

**Junos<sup>®</sup> OS**

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# ATM Interfaces User Guide for Routing Devices

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Use this guide to configure the Asynchronous Transfer Mode (ATM) over ADSL and SHDSL interfaces. This technology helps you handle various types of traffic streams (voice, data, and video) simultaneously at very high speeds over the same physical connection.

[Junos OS Network Interfaces Library for Routing Devices](#)

## Documentation and Release Notes

To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <https://www.juniper.net/documentation/>.

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## Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

## Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xsl;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

## Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {  
    file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]  
user@host# edit system scripts  
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]  
user@host# load merge relative /var/tmp/ex-script-snippet.conf  
load complete
```

For more information about the **load** command, see [CLI Explorer](#).

## Documentation Conventions

[Table 1 on page xvi](#) defines notice icons used in this guide.

Table 1: Notice Icons







Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xvi defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies guide names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS CLI User Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>



Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name:  [edit] root@# <b>set system domain-name</b> <i>domain-name</i>
<b>Text like this</b>	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"><li>• To configure a stub area, include the <b>stub</b> statement at the [edit <b>protocols ospf area area-id</b>] hierarchy level.</li><li>• The console port is labeled <b>CONSOLE</b>.</li></ul>
< > (angle brackets)	Encloses optional keywords or variables.	<b>stub</b> <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast   multicast</b>  ( <i>string1</i>   <i>string2</i>   <i>string3</i> )
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	<b>community name members [ <i>community-ids</i> ]</b>
Indentation and braces ( { } )	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		

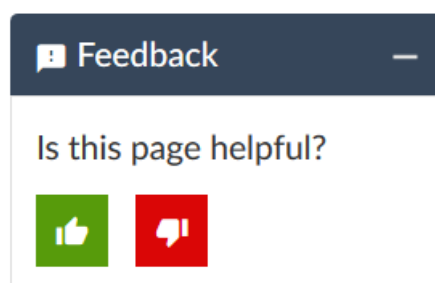
Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
<b>Bold text like this</b>	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

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We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

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- Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.
- E-mail—Send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net). Include the document or topic name, URL or page number, and software version (if applicable).

## Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active Juniper Care or Partner Support Services support contract, or are

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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <https://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <https://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

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- Search for known bugs: <https://prsearch.juniper.net/>
- Find product documentation: <https://www.juniper.net/documentation/>
- Find solutions and answer questions using our Knowledge Base: <https://kb.juniper.net/>
- Download the latest versions of software and review release notes: <https://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum: <https://www.juniper.net/company/communities/>
- Create a service request online: <https://myjuniper.juniper.net>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://entitlementsearch.juniper.net/entitlementsearch/>

## Creating a Service Request with JTAC

You can create a service request with JTAC on the Web or by telephone.

- Visit <https://myjuniper.juniper.net>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <https://support.juniper.net/support/requesting-support/>.

# 1

PART

## ATM Interfaces

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# ATM Interfaces Overview

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## ATM Interfaces Overview

Asynchronous Transfer Mode (ATM) is a network protocol designed to facilitate the simultaneous handling of various types of traffic streams (voice, data, and video) at very high speeds over the same physical connection. By always using 53-byte cells, ATM simplifies the design of hardware, enabling it to quickly determine the destination address of each cell. This allows simple switching of network traffic at much higher speeds than are easily accomplished using protocols with variable sizes of transfer units, such as Frame Relay and Transmission Control Protocol/Internet Protocol (TCP/IP).

Although ATM was designed to operate without the requirement of any other networking protocol, other protocols are frequently segmented and encapsulated across multiple, smaller ATM cells. This makes ATM a transport mechanism for preexisting technologies such as Frame Relay and the TCP/IP family of protocols.

ATM relies on the concepts of virtual paths and virtual circuits. A virtual path, represented by a specific virtual path identifier (VPI), establishes a route between two devices in a network. Each VPI can contain multiple virtual circuits, each represented by a virtual circuit identifier (VCI).

