line
============================

----------------------------
ES                      0
SES                     0
SEFS                    0
UAS                     0
CSS                     0
PCV                     0
LES                     0
BES                     0
LCV      :              0

=========================

=========================

Transmit:

FE-LOF   :              0
AIS      :              0

Receive:

FE-LOF   :              0
AIS      :              0
LOS      :              0
```

```
LOF      :             0

Looped   :             0
=========================

===============================================================================
DS1/E1 CAS Signalling Bits
===============================================================================
          Rx                                        Rx
Timeslot  ABCD                            Timeslot  ABCD
-------------------------------------------------------------------------------
1         n/a                             17        n/a
2         0000                            18        n/a
3         0000                            19        n/a
4         0000                            20        n/a
5         0000                            21        n/a
6         0000                            22        n/a
7         0000                            23        n/a
8         0000                            24        n/a
9         0000                            25        n/a
10        0000                            26        n/a
11        0000                            27        n/a
12        0000                            28        n/a
13        n/a                             29        n/a
14        n/a                             30        n/a
15        n/a                             31        n/a
16        n/a                             32        n/a
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                    Input                 Output
-------------------------------------------------------------------------------
Packets                                                 0                      0
Discards                                                0                      0
Unknown Proto Discards                                  0
===============================================================================

*A:ALU-1>
```

Table 19: Show Port Channel Group Output Fields

Label	Description
Description	A text description of the port
Interface	The port ID displayed in the *slot/mda/port* format
Timeslots	The number of timeslots that are part of this channel group
Speed	The speed of the interface
CRC	The checksum used for the channel group (16 or 32)
Admin Status	Up — the port is administratively up

Table 19: Show Port Channel Group Output Fields (Continued)

Label	Description
	`Down` — the port is administratively down
`Oper Status`	`Up` — the port is operationally up
	`Down` — the port is operationally down
`Last State Change`	The last time the operational status of the port changed state
`Chan Grp IfIndex`	The channel group index number
`Configured Mode`	`network` — the port is configured for transport network use
	`access` — the port is configured for service access
`Encap Type`	The encapsulation type for the channel group (atm, cem, ipcp, or ppp-auto)
`Admin MTU`	The configured MTU
`Oper MTU`	The negotiated size of the largest packet that can be sent on the port or channel specified in octets
`Scramble`	Indicates if payload scrambling is enabled on channel groups (only applicable if encap type is atm)
`Physical Link`	`Yes` — a physical link is present
	`No` — a physical link is not present
`Bundle Number`	The number assigned to the multilink bundle
`Idle Cycle Flags`	The value transmitted by the DS0, DS1, or E1 interface during idle cycles
`Payload Fill Type`	The payload type to be transmitted when the circuit emulation service is not operational or temporarily experiences underrun conditions (only valid for CESoPSN services)
`Payload Pattern`	Indicates the user-defined pattern transmitted if the payload fill type is pattern
`Signal Fill Type`	The signaling type to be transmitted when the circuit emulation service is not operational or temporarily experiences underrun conditions (only valid for CESoPSN with CAS)
`Signal Pattern`	Indicates the user-defined pattern transmitted if the payload fill type is pattern
`Traffic stats`	`Octets input/output` — the total number of octets received and transmitted on the port

Table 19: Show Port Channel Group Output Fields (Continued)

Label	Description
	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. 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. 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.
Port stats	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. 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. For ATM, this field displays cells discarded on an invalid vpi/vci. Unknown proto discards do not show up in the packet counts.

Sample Output

```
*A:ALU-1># show port 1/4/1.5

===============================================================================
TDM DS0 Chan Group
===============================================================================
Description        : DS0GRP
Interface          : 1/4/1.5
TimeSlots          :
Speed              : 64                        CRC                 : 16
Admin Status       : down                      Oper Status         : down
Last State Change  : 10/22/2008 12:29:42       Chan-Grp IfIndex    : 578846785

Configured mode    : access                    Encap Type          : atm
Admin MTU          : 1572                      Oper MTU            : 1572
Scramble           : true
Physical Link      : Yes                       Bundle Number       : none
Idle Cycle Flags   : n/a                       Load-balance-algo   : n/a
Payload Fill Type  : n/a                       Payload Pattern     : n/a
Signal Fill Type   : n/a                       Signal Pattern      : n/a
Ing. Pool % Rate   : 100                       Egr. Pool % Rate    : 100
Egr. Sched. Pol    : n/a
===============================================================================

===============================================================================
Traffic Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                                  0                     0
Packets                                                 0                     0
Errors                                                  0                     0

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                                 0                     0
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
```

Table 20: Show Port ACR Detail Output Fields

Label	Description
Adaptive Clock Recovery (ACR) Configuration	
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

Table 20: Show Port ACR Detail Output Fields (Continued)

Label	Description
CEM SAP Configuration Information	
Endpoint Type	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)
Internal Digital Phase Locked Loop (DPLL) Statistics	
ACR DPLL Statistics	frequency offset mean — the ACR frequency offset mean for the previous 15 sets of 60-second intervals frequency offset stddev — the ACR frequency offset standard deviation for the previous 15 sets of 60-second intervals phase error mean — the ACR input phase error mean and output DCO mean for the previous 15 sets of 60-second intervals phase error stddev — the ACR input phase error standard deviation and output DCO standard deviation for the previous 15 sets of 60-second intervals

Table 20: Show Port ACR Detail Output Fields (Continued)

Label	Description
ACR State Statistics	
Algorithm State Counts	normal — the number of 2-second intervals the ACR algorithm was in the normal state
	Phase-tracking — the number of 2-second intervals the ACR algorithm was in the phase-tracking state
	Freq-tracking — the number of 2-second intervals the ACR algorithm was in the frequency tracking state
	Holdover — the number of 2-second intervals the ACR algorithm was in the holdover state
	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
	Prolonged ACR failure — the number of times the ACR algorithm was in the phase-tracking or holdover state for an extended period of time
	Excessive Packet Loss — increments every 2-second interval that ACR is in the phase-tracking state and the tolerated packet loss threshold is exceeded
	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

Sample Output

```
*A:ALU-1># show port 1/4/1.e1 acr detail
===============================================================================
Adaptive Clock Recovery (ACR) Configuration
===============================================================================
Clock Master PW  : 1/4/1.1
Clock Sync State : normal
-------------------------------------------------------------------------------
CEM SAP Configuration Information
-------------------------------------------------------------------------------
Endpoint Type  : NxDS0                    Bit-rate       : 16
Payload Size   : 32                       Jitter Buffer  : 5
Use RTP Header : No                       Differential   : No
Timestamp Freq : 0                        CAS Framing    : No CAS
Effective PDVT : +/-2.500 ms

Cfg Alarm      : stray malformed pktloss overrun underrun
Alarm Status   :
```

```
-------------------------------------------------------------------------------
CEM SAP Statistics
-------------------------------------------------------------------------------
                          Packets           Seconds           Events
Egress Stats
Forwarded             :  32993106
Dropped               :  0
Missing               :  0
Reordered Forwarded   :  0
Underrun              :  8058                                 0
Overrun               :  0                                    0
Misordered Dropped    :  0
Malformed Dropped     :  0
LBit Dropped          :  0
Error                 :                    3
Severely Error        :                    2
Unavailable           :                    0
Failure Count         :                                       1