VPIs and VCIs are local to the router, which means that only the two devices connected by the VCI or VPI need know the details of the connection. In a typical ATM network, user data might traverse multiple connections, using many different VPI and VCI connections. Each end device, just like each device in the network, needs to know only the VCI and VPI information for the path to the next device.

**NOTE:** The ATM three-bit payload type identifier (PTI) field is not supported.

With ATM2 intelligent queuing (IQ) interfaces, you can configure virtual path (VP) shaping and Operation, Administration, and Management (OAM) F4 cell flows.

## RELATED DOCUMENTATION

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## ATM Pseudowire Overview

An Asynchronous Transfer Mode (ATM) pseudowire acts as a Layer 2 circuit or service, which allows the migration of ATM services to an MPLS packet-switched network without having to provision the ATM subscriber or customer edge (CE) device. When you configure an ATM pseudowire, the network between the customer edge (CE) routers appears transparent to the CE routers, making it seem that the CE routers are directly connected across a time-division multiplex (TDM) leased line. ATM pseudowires are primarily used in an ATM service provider's network to connect existing ATM switches across a higher speed packet-switched network or to provide ATM backhaul services for remote access to existing ATM networks.

On ACX series routers, you configure an ATM pseudowire with Layer 2 encapsulation for Inverse Multiplexing for ATM (IMA).

### RELATED DOCUMENTATION

<a href="#"><i>Understanding Encapsulation on an Interface</i></a>
<a href="#">Configuring Inverse Multiplexing for ATM (IMA) on ACX Series</a>   29
<a href="#"><i>Pseudowire Overview for ACX Series Universal Metro Routers</i></a>
<a href="#"><i>TDM Pseudowires Overview</i></a>
<a href="#"><i>Ethernet Pseudowire Overview</i></a>

## Understanding Inverse Multiplexing for ATM

### IN THIS SECTION

- [Understanding Asynchronous Transfer Mode | 5](#)
- [Understanding Inverse Multiplexing for ATM | 6](#)
- [How Inverse Multiplexing for ATM Works | 6](#)
- [Supported Platforms | 7](#)

Inverse multiplexing for ATM (IMA) is a technique of transporting ATM traffic over a bundle of T1 or E1 interfaces. The following sections explain IMA in detail:

### Understanding Asynchronous Transfer Mode

Asynchronous Transfer Mode (ATM) is a high-speed networking technology that handles data in fixed-size units called cells. It enables high-speed communication between edge routers and core routers in an ATM network.

ATM is designed to facilitate the simultaneous handling of various types of traffic streams (voice, data, and video) at very high speeds over a dedicated connection. ATM uses asynchronous time-division multiplexing (TDM) and it encodes data into 53-byte cells, thereby simplifying the design of hardware and enabling it to quickly determine the destination address of each cell. ATM operates over either fiber optic cables or twisted-pair cables. Each ATM PIC is assigned an ATM switch ID that displays the switch's IP address and the local interface names of the adjacent Fore ATM switches. For information about ATM PICs, see the platform-specific *Hardware Guide*.

ATM relies on the concepts of virtual paths (VPs) and virtual circuits (VCs). A virtual path, represented by a specific virtual path identifier (VPI), establishes a route between two devices in a network. Each VPI can contain multiple VCs, each represented by a virtual circuit identifier (VCI). VPIs and VCIs are local to the router, which means that only the two devices connected by the VCI or VPI need know the details of the connection. In a typical ATM network, user data might traverse multiple connections, using many different VPI and VCI connections. Each end device, just like each device in the network, needs to know only the VCI and VPI information for the path to the next device.

An ATM interface is indicated by the **at-fpc/pic/port** CLI descriptor.



## Understanding Inverse Multiplexing for ATM

Inverse multiplexing is a method where a single data stream is divided into multiple smaller data streams that are transmitted over either fiber optic cables or twisted pair cables and are recombined on the other end to form the original data stream. This concept is useful for attaining high-speed data transmission rates. This concept has been extended to ATM and is called inverse multiplexing for ATM or IMA.

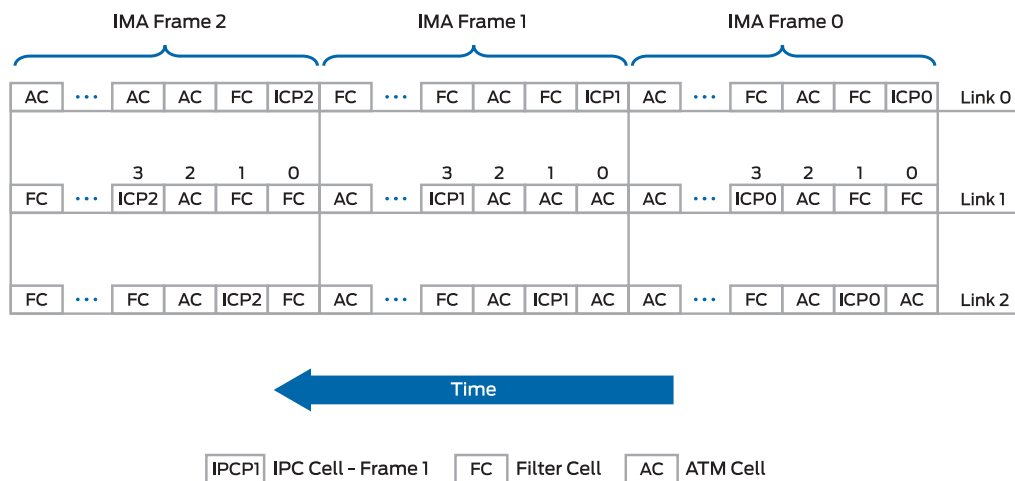
IMA is a technique of transporting ATM traffic over a bundle of T1 or E1 interfaces. IMA divides a single data stream into multiple smaller data streams, that is transmitted at the same time across separate channels (such as T1 or E1 interfaces) and then reconstructed at the other end back into the original data stream.

Two versions of IMA are available—IMA 1.0 (af-phy-0086.000-IMA) and IMA 1.1 (af-phy-0086.001-IMA). You can configure either of these versions, by using the Junos OS CLI. If not specified, IMA 1.1 is selected by default. Note that IMA 1.0 and IMA 1.1 do not interoperate. The IMA v1.1 specification increments the OAM (operations and maintenance) label value used in the IMA OAM cells in order to differentiate v1.1 from v1.0 IMA units.

## How Inverse Multiplexing for ATM Works

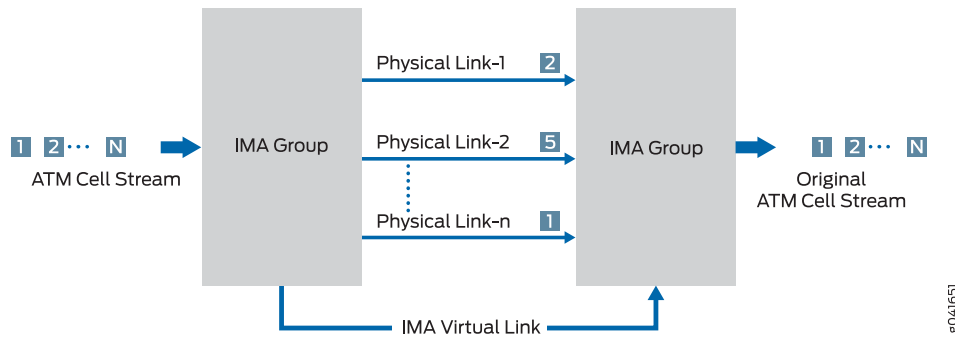
Figure 1 on page 6 displays IMA frames on different links. An IMA frame consists of ATM cells, an ICP cell, and filler cells (if required).