Ingress Stats
Forwarded             :  32995595
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)
-------------------------------------------------------------------------------
10/08/2008 11:27:11        220           1         273          94
10/08/2008 11:26:11        217           1         240         120
10/08/2008 11:25:11        214           1          79         157
10/08/2008 11:24:11        214           1         -15         102
10/08/2008 11:23:11        214           1          82         117
10/08/2008 11:22:11        213           1          12         113
10/08/2008 11:21:11        213           1         -64         119
10/08/2008 11:20:11        213           1         -66         126
10/08/2008 11:19:11        214           1         -41         117
10/08/2008 11:18:11        215           1          72         125
10/08/2008 11:17:11        214           1         -34          95
10/08/2008 11:16:11        214           1         -28         115
10/08/2008 11:15:11        215           1          30          89
10/08/2008 11:14:11        214           1          12          95
10/08/2008 11:13:11        214           1          19         144
-------------------------------------------------------------------------------
Current
24 Hour
(137 min)           214         19
===============================================================================
```

```
===============================================================================
ACR State Statistics
===============================================================================
Algorithm State Counts
  normal                : 4121
  Phase-tracking        : 3
  Freq-tracking         : 0
  Holdover              : 0
  Free-run              : 8
Events
  ACR Calc Out of Range : 0
  Prolonged ACR Failure : 1
  Excessive Packet Loss : 0
  Excessive Phase Shift : 0
===============================================================================
```

Table 21: Show Port Descriptions Output Fields

Label	Description
Port Id	The port identifier
Description	A text description of the port

Sample Output

```
*A:ALU-1># show port 1/4/1 description

===============================================================================
Port Descriptions on Slot 1
===============================================================================
Port Id        Description
-------------------------------------------------------------------------------
1/4/1          DS1/E1
===============================================================================
*A:ALU-1>#
```

Table 22: Show Port Associations Output Fields

Label	Description
Router/ServiceId	The service identifier
Name	The name of the IP interface
Encap Val	The dot1q or null encapsulation value on the port for this IP interface

Sample Output

```
*A:ALU-1># show port 1/5/1 associations
===============================================================================
Interface Table
===============================================================================
Router/ServiceId               Name                            Encap Val
-------------------------------------------------------------------------------
Router: Base                   if1000                          1000
Router: Base                   if2000                          2000
-------------------------------------------------------------------------------
Interfaces
===============================================================================
*A:ALU-1>
```

Table 23: Show Port PPP Output Fields

Label	Description
Protocol	Displays the applicable protocols for the specified port
State	The current status of a PPP link. Values are initial, starting, closed, stopped, closing, stopping, requestSent, ackReceived, ackSent, opened.
Last Change	Displays the last time the PPP link state changed
Restart Count	The number of times that this Control Protocol has reached the 'open' state
Last Cleared	The date and time the restart count was set to zero
Local Mac address	The MAC address assigned to the local end of the PPP link
Remote Mac address	The Ethernet MAC address sent by the remote end of the PPP link
Local Magic Number	The local magic number to be sent to the peer. The magic number provides a method to detect loopbacks. If the value of the local magic number is the same as the value of the remote magic number, then it is possible that the link might be looped back. If the two magic numbers do not match, the link is not looped back.

Table 23: Show Port PPP Output Fields (Continued)

Label	Description
Remote Magic Number	The magic number sent by the peer. If the value of the remote magic number is the same as the value of the local magic number, then it is possible that the link might be looped back. If the two magic numbers do not match, the link is not looped back.
Local Address	The IP address at the local end of the link
Remote Address	The IP address at the remote end of the link
Line Monitor Method	The type of line monitoring packets being sent and received on this PPP link
Request Interval	The time interval in seconds at which keepalive requests are issued
Threshold exceeded	The number of times that the drop count was reached
Drop Count	The number of keepalive or LQR messages that were missed before the line was brought down
In packets	The number of echo-reply packets received
Time to link drop	The time remaining before the link will be declared dropped if a keepalive echo reply packet is not received
Out packets	The number of echo-request packets sent
Last cleared time	The time since the last clear

Sample Output

```
*A:ALU-1># show port 1/4/1.5 ppp

===============================================================================
PPP Protocols for 1/4/1.5
===============================================================================
Protocol  State         Last Change         Restart Count   Last Cleared
-------------------------------------------------------------------------------
lcp       initial       10/12/2007 20:15:54          0      10/12/2007 20:15:54
ipcp      initial       10/12/2007 20:15:54          0      10/12/2007 20:15:54
mplscp    initial       10/12/2007 20:15:54          0      10/12/2007 20:15:54
bcp       initial       10/12/2007 20:15:54          0      10/12/2007 20:15:54
osicp     initial       10/12/2007 20:15:54          0      10/12/2007 20:15:54
ipv6cp    initial       10/12/2007 20:15:54          0      10/12/2007 20:15:54
===============================================================================
```

```
===============================================================================
PPP Statistics
===============================================================================
Local Mac address  : 68:83:01:04:00:01  Remote Mac address :
Local Magic Number : 0x0                Remote Magic Number: 0x0
Local address      : 0.0.0.0            Remote address     : 0.0.0.0

Line Monitor Method: keepalive

Keepalive statistics

Request interval   : 10           Threshold exceeded : 0
Drop Count         : 3            In packets         : 0
Time to link drop  : 00h00m30s    Out packets        : 0
Last cleared time  : 10/12/2007 20:15:54