Figure 1: IMA Frames on Links



On the transmission side of the ATM IMA network, the ATM cell stream (received from the ATM layer) is divided across multiple links in an IMA group on a cell by cell basis. On the receiving end of the ATM IMA network, the cells are recombined to form the original ATM cells stream (with the help of ICP cells), and then passed on to the ATM layer. Figure 2 on page 7 displays an IMA frame being transmitted and received through an IMA group.

Figure 2: IMA Frames Transmitted Through IMA Group



IMA Control Protocol (ICP) cells are special cells that are sent over the ATM IMA interface with the ATM cell stream to help align the ATM cells at the receiving end. An ICP cell tracks link differential delay, reduces cell delay variation (CDV), and performs other functions.

When there are no ATM cells to be sent on an IMA frame, the IMA transmitter inserts filler cells to maintain a continuous stream of cells at the physical layer. The filler cells are discarded by the IMA receiver. An OAM cell has codes that define it as an ICP cell or a filler cell.

## Supported Platforms

The following are the various Juniper Networks routers and their components that support inverse multiplexing for ATM (IMA):

- 16-port Channelized E1/T1 Circuit Emulation MIC (MIC-3D-16CHE1-T1-CE) on MX Series routers (from Junos OS Release 13.2R1 onward).
- 4-port Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP (MIC-3D-4COC3-1COC12-CE) on MX Series routers (from Junos OS Release 13.2R1 onward).
- 4-port Channelized OC3/STM1 Circuit Emulation PIC with SFP (PB-4CHOC3-CE-SFP) on M7i, M10i, M40e, M120, and M320 routers supports channelized OC3/STM1 (down to T1) ATM IMA.
- 12-port E1/T1 Circuit Emulation PIC (PB-12T1E1-CE-TELCO) on M7i, M10i, M40e, M120, and M320 routers supports discrete T1 ATM IMA.

**NOTE:** Circuit Emulation PICs require firmware version **rom-ce-9.3.pbin** or **rom-ce-10.0.pbin** for ATM IMA functionality on M7i, M10i, M40e, M120, and M320 routers running Junos OS Release 10.0R1 or later.

## RELATED DOCUMENTATION

ATM IMA Configuration Overview

ATM Support on Circuit Emulation PICs Overview

Configuring ATM IMA

## Understanding ATM IMA Configuration on ACX Series Router

### IN THIS SECTION

- IMA Version | 9
- IMA Frame Length | 9
- Transmit Clock | 10
- IMA Group Symmetry | 10
- Minimum Active Links | 10
- State Transition Variables: Alpha, Beta, and Gamma | 11
- IMA Link Addition and Deletion | 11
- IMA Test Pattern Procedure | 12
- IMA Group Alarms and Group Defects | 12
- IMA Link Alarms and Link Defects | 13
- IMA Group Statistics | 14
- IMA Link Statistics | 15
- IMA Clocking | 16
- Differential Delay | 16

IMA involves inverse multiplexing and demultiplexing of ATM cells in a round-robin sequence among links grouped to form a higher-bandwidth logical link whose rate is the sum of all the link rates. This group of links is called an IMA group. An IMA group can also be defined as a group of links at the transmitting end that is used to establish an IMA virtual link to the receiving end. The IMA virtual link is a virtual link that is established between two IMA units or routers over a number of physical links (in an IMA group). IMA groups terminate at each end of the IMA virtual link.

You can configure 42 IMA groups. Each group can contain from 1 through 32 links.

You can configure a maximum of 16 IMA groups on the 16-port Channelized E1/T1 Circuit Emulation MIC (ACX-MIC-16CHE1-T1-CE) and each group can have from 1 through 8 IMA links. Port numbers starting from 0 through 15 are used for T1/E1 ports; therefore, IMA port numbers start from 16 onward.

You can configure a maximum of 16 IMA groups on the Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP (ACX-MIC-4COC3-1COC12CE).

To configure an IMA group, execute the **set chassis fpc fpc-slot pic pic-slot aggregated devices ima device-count count** configuration command, where **count** results in the creation of interfaces from at-x/y/g through at-x/y/g+count-1. The variable g is picked from 16 onward. For example, if the count variable is set to 4, then the new ATM interfaces are created from at-x/y/16 through at-x/y/19.

You can implement inverse multiplexing for ATM (IMA) on Juniper Networks ACX Series routers by configuring an IMA group and its options. The following sections explain the various options that can be set for an IMA group:

## IMA Version

Either IMA 1.0 (af-phy-0086.000-IMA) or IMA 1.1 (af-phy-0086.001-IMA) can be selected through the CLI. To choose the IMA specification version, execute the **set interfaces interface-name ima-group-options (1.0|1.1)** configuration command. Note that, if you do not specify the version, IMA 1.1 is selected by default.

**NOTE:** IMA 1.0 and IMA 1.1 do not interoperate.

The IMA v1.1 specification increments the operations and maintenance (OAM) label value used in the IMA OAM cells in order to differentiate v1.1 from v1.0 IMA units.

## IMA Frame Length

An IMA frame consists of ATM cells, an ICP cell, and filler cells (if required). When you configure an IMA group, you can choose a frame length of 32, 64, 128, or 256. The frame length can be selected independently in each direction and in each group. To set the frame length, execute the **set interface interface-name**

**frame-length (32 | 64 | 128 | 256)** configuration command. Note that if the frame length is not specified, the frame length value of 128 is selected by default.

## Transmit Clock

When you create an IMA group, you can configure a common transmit clock timing mode or an independent transmit clock timing mode to reflect the primary reference source (PRS) of the clock for each link in a group. By default, the **common** mode is selected. To select the transmit clock timing mode, execute the **set interface *interface-name* ima-group-options transmit-clock (common | independent)** configuration command.

## IMA Group Symmetry

You can configure an IMA group to allow symmetric or asymmetric cell rate transfer over an IMA virtual link. You can configure the IMA group with one of the following modes:

- Symmetrical configuration and operation—In this mode, on the ATM IMA device, an IMA link must be configured in each direction for all physical links that the ATM IMA device is configured to use. In this mode, the ATM IMA device can transmit and receive ATM layer cells over the physical links on which the IMA links running in both directions are **Active**.
- Symmetrical configuration and asymmetrical operation—In this mode, on the ATM IMA device, an IMA link must be configured in each direction for all physical links that the ATM IMA device is configured to use. In this mode, the ATM IMA device can transmit ATM layer cells over the physical links on which the IMA links in the transmit direction are **Active**, while the IMA links in the receive direction are not **Active** or contrariwise.

Asymmetrical configuration and operation are not supported.

The mode can be configured through the CLI when an IMA group is created. To select the symmetry option, execute the **set interface *interface-name* ima-group-options symmetry (symmetrical-config-and-operation | symmetrical-config-asymmetrical-operation)** configuration command. By default, symmetrical configuration and operation is selected.

## Minimum Active Links

You can set the minimum active links for an IMA group from 1 through 32.

- $P_{Tx}$  is the minimum number of links required to be active in the transmit direction for the IMA group to move into the operational state.
- $P_{Rx}$  is the minimum number of links required to be active in the receive direction for the IMA group to move into the operational state.

You configure  $P_{Tx}$  and  $P_{Rx}$  through the CLI when an IMA group is created. By default, 1 is selected.

For a symmetrical configuration,  $P_{Tx}$  is equal to  $P_{Rx}$ .

To set minimum links, execute the **set interface *interface-name* ima-group-options minimum-links *links*** configuration command. By default, symmetrical configuration and operation is selected.

### State Transition Variables: Alpha, Beta, and Gamma

Frame synchronization is a process of recovery of the aggregated frames. The frame synchronization states form a basis for the different error and maintenance states. You can configure the IMA frame synchronization link state transition variables as alpha, beta, and gamma. The valid ranges and default values are shown in [Table 3 on page 11](#).