===============================================================================
*A:ALU-1>#
```

Show ATM Port Commands

port

Syntax **port** *port-id* **atm**
port *port-id* **atm connections**
port *port-id* **atm pvc** [*vpi*/*vci*] [**detail**]
port *port-id* **atm pvp** [*vpi*] [**detail**]

Context show

Description This command displays ATM port information.

If no command line options are specified, the command port displays summary information for all ports on provisioned adapter cards.

Parameters *port-id* — specifies the physical port ID

Syntax port-id *slot*[/*mda*[/*port*]] or *slot*/*mda*/*port*[.*channel*]

Values 1 (slot)

1 to 4 (SONET/SDH ports)

1 to 6 (mda)

1 to 16 (T1/E1 ASAP Adapter card ports); 1 to 8 (Ethernet Adapter card ports)

1 to 24 (DS1 channels); 1 to 32 (E1 channels)

atm — displays ATM information

connections — displays ATM connection information

pvc — displays ATM port PVC information

pvp — displays ATM port PVP information

vpi-range — 0 to 4095 (NNI; not supported on SONET/SDH ports)
0 to 255 (UNI)

vpi/vci — vpi: 0 to 4095 (NNI; not supported on SONET/SDH ports)
0 to 255 (UNI)

vci: 1, 2, 5 to 65534

detail — provides detailed information

Output **Port ATM Output —** The following tables describe ATM output fields:

- Table 24: "Show Port ATM Output Fields"
- Table 25: "Show Port ATM Connections Output Fields"
- Table 26: "Show Port ATM PVC Output Fields"
- Table 27: "Show Port ATM PVC VPI/VCI Output Fields"

- Table 28: "Show Port ATM PVC VPI/VCI Detail Output Fields"
- Table 29: "Show Port ATM PVP Output Fields"
- Table 30: "Show Port ATM PVP Detail Output Fields"

Table 24: Show Port ATM Output Fields

Label	Description
Cell Mode	The cell format (UNI or NNI) that is used on the ATM interface (NNI is not supported on SONET/SDH ports)
Configured VCs	The number of configured VCs
Configured VTs	The number of configured VTs
Configured minimum VPI	The configured minimum allowable VPI value that can be used on the ATM interface for a VPC
Last Unknown VPI/VCI	The last unknown VPI/VCI that was received on this interface
Mapping	Direct — direct ATM cell mapping is used PLCP — PLCP ATM cell mapping is used
Configured VPs	The number of configured VPs
Configured IFCs	The number of configured IFCs
TC Alarm State	The ATM interface notifications indicating that the TC sublayer is currently in the Loss of Cell Delineation (LCD) defect maintenance state or that the TC sublayer is currently not in the Loss of Cell Delineation (LCD) defect maintenance state
HEC Errors (Dropped)	The number of cells with uncorrectable HEC errors on this interface
Number OCD Events	The number of times the Out of Cell Delineation (OCD) events occurred
HEC Errors (Fixed)	The number of cells with correctable HEC errors on this interface
Ingress CBR	The total CBR bandwidth consumed on this interface in the ingress direction
Ingress RT-VBR	The total real-time variable bit rate (rt-VBR) bandwidth consumed on this interface in the ingress direction
Ingress NRT-VBR	The total non-real-time variable bit rate (nrt-VBR) bandwidth consumed on this interface in the ingress direction
Ingress UBR	The total unspecified bit rate (UBR) bandwidth consumed on this interface in the ingress direction

Table 24: Show Port ATM Output Fields (Continued)

Label	Description
Egress CBR	The total CBR bandwidth consumed on this interface in the egress direction
Egress RT-VBR	The total real-time variable bit rate (rt-VBR) bandwidth consumed on this interface in the egress direction
Egress NRT-VBR	The total non-real-time variable bit rate (nrt-VBR) bandwidth consumed on this interface in the egress direction
Egress UBR	The total unspecified bit rate (UBR) bandwidth consumed on this interface in the egress direction
Ingress Total	The total bandwidth of all service categories consumed on this interface in the ingress direction
Egress Total	The total bandwidth of all service categories consumed on this interface in the egress direction
ATM Link Bandwidth	The total ATM link bandwidth accepted on this interface
Shaped Bandwidth	The total shaped bandwidth consumed on this interface in the egress direction

Sample Output

```
*A:ALU-1># show port 1/1/3.sts3 atm

===============================================================================
ATM Info for 1/1/3
===============================================================================
Cell Mode              : UNI               Mapping            : Direct
Configured VCs         : 0                 Configured VPs     : 0
Configured VTs         : 0                 Configured IFCs    : 0
Configured minimum VPI: 0
Last Unknown VPI/VCI   : none

===============================================================================
TC Sublayer Information
===============================================================================
TC Alarm State         : LCD Failure       Number OCD Events  : 0
HEC Errors (Dropped)   : 0                 HEC Errors (Fixed) : 0

===============================================================================
ATM Bandwidth Info
===============================================================================
                     kbps      %                             kbps      %
-------------------------------------------------------------------------------
Ingress CBR        : 0          0%      Egress CBR         : 0          0%
Ingress RT-VBR     : 0          0%      Egress RT-VBR      : 0          0%
Ingress NRT-VBR    : 0          0%      Egress NRT-VBR     : 0          0%
Ingress UBR        : 0          0%      Egress UBR         : 0          0%
```

```
-------------------------------------------------------------------------------
Ingress Total      : 0          0%      Egress Total       : 0          0%
ATM Link Bandwidth : 149760 kbps
Shaped Bandwidth   : 0 kbps
===============================================================================
```

Table 25: Show Port ATM Connections Output Fields

Label	Description
Owner	Identifies the system entity that owns a specific ATM connection
Type	The connection type
Ing. TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	The administrative state of the interface connection
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	The status of the ATM interface

Sample Output

```
A:ALU-1># show port 1/1/1.1 atm connections

===============================================================
ATM Connections, Port 1/1/1.1
===============================================================
           Owner  Type     Ing.TD  Egr.TD  Adm  OAM          Opr
---------------------------------------------------------------
0/100      SAP    PVC      101     201     up   up           up
0/101      SAP    PVC      101     201     up   up           up
0/102      SAP    PVC      101     201     up   up           up
0/103      SAP    PVC      101     201     up   up           up
0/104      SAP    PVC      101     201     up   up           up
0/105      SAP    PVC      101     201     up   up           up
0/106      SAP    PVC      101     201     up   up           up
0/107      SAP    PVC      101     201     up   up           up
0/108      SAP    PVC      101     201     up   up           up
0/109      SAP    PVC      101     201     up   up           up
0/110      SAP    PVC      101     201     up   up           up
0/111      SAP    PVC      101     201     up   up           up
0/112      SAP    PVC      101     201     up   up           up
0/113      SAP    PVC      101     201     up   up           up
0/114      SAP    PVC      101     201     up   up           up
===============================================================
```

Table 26: Show Port ATM PVC Output Fields

Label	Description
VPI/VCI	Displays the VPI/VCI values
Owner	Identifies the system entity that owns a specific ATM connection
Type	The connection type
Ing. TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	The administrative state of the interface connection
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	The status of the ATM interface

Sample Output

```
*A:ALU-1># show port 1/1/1.1 atm pvc

===============================================================
ATM PVCs, Port 1/1/1.1
===============================================================
VPI/VCI    Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
0/32       SAP    PVC      1       1       up   ETE-AIS     dn
===============================================================
*A:ALU-1>#
```

Table 27: Show Port ATM PVC VPI/VCI Output Fields

Label	Description
Port Id	The port ID configured or displayed in the *slot/mda/port* format
VPI/VCI	Displays the VPI/VCI values
Admin State	The administrative state of the interface connection
Oper State	The status of the ATM interface
OAM State	The OAM operational status of ATM connections: Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Encap Type	The encapsulation type
Owner	Identifies the system entity that owns a specific ATM connection
Endpoint Type	The endpoint type
Cast Type	The connection topology type
Ing. TD Idx	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. TD Idx	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection

Sample Output

```
*A:ALU-1># show port 1/1/1.1 atm pvc 0/32

===============================================================================
ATM PVC
===============================================================================
Port Id            : 1/1/1.1             VPI/VCI            : 0/32
Admin State        : up                  Oper state         : down
OAM State          : ETE-AIS             Encap Type         : n/a
Owner              : SAP                 AAL Type           : n/a
Endpoint Type      : PVC                 Cast Type          : P2P
Ing. Td Idx        : 1                   Egr. Td Idx        : 1
Last Changed       : 11/08/2007 17:02:36 ILMI Vpi/Vci Range : n/a
===============================================================================
*A:ALU-1>#
```

Table 28: Show Port ATM PVC VPI/VCI Detail Output Fields

Label	Description
Port Id	The port ID configured or displayed in the *slot/mda/port* format
VPI/VCI	Displays the VPI/VCI values
Admin State	The administrative state of the interface connection
Oper State	The status of the ATM interface
OAM State	The OAM operational status of ATM connections: Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Encap Type	The encapsulation type
Owner	Identifies the system entity that owns a specific ATM connection
AAL Type	Displays ATM Adaptation Layer 5 (AAL5) information
Endpoint Type	The endpoint type
Cast Type	The connection topology type
Ing. Td Idx	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. Td Idx	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Last Changed	The date and time that the interface connection entered its current operational state
Octets	The number of input and output octets HEC discarded cells are not included in the input octet numbers
Cells	The number of input and output cells HEC discarded cells are not included in the input cell numbers
CLP=0 Cells	The number of CLP=0 cells
Dropped CLP=0 Cells	The number of dropped CLP=0 cells
Dropped Cells (CLP=0+1)	The number of dropped CLP=0+1 cells
Tagged Cells	The number of tagged cells

Table 28: Show Port ATM PVC VPI/VCI Detail Output Fields (Continued)

Label	Description
Loopback	The number of loopback requests and responses transmitted and received on this connection for both end-to-end and segment
OAM Cells (generated)	The number of OAM cells generated at the endpoint and sent towards the network

Sample Output

```
*A:ALU-1># show port 1/1/1.1 atm pvc 0/32 detail

===============================================================================
ATM PVC
===============================================================================
Port Id            : 1/1/1.1             VPI/VCI            : 0/32
Admin State        : up                  Oper state         : down
OAM State          : up                  Encap Type         : n/a
Owner              : SAP                 AAL Type           : n/a
Endpoint Type      : PVC                 Cast Type          : P2P
Ing. Td Idx        : 1                   Egr. Td Idx        : 1
Last Changed       : 11/08/2007 17:02:36 ILMI Vpi/Vci Range : n/a
===============================================================================

===============================================================================
ATM Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                               1643                  1643
Cells                                                  31                    31
CLP=0 Cells                                            31                    31
Dropped CLP=0 Cells                                     0                     0
Dropped Cells (CLP=0+1)                                 0
Tagged Cells                                            0
===============================================================================

===============================================================================
ATM OAM Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Loopback                                                0                     0
OAM Cells (generated)                                   0
===============================================================================
*A:ALU-1>#
```

Table 29: Show Port ATM PVP Output Fields

Label	Description
VPI	Displays the VPI value
Owner	Identifies the system entity that owns a specific ATM connection
Type	The type of connection
Ing.TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr.TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	Up — the interface is administratively up Down — the interface is administratively down
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	Up — the interface is operationally up Down — the interface is operationally down

Sample Output

```
*A:ALU-1># show port 1/1/1.1 atm pvp

===============================================================
ATM PVPs, Port 1/1/1.1
===============================================================
VPI        Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
2          SAP    PVP      1       1       up   up          up
===============================================================
*A:ALU>#
```

Table 30: Show Port ATM PVP Detail Output Fields

Label	Description
Port Id	The port ID configured or displayed in the *slot/mda/port* format
VPI	Displays the VPI values
Admin State	The administrative state of the interface connection
Oper State	The status of the ATM interface
OAM State	The OAM operational status of ATM connections: Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Owner	Identifies the system entity that owns a specific ATM connection
Endpoint Type	The endpoint type
Cast Type	The connection topology type
Ing. Td Idx	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr. Td Idx	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Last Changed	The date and time that the interface connection entered its current operational state
Octets	The number of input and output octets HEC discarded cells are not included in the input octet numbers
Cells	The number of input and output cells HEC discarded cells are not included in the input cell numbers
CLP=0 Cells	The number of CLP=0 cells
Dropped CLP=0 Cells	The number of dropped CLP=0 cells
Dropped Cells (CLP=0+1)	The number of dropped CLP=0+1 cells
Tagged Cells	The number of tagged cells
Loopback	The number of loopback requests and responses transmitted and received on this connection for both end-to-end and segment
OAM Cells (generated)	The number of OAM cells generated at the endpoint and sent towards the network

Sample Output

```
*A:ALU-1>show port 1/1/1.1 atm pvp 11 detail

===============================================================================
ATM PVP
===============================================================================
Port Id            : 1/1/1.1             VPI                : 11
Admin State        : up                  Oper state         : up
OAM State          : up
Owner              : SAP
Endpoint Type      : PVP                 Cast Type          : P2P
Ing. Td Idx        : 1                   Egr. Td Idx        : 1
Last Changed       : 02/01/2000 00:37:25 ILMI Vpi Range     : n/a
===============================================================================

===============================================================================
ATM Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Octets                                               1007                  1007
Cells                                                  19                    19
CLP=0 Cells                                            19                    19
Dropped CLP=0 Cells                                     0                     0
Dropped Cells (CLP=0+1)                                 0
Tagged Cells                                            0
===============================================================================

===============================================================================
ATM OAM Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Loopback                                                0                     0
OAM Cells (generated)                                0
===============================================================================
*A:ALU-1>#
```

Show Multilink Bundle and IMA Group Commands

multilink-bundle

Syntax **multilink-bundle** [*bundle-id* | *slot/mda* | **type** {**mlppp** | **ima-grp**}] [**detail**]
multilink-bundle [{*bundle-id* | *slot/mda*} | [**ppp** | **ima**]]

Context show

Description This command displays multilink bundle information. An operator can display:

- all bundles on the system/adapter card or all bundles of a given type on the system by specifying the value of type filter to be either mlppp or ima-grp
- bundle-specific information in summary (no detail option) or detailed format (detail option specified) for one or more bundles
- protocol-specific information (for example, PPP or IMA) for the specified bundle

Parameters *bundle-id* — the multilink (PPP or IMA) bundle to be associated with this IP interface. The command syntax must be used as follows:

Syntax: bundle-*type-slot/mda.bundle-num*
bundle-ppp-*slot/mda.bundle-num* (a multilink PPP bundle)
bundle-ima-*slot/mda.bundle-num* (an IMA group bundle)
bundle: keyword
slot: MDA slot numbers
bundle-num: 1 to 16 (up to 8 for MLPPP and IMA)

ppp — displays PPP bundle information

ima, ima-grp — displays IMA-type groups

mlppp — displays MLPPP-type groups

detail — provides detailed information

Output **Multilink Bundle Output —** The following tables describe multilink bundle output fields:

- Table 31: "Show Multilink Bundle Output Fields"
- Table 32: "Show Multilink Bundle IMA Group Output Fields"
- Table 33: "Show Multilink Bundle IMA Group Detailed Output Fields"
- Table 34: "Show Multilink Bundle MLPPP Output Fields"
- Table 35: "Show Multilink Bundle MLPPP Detailed Fields"

Table 31: Show Multilink Bundle Output Fields

Label	Description
Bundle Id	The port ID for this bundle
Type	The type of this multilink bundle: mlppp – the bundle is of type MLPPP ima – the bundle is of type IMA group
Admin State	Up – the bundle is administratively up
	Down – the bundle is administratively down
Oper State	Up – the bundle is operationally up
	Down – the bundle is operationally down
Port State	The state level of the port:
	none – the port is either in its initial creation state or is just about to be deleted
	ghost – no member links are configured as part of this bundle
	down – all member links are in “none”, “ghost”, or “down” state
	linkUp – at least one member link is in port state “link up” but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to insufficient number of member links in “link up” state yet or to bundle being shut down)
	Up – the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least “minimum links” member links are in the port state up and the bundle protocol is up)
Min Links	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.
Total Links	The total number active of member links configured for this bundle
Active Links	The total number of active links for the bundle

Sample Output