**Table 3: IMA Frame Synchronization Link State Transition Variables**

Setting	Range	Default	Description
alpha	1-2	2	Consecutive invalid ICP cells
beta	1-5	2	Consecutive errored ICP cells
gamma	1-5	1	Consecutive valid ICP cells

To set the frame synchronization option, execute the **set interface *interface-name* ima-group-options frame-synchronization alpha *number* beta *number* gamma *number*** configuration command.

### IMA Link Addition and Deletion

When an IMA group is up, you can add links to or delete links from the group without dropping cells.

To create an IMA link, you must:

- Configure the encapsulation as **ima** at the **[edit interfaces *interface-name* encapsulation]** hierarchy level.
- Configure an ATM interface with one T1 link or one E1 link with the **set interfaces *interface-name* ima-link-options group-id *g*** configuration command.

The ***interface-name*** variable refers to the T1 or E1 interface to be set as an IMA interface link and the variable ***g*** refers to the port in the *at-x/y/g* interface.

To delete the configured IMA link, you must execute the following configuration commands:

- **delete interfaces *interface-name* encapsulation ima**
- **delete interfaces *interface-name* ima-link-options group *g***

## IMA Test Pattern Procedure

A test pattern procedure is supported for IMA to test the ATM, T1, and E1 interfaces for irregularities. You can use the CLI to start and end the test pattern procedure.

The following options can be set according to the requirement at the **[edit interface *interface-name* ima-group-options test-procedure]** hierarchy level:

- **interface *interface-name***—Interface name of the IMA link to test.
- **pattern *number***—IMA test pattern that can be set from 1 through 254
- **period *number***—Length of the IMA test pattern that can be set from 1 second through 4,294,967,294 seconds. Default is 10 seconds.

To perform the test pattern procedure, execute the **test interface *interface-name* ima-test-start** and **test interface *interface-name* ima-test-stop** operational mode commands to start and to stop the IMA test, respectively.

## IMA Group Alarms and Group Defects

[Table 4 on page 12](#) shows the supported IMA group alarms and their associated IMA standard requirement numbers. This is displayed in the *group status and control* field of an ICP cell.

Table 4: IMA Group Alarms with IMA Standard Requirement Numbers

Alarm	IMA Standard Requirement Number
Start-up-FE	R-145
Config-Aborted	R-146
Config-Aborted-FE	R-147
Insufficient-Links	R-148
Insufficient-Links-FE	R-149
Blocked-FE	R-150
Timing-Mismatch	R-151
Blocked	
Version-Mismatch	

Table 5 on page 13 shows the supported IMA group defects and their associated IMA standard requirement numbers. This is displayed in the *group status and control* field of an ICP cell.

**Table 5: IMA Group Defects with IMA Standard Requirement Numbers**

Defects	IMA Standard Requirement Number
Start-up-FE	R-145
Config-Aborted	R-146
Config-Aborted-FE	R-147
Insufficient-Links	R-148
Insufficient-Links-FE	R-149
Blocked-FE	R-150
Timing-Mismatch	R-151
Blocked	
Version-Mismatch	

## IMA Link Alarms and Link Defects

Table 6 on page 13 shows the supported IMA link alarms that are reported to the IMA unit management with their associated IMA standard requirement numbers.

**Table 6: IMA Link Alarms with IMA Standard Requirement Numbers**

Alarm	IMA Standard Requirement Number	Description
LIF	R-138	Loss of IMA frame
LODS	R-139	Link out of delay synchronization
RFI-IMA	R-140	Remote defect/failure
Tx-Mis-Connected	R-141	Transmit misconnected
Rx-Mis-Connected	R-142	Receive misconnected



Table 6: IMA Link Alarms with IMA Standard Requirement Numbers (*continued*)

Alarm	IMA Standard Requirement Number	Description
Tx-Unusable-FE	R-143	Transmit unusable far end
Rx-Unusable-FE	R-144	Receive unusable far end
Link Fault		Link fault

An IMA unit management is defined by SNMP MIBs.

Table 7 on page 14 shows the supported IMA link defects that are reported to the unit management with their associated IMA standard requirement numbers.