```
*A:ALU-1># show multilink-bundle

===============================================================================
Bundle Summary
===============================================================================
Bundle               Type    Admin     Oper      Port      Min    Total/
Id                           State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ppp-1/1.1     mlppp   Down      Down      Ghost     1      0/0
bundle-ppp-1/4.8     mlppp   Up        Down      Ghost     1      0/0
bundle-ima-1/6.3     ima-grp Down      Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 3
===============================================================================
*A:ALU-1>#
```

Table 32: Show Multilink Bundle IMA Group Output Fields

Label	Description
Bundle Id	The port ID for this bundle
Type	The type of this multilink bundle: ima — the bundle is of type IMA group
Admin State	Up — the bundle is administratively up
	Down — the bundle is administratively down
Oper State	Up — the bundle is operationally up
	Down — the bundle is operationally down
Port State	The state level of the port:
	none — the port is either in its initial creation state or is just about to be deleted
	ghost — no member links are configured as part of this bundle
	down — all member links are in “none”, “ghost”, or “down” state
	linkUp — at least one member link is in port state “link up” but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to insufficient number of member links in “link up” state yet or to bundle being shut down)
	Up — the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least “minimum links” member links are in the port state up and the bundle protocol is up)
Min Links	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.

Table 32: Show Multilink Bundle IMA Group Output Fields (Continued)

Label	Description
Total Links	The total number active of member links configured for this bundle
Active Links	The total number of active links for the bundle
Bundles	Number of bundles on the port

Sample Output

```
*A:ALU-1># show multilink-bundle type ima-grp

===============================================================================
Bundle Summary
===============================================================================
Bundle               Type    Admin     Oper      Port      Min    Total/
Id                           State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ima-1/6.3     ima-grp Down      Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 1
===============================================================================
*A:ALU-1>#


*A:ALU-1># show multilink-bundle bundle-ima-1/6.3

===============================================================================
Bundle Summary
===============================================================================
Bundle               Type    Admin     Oper      Port      Min    Total/
Id                           State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ima-1/6.3     ima-grp Down      Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 1
===============================================================================
*A:ALU-1>
```

Note: The ima-grp command shows all bundles in the IMA group. The bundle-ima command shows information on the specified bundle. The fields for both commands are the same.

Table 33: Show Multilink Bundle IMA Group Detailed Output Fields

Label	Description
Description	Displays the configured description for this bundle
Bundle Id	The port ID for this bundle
Admin Status	Up — the bundle is administratively up
	Down — the bundle is administratively down
Minimum Links	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.
Total Links	The total number of active member links configured for this bundle
Red Diff Delay	The maximum acceptable differential delay for individual circuits within this multilink bundle. If the delay exceeds this threshold, a trap is issued.
Red Diff Delay Act	The action that will be taken on the IMA group once the Red Diff Delay is exceeded
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel, specified in octets
Mode	network — the port is configured for transport network use
	access — the port is configured for service access
Type	Indicates that this bundle is of type IMA group
Oper Status	The operational port status of a member link
Bundle IfIndex	Displays the bundle's interface index number, which reflects its initialization sequence
Active Links	The total number of active links for the bundle
Bandwidth	The bandwidth configured for this IMA group bundle in kb/s
Traffic and Port statistics	The traffic and port statistics information displayed for bundles when the detail option is selected is the same as information displayed for physical ports

Sample Output

```
*A:ALU-1># show multilink-bundle type ima-grp detail

===============================================================================
Bundle bundle-ima-1/6.3 Detail
===============================================================================
Description        : MultiLink Bundle
Bundle Id          : bundle-ima-1/6.3   Type               : ima-grp
Admin Status       : down               Oper Status        : down
Minimum Links      : 1                  Bundle IfIndex     : 583012355
Total Links        : 0                  Active Links       : 0
Red Diff Delay     : 25                 Yellow Diff Delay  : N/A
Red Diff Delay Act : down               MRRU               : N/A
Short Sequence     : N/A                Oper MRRU          : N/A
Oper MTU           : 1524               Fragment Threshold : 128 bytes
Up Time            : N/A                Bandwidth          : 0 KBit
PPP Input Discards : N/A                Primary Member Port: None
Mode               : access

===============================================================================
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
===============================================================================

*A:ALU-1>


*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 detail

===============================================================================
Bundle bundle-ima-1/6.3 Detail
===============================================================================
Description        : MultiLink Bundle
Bundle Id          : bundle-ima-1/6.3   Type               : ima-grp
Admin Status       : down               Oper Status        : down
Minimum Links      : 1                  Bundle IfIndex     : 583012355
Total Links        : 0                  Active Links       : 0
Red Diff Delay     : 25                 Yellow Diff Delay  : N/A
Red Diff Delay Act : down               MRRU               : N/A
Short Sequence     : N/A                Oper MRRU          : N/A
Oper MTU           : 1524               Fragment Threshold : 128 bytes
Up Time            : N/A                Bandwidth          : 0 KBit
```

```
PPP Input Discards : N/A                Primary Member Port: None
Mode               : access

===============================================================================
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
===============================================================================

*A:ALU-1>#
```

Note: The ima-grp detail command shows all bundles in the IMA group. The bundle-ima detail command shows information on the specified bundle. The fields for both commands are the same.

Table 34: Show Multilink Bundle MLPPP Output Fields

Label	Description
Bundle Id	The port ID for this bundle
Type	The type of this multilink bundle: mlppp – the bundle is of type MLPPP
Admin State	Up – the bundle is administratively up Down – the bundle is administratively down
Oper State	Up – the bundle is operationally up Down – the bundle is operationally down
Port State	The state level of the port: none – the port is either in its initial creation state or is just about to be deleted ghost – no member links are configured as part of this bundle down – all member links are in “none”, “ghost”, or “down” state

Table 34: Show Multilink Bundle MLPPP Output Fields (Continued)

Label	Description
	linkUp — at least one member link is in port state "link up" but the bundle protocol is not yet operationally up (due to the bundle protocol still coming up; for example, due to insufficient number of member links in "link up" state yet or to bundle being shut down)
	Up — the bundle is ready to pass some kinds of traffic as the bundle protocol has come up (at least "minimum links" member links are in the port state up and the bundle protocol is up)
Min Links	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.
Total Links	The total number of active member links configured for this bundle
Active Links	The total number of active links for the bundle
Bundles	Number of bundles on the port

Sample Output

```
*A:ALU-1># show multilink-bundle type mlppp

===============================================================================
Bundle Summary
===============================================================================
Bundle               Type    Admin     Oper      Port      Min    Total/
Id                           State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ppp-1/1.1     mlppp   Down      Down      Ghost     1      0/0
bundle-ppp-1/4.8     mlppp   Up        Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 2
===============================================================================
*A:ALU-1>#

*A:ALU-1># show multilink-bundle bundle-ppp-1/4.8

===============================================================================
Bundle Summary
===============================================================================
Bundle               Type    Admin     Oper      Port      Min    Total/
Id                           State     State     State     Links  Active Links
-------------------------------------------------------------------------------
bundle-ppp-1/4.8     mlppp   Up        Down      Ghost     1      0/0
-------------------------------------------------------------------------------
Bundles : 1
===============================================================================
*A:ALU-1>#
```

Note: The mlppp command shows all bundles in the MLPPP group. The bundle-ppp command shows information on the specified bundle. The fields for both commands are the same.

Table 35: Show Multilink Bundle MLPPP Detailed Fields

Label	Description
Description	Displays the configured description for this bundle
Bundle Id	The port ID for this bundle
Admin Status	Up — the bundle is administratively up
	Down — the bundle is administratively down
Minimum Links	The minimum number of links that must be active for a bundle to be active. If the number of links drop below the given minimum, then the multilink bundle will transition to an operation down state.
Total Links	The total number of active member links configured for this bundle
Red Diff Delay	The maximum acceptable differential delay for individual circuits within this multilink bundle. If the delay exceeds this threshold, a trap is issued.
Red Diff Delay Act	The action that will be taken on the MLPPP bundle once the Red Diff Delay is exceeded
Short Sequence	Indicates whether the MLPPP bundle uses short (12 bit) sequence numbers instead of the default 24-bit sequence number
Oper MTU	The negotiated size of the largest packet that can be sent on the port or channel, specified in octets
Mode	network — the port is configured for transport network use
	access — the port is configured for service access
Type	Indicates that this bundle is of type MLPPP
Oper Status	The operational port status of a member link
Bundle IfIndex	Displays the bundle's interface index number, which reflects its initialization sequence
Active Links	The total number of active links for the bundle
Yellow Diff Delay	The yellow warning threshold for the differential delay for members within a multilink bundle
MRRU	The configured maximum frame size that can be reconstructed from multilink fragments

Table 35: Show Multilink Bundle MLPPP Detailed Fields (Continued)

Label	Description
Oper MRRU	The operating maximum frame size that can be reconstructed from multilink fragments
Bandwidth	The bandwidth configured for this MLPPP bundle in kb/s
Traffic and Port statistics	The traffic and port statistics information displayed for bundles when the detail option is selected is the same as information displayed for physical ports

Sample Output

```
*A:ALU-1># show multilink-bundle type mlppp detail

===============================================================================
Bundle bundle-ppp-1/1.1 Detail
===============================================================================
Description        : MultiLink Bundle
Bundle Id          : bundle-ppp-1/1.1   Type               : mlppp
Admin Status       : down               Oper Status        : down
Minimum Links      : 1                  Bundle IfIndex     : 572522497
Total Links        : 0                  Active Links       : 0
Red Diff Delay     : 0                  Yellow Diff Delay  : 0
Red Diff Delay Act : none               MRRU               : 1524
Short Sequence     : false              Oper MRRU          : 1524
Oper MTU           : 1526               Fragment Threshold : 128 bytes
Up Time            : N/A                Bandwidth          : 0 KBit
PPP Input Discards : 0                  Primary Member Port: None
Mode               : network            Net. Egr. Queue Pol:

===============================================================================
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
===============================================================================
```

```
*A:ALU-1># show multilink-bundle bundle-ppp-1/4.8 detail

===============================================================================
Bundle bundle-ppp-1/4.8 Detail
===============================================================================
Description        : MultiLink Bundle
Bundle Id          : bundle-ppp-1/4.8   Type               : mlppp
Admin Status       : up                 Oper Status        : down
Minimum Links      : 1                  Bundle IfIndex     : 578813960
Total Links        : 0                  Active Links       : 0
Red Diff Delay     : 0                  Yellow Diff Delay  : 0
Red Diff Delay Act : none               MRRU               : 1524
Short Sequence     : false              Oper MRRU          : 1524
Oper MTU           : 1526               Fragment Threshold : 128 bytes
Up Time            : N/A                Bandwidth          : 0 KBit
PPP Input Discards : 0                  Primary Member Port: None
Mode               : network            Net. Egr. Queue Pol:

===============================================================================
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
===============================================================================
*A:ALU-1>#
```

Note: The mlppp detail command shows all bundles in the MLPPP group. The bundle-ppp detail command shows information on the specified bundle. The fields for both commands are the same.

Show ATM IMA Group Commands

multilink-bundle

Syntax **multilink-bundle** *bundle-id* **ima atm** [**detail**]
multilink-bundle *bundle-id* **ima atm connections**
multilink-bundle *bundle-id* **ima atm pvc** [*vpi*/*vci*] [**detail**]
multilink-bundle *bundle-id* **ima atm pvp** [*vpi*] [**detail**]

Context show

Description This command displays ATM port information for IMA group bundles. The information displayed is equivalent to that displayed for **show port (atm)** command.

Parameters *bundle-id* — specifies the IMA port ID

atm — displays ATM information

connections — displays ATM connection information

pvc — displays ATM port PVC information

pvp — displays ATM port PVP information

vpi-range — displays the VPI range

Values vpi: 0 to 4095 (NNI)
0 to 255 (UNI)

vpi/vci — displays the VPI/VCI values

Values vpi: 0 to 4095 (NNI)
0 to 255 (UNI)

vci — displays the VCI value

Values 1, 2, 5 to 65534

detail — provides detailed information

Output **Mutlilink-bundle IMA ATM Output —** The following tables describe IMA ATM output fields:

- Table 36: "Show Multilink-bundle IMA ATM Output Fields"
- Table 37: "Show Multilink-bundle IMA ATM Connections Output Fields"
- Table 38: "Show Multilink-bundle IMA ATM PVC Output Fields"
- Table 39: "Show Multilink-bundle IMA ATM PVP Output Fields"

Table 36: Show Multilink-bundle IMA ATM Output Fields

Label	Description
Cell Mode	The cell format (UNI or NNI) that is used on the ATM interface
Configured VCs	The number of configured VCs
Configured VTs	The number of configured VTs
Configured minimum VPI	The minimum VPI configured for this bundle
Last Unknown VPI/VCI	Indicates the last unknown VPI/VCI that was received on this interface
Configured VPs	The number of configured VPs

Sample Output

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm

===============================================================================
ATM Info for bundle-ima-1/6.3
===============================================================================
Cell Mode             : UNI               Mapping            : n/a
Configured VCs        : 0                 Configured VPs     : 0
Configured VTs        : 0                 Configured IFCs    : 0
Configured minimum VPI: 0
Last Unknown VPI/VCI  : none

===============================================================================

*A:ALU-1>#
```