Table 7: IMA Link Defects with IMA Standard Requirement Numbers

Defect	IMA Standard Requirement Number	Description
LIF	R-138	Loss of IMA frame
LODS	R-139	Link out of delay synchronization
RFI-IMA	R-140	Remote defect/failure
Tx-Mis-Connected	R-141	Transmit misconnected
Rx-Mis-Connected	R-142	Receive misconnected
Tx-Unusable-FE	R-143	Transmit unusable far end
Rx-Unusable-FE	R-144	Receive unusable far end
Link Fault		Link fault

## IMA Group Statistics

You can use the **show interfaces** command to display the following IMA group statistics:

- Near-end failure count
- Far-end failure count
- Receive end (R<sub>x</sub>) faulty cells due to address mismatch

- Running seconds
- Unavailable seconds

For more information about IMA group statistics, see the **show interfaces** command description in the [CLI Explorer](#).

## IMA Link Statistics

[Table 8 on page 15](#) shows the IMA link statistics.

**Table 8: IMA Link Statistics with IMA Standard Requirement Numbers**

Performance Parameter	IMA Standard Requirement Number
Rx LIF	–
Rx ICP cells	–
Rx errored ICP cells	R-106
Rx LODS	R-106
Rx ICP violation	R-107
Rx stuff	O-17
Near-end Rx SES	R-108
Near-end Rx UAS	R-110
Near-end Rx UUS	R-113
Near-end Rx failure	R-117
Near-end Tx failure	–
Far-end Rx SES	R-109
Far-end Rx UAS	R-111
Far-end Rx UUS	R-115
Far-end defects	–
Far-end Rx failure	–

Table 8: IMA Link Statistics with IMA Standard Requirement Numbers (*continued*)

Performance Parameter	IMA Standard Requirement Number
Tx ICP cells	-
Tx stuff	O-16
Near-end Tx UUS	R-112
Far-end Tx UUS	R-114
Far-end Tx failure	-

## IMA Clocking

Interface clock source is applicable only to IMA links.

You can set the interface clock source as external or internal with the **set interfaces *at-x/y/z* clocking (external | internal)** configuration command. Note that the **clocking** statement is not applicable to the **at-x/y/g** interface because the IMA group it represents is a virtual interface.

## Differential Delay

You can set the maximum differential delay from 1 millisecond through 56 milliseconds among links in an IMA group. By default, a differential delay of 25 milliseconds is set. Execute the **set interfaces *interface-name* ima-group-options differential-delay *delay*** configuration command to set the differential delay.

## Understanding CoS on ATM IMA Pseudowire Interfaces Overview

### IN THIS SECTION

- [Cell-Based ATM Policing | 17](#)
- [Cell-Based ATM Shaping | 18](#)
- [Fixed Classification | 18](#)

ACX Series routers configured with Asynchronous Transfer Mode (ATM) inverse multiplexing for ATM (IMA) pseudowire interfaces support class of service (CoS) features for ingress and egress traffic. Policing is performed by monitoring the configured parameters on incoming traffic to conserve resources by dropping traffic that might not meet those configured parameters. Egress shaping uses queuing and scheduling to control the bandwidth used. Fixed classification is provided per interface.

**NOTE:** ACX5048 and ACX5096 routers do not support ATM IMA pseudowire configurations.

ATM IMA pseudowires with the following encapsulation are supported:

- **atm-ccc-cell-relay**
- **atm-ccc-vc-mux**

The following ATM IMA CoS features are supported:

### Cell-Based ATM Policing

Policing, or rate limiting, enables you to limit the amount of traffic that passes into or out of the interface. Policing works with firewall filters to thwart denial-of-service (DoS) attacks. Networks police traffic by limiting the input or output transmission rate of a class of traffic on the basis of user-defined criteria. The ATM policer controls the maximum rate of traffic sent from or received on the interface on which it is applied. To apply limits to the traffic flow, configure the **cdvt