Table 37: Show Multilink-bundle IMA ATM Connections Output Fields

Label	Description
Owner	Identifies the system entity that owns a specific ATM connection
Type	The type of connection
Ing.TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr.TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	Up — the bundle is administratively up Down — the bundle is administratively down
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	Up — the bundle is operationally up Down — the bundle is operationally down

Sample Output

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm connections

===============================================================
ATM Connections, Port bundle-ima-1/6.3
===============================================================
           Owner  Type     Ing.TD  Egr.TD  Adm  OAM          Opr
---------------------------------------------------------------
1/100      SAP    PVC      2       2       up   up           up
===============================================================
*A:ALU-1>#
```

Table 38: Show Multilink-bundle IMA ATM PVC Output Fields

Label	Description
VPI/VCI	Displays the VPI/VCI value
Owner	Identifies the system entity that owns a specific ATM connection
Type	The type of connection
Ing.TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr.TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	Up — the bundle is administratively up Down — the bundle is administratively down
OAM	The OAM operational status of ATM connections Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	Up — the bundle is operationally up Down — the bundle is operationally down

Sample Output

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvc

===============================================================
ATM PVCs, Port bundle-ima-1/6.3
===============================================================
VPI/VCI    Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
1/100      SAP    PVC      2       2       up   up          up
===============================================================
*A:ALU-1>#
```

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvc detail

===============================================================
ATM PVCs, Port bundle-ima-1/6.3
===============================================================
VPI/VCI    Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
1/100      SAP    PVC      2       2       up   up          up
===============================================================================
ATM Statistics
===============================================================================
                                                  Input                Output
-------------------------------------------------------------------------------
Octets                                               0                     0
Cells                                                0                     0
===============================================================================

===============================================================================
AAL-5 Packet Statistics
===============================================================================
                                                  Input                Output
-------------------------------------------------------------------------------
Packets                                              0                     0
Dropped Packets                                      0                     0
CRC-32 Errors                                        0
Reassembly Timeouts                                  0
Over Sized SDUs                                      0
===============================================================================

===============================================================================
ATM OAM Statistics
===============================================================================
                                                  Input                Output
-------------------------------------------------------------------------------
Loopback                                             0                     0
OAM Cells (generated)                          0
===============================================================================
*A:ALU-1>#
```

Table 39: Show Multilink-bundle IMA ATM PVP Output Fields

Label	Description
VPI	Displays the VPI value
Owner	Identifies the system entity that owns a specific ATM connection
Type	The type of connection
Ing.TD	The ATM traffic descriptor profile that applies to the receive direction of the interface connection
Egr.TD	The ATM traffic descriptor profile that applies to the transmit direction of the interface connection
Adm	Up — the bundle is administratively up Down — the bundle is administratively down
OAM	The OAM operational status of ATM connections: Up — the interface is operationally up ETE-AIS — the endpoint is down and is generating end-to-end AIS OAM cells to alert the far end that it is down
Opr	Up — the bundle is operationally up Down — the bundle is operationally down

Sample Output

```
*A:ALU-1># show multilink-bundle bundle-ima-1/6.3 ima atm pvp

===============================================================
ATM PVPs, Port bundle-ima-1/6.3
===============================================================
VPI        Owner  Type     Ing.TD  Egr.TD  Adm  OAM         Opr
---------------------------------------------------------------
2          SAP    PVP      1       1       up   up          up
===============================================================
*A:ALU-1>#
```

Monitor Commands

Port Monitor Commands

port

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

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-id* — specifies up to 5 port IDs

Syntax: *port-id* slot/mda/port[.channel]
bundle IDbundle-*type-slot/mda.bundle-num*
bundle keyword
bundle-num: 1 to 16 (up to 8 for MLPPP and IMA)
type ima, ppp

seconds — configures the interval for each display in seconds

Default 5 seconds

Values 3 to 60

repeat — configures how many times the command is repeated

Default 10

Values 1 to 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:ALU-1# monitor port 1/1/1.1 interval 3 repeat 3 absolute

===============================================================================
Monitor statistics for Port 1/1/1.1
===============================================================================
                                                    Input                  Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Octets                                          330161274              330161274
Packets                                           6229458                6229458
Errors                                                  0                      0

-------------------------------------------------------------------------------
At time t = 3 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                          330162917              330162917
Packets                                           6229489                6229489
Errors                                                  0                      0

-------------------------------------------------------------------------------
At time t = 6 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                          330164560              330164560
Packets                                           6229520                6229520
Errors                                                  0                      0

-------------------------------------------------------------------------------
At time t = 9 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                          330166203              330166203
Packets                                           6229551                6229551
Errors                                                  0                      0

===============================================================================
*A:ALU-1#
```

port

Syntax **port** *port-id* **atm** [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor

Description This command enables ATM port traffic monitoring.

Parameters *port-id* — specifies the physical port ID

Syntax: *port-id* slot/mda/port.channel
bundle-*type-slot/mda.bundle-num*
bundle keyword
bundle-num: 1 to 16 (up to 8 for MLPPP and IMA)
type ima, ppp

seconds — configures the interval for each display in seconds

Default 5 seconds

Values 3 to 60

repeat — configures how many times the command is repeated

Default 10

Values 1 to 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:ALU-1# monitor port 1/1/1.1 atm interval 3 repeat 3 absolute

===============================================================================
Monitor ATM statistics for Port 1/1/1.1
===============================================================================
                                                    Input                 Output
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
At time t = 0 sec (Base Statistics)
-------------------------------------------------------------------------------
Octets                                          330260861             330260861
Cells                                             6231337               6231337
Unknown VPI/VCI Cells                                   0

-------------------------------------------------------------------------------
At time t = 3 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                          330262504             330262504
Cells                                             6231368               6231368
Unknown VPI/VCI Cells                                   0

-------------------------------------------------------------------------------
```

```
At time t = 6 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                        330264147              330264147
Cells                                           6231399                6231399
Unknown VPI/VCI Cells                                 0

-------------------------------------------------------------------------------
At time t = 9 sec (Mode: Absolute)
-------------------------------------------------------------------------------
Octets                                        330265790              330265790
Cells                                           6231430                6231430
Unknown VPI/VCI Cells                                 0

===============================================================================
*A:ALU-1#
```

Fabric Profile Statistics Monitor Commands

fabric-profile

Syntax **fabric-profile mda** {*mda-id* | **with-stats-enabled**} {**dest-mda** | **source-mda**} [**interval** *seconds*] [**repeat** *repeat*] [**absolute** | **rate**]

Context monitor

Description This command enables monitoring of adapter card fabric profile statistics. The specified adapter card statistical information displays and automatically refreshes at the configured interval.

Parameters *mda-id* — the slot number of the adapter card

with-stats-enabled — if used, this keyword replaces the *mda-id* parameter, in which case the adapter card that has fabric-stats-enabled configured will be the one which is monitored; that is, the command will be **monitor fabric-profile mda with-stats-enabled dest-mda** | **source-mda**. If there are no adapter cards that have fabric-stats-enabled configured, no statistics will be displayed.

dest-mda — displays network ingress statistics for all adapter cards going towards the fabric and destined for the specific destination adapter card. Global fabric statistics are also displayed, as well as the fabric port statistics if the destination adapter card has the collection of fabric statistics enabled.

source-mda — displays network ingress traffic statistics from the specified adapter card going towards the fabric and towards a destination adapter card. The sum of traffic forwarded or dropped is also displayed.

seconds — configures the interval for each display in seconds

Default 5 seconds

Values 3 to 60

repeat — configures how many times the command is repeated

Default 10

Values 1 to 999

absolute — displays the raw statistics without processing. No calculations are performed on the delta or rate statistics.

rate — displays the rate-per-second for each statistic instead of the delta

Clear Commands

mda

Syntax **mda** *mda-id*
mda *mda-id* **statistics** [**source-mda** | **destination-mda** | **fabric-port** | **fabric-global** | **all**]

Context clear

Description The **clear mda** form of this command re-initializes the specified adapter card and clears all the collected fabric statistics related to the specified adapter card. The **clear mda statistics** form of this command clears all the collected fabric statistics related to the specified adapter card.

Parameters *mda-id* — the slot number of the specified adapter card

statistics — specifies that fabric statistics will be cleared for the specified adapter card

source-mda — clears all the network ingress traffic statistics in the fabric direction from the specified adapter card towards all other destination adapter cards

destination-mda — clears all the network ingress traffic statistics towards the specified adapter card fabric port, from all other adapter cards

fabric-port — clears the fabric port statistics towards the specified destination adapter card, if the specified adapter card has fabric-stats-enabled. If the specified adapter card does not have fabric-stats-enabled, no statistics will be cleared.

fabric-global — clears global fabric statistics collected for all egress traffic from the fabric

all — clears all the collected fabric statistics related to the specified adapter card. This command is equivalent to clearing the specified adapter card using all keywords above (**source-mda**, **destination-mda**, **fabric-port**, **fabric-global**).

port

Syntax **port** *port-id* **statistics**
port *port-id* **atm pvc** [*vpi*[*/vci*]] **statistics**
port *port-id* **atm pvp** [*vpi*] **statistics**

Context **clear**

Description This command clears port statistics for the specified port(s).

Parameters *port-id* — specifies the physical port ID

Syntax *slot*[/*mda*[/*port*]] or *slot*/*mda*/*port*[.*channel*]

bundle-type-slot/mda.bundle-num
bundle keyword
type ima, ppp
bundle-num 1 to 16 (up to 8 for MLPPP and IMA)

statistics — specifies that port statistics will be cleared

atm — specifies that ATM port statistics will be cleared

vpi — specifies the ATM network virtual path identifier (VPI) for this PVC

vci — specifies the ATM network virtual channel identifier (VCI) for this PVC

pvc — clears PVC statistics

pvp — clears PVP statistics

Standards and Protocol Support

Standards Compliance

IEEE 802.1p/q VLAN Tagging
IEEE 802.3 10BaseT
IEEE 802.3u 100BaseTX
IEEE 802.3x Flow Control
IEEE 802.3z 1000BaseSX/LX

Protocol Support

ATM

RFC 2514 Definitions of Textual Conventions and OBJECT_IDENTITIES for ATM Management, February 1999

RFC 2515 Definition of Managed Objects for ATM Management, February 1999

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ITU-T Recommendation I.432.1 - B-ISDN user-network interface - Physical layer specification: General characteristics

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GR-1113-CORE - Bellcore, Asynchronous Transfer Mode (ATM) and ATM Adaptation Layer (AAL) Protocols Generic Requirements, Issue 1, July 1994

GR-253-CORE - SONET Transport Systems: Common Generic Criteria. Issue 3, September 2000

AF-PHY-0086.001 Inverse Multiplexing for ATM (IMA)

DIFFERENTIATED SERVICES

RFC 2474 Definition of the DS Field in the IPv4 and IPv6 Headers

RFC 2597 Assured Forwarding PHB Group

RFC 2598 An Expedited Forwarding PHB

RFC 3140 Per-Hop Behavior Identification Codes

LDP

RFC 5036 LDP Specification

MPLS

RFC 3031 MPLS Architecture

RFC 3032 MPLS Label Stack Encoding

RFC 4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures

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 1305 Network Time Protocol (Version 3) Specification, Implementation and Analysis

RFC 1850 OSPF-MIB

RFC 1907 SNMPv2-MIB

RFC 2011 IP-MIB

RFC 2012 TCP-MIB

RFC 2013 UDP-MIB

RFC 2030 Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI

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-BASED-SMMIB

RFC 2575 SNMP-VIEW-BASED ACM-MIB
RFC 2576 SNMP-COMMUNITY-MIB
RFC 2588 SONET-MIB
RFC 2665 EtherLike-MIB
RFC 2819 RMON-MIB
RFC 2863 IF-MIB
RFC 2864 INVERTED-STACK-MIB
RFC 3014 NOTIFICATION-LOG MIB
RFC 3164 The BSD Syslog Protocol
RFC 3273 HCRMON-MIB
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
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OSPF

RFC 1765 OSPF Database Overflow
RFC 2328 OSPF Version 2
RFC 2370 Opaque LSA Support
RFC 3101 OSPF NSSA Option
RFC 3630 Traffic Engineering (TE) Extensions to OSPF

PPP

RFC 1332 PPP IPCP
RFC 1661 PPP
RFC 1662 PPP in HDLC-like Framing
RFC 1989 PPP Link Quality Monitoring
RFC 1990 The PPP Multilink Protocol (MP)

PSEUDOWIRES

RFC 3985 Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture
RFC 4385 Pseudowire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN
RFC 4446 IANA Allocation for PWE3
RFC 4447 Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)
RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks
RFC 4553 Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP)
RFC 4717 Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) over MPLS Networks
RFC 5086 Structure-Aware Time Division Multiplexed (TDM) Circuit Emulation Service over Packet Switched Network (CESoPSN)
RFC 5085 Pseudowire Virtual Circuit Connectivity Verification (VCCV): A Control Channel for Pseudowires
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RFC 2865 Remote Authentication Dial In User Service
RFC 2866 RADIUS Accounting

RSVP-TE and FRR

RFC 2430 A Provider Architecture for DiffServ & TE
RFC 2961 RSVP Refresh Overhead Reduction Extensions
RFC 3209 Extensions to RSVP for LSP Tunnels
RFC 3210 Applicability Statement for Extensions to RSVP for LSP Tunnels
RFC 4090 Fast Reroute Extensions to RSVP-TE for LSP Tunnels

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draft-ietf-secsh-transport.txt SSH Transport Layer Protocol

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G.813 Timing characteristics of SDH equipment slave clocks (SEC)

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G.8262 Timing characteristics of synchronous Ethernet equipment slave clock

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draft-grant-tacacs-02.txt The TACACS+ Protocol

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RFC 768 UDP
RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 826 ARP
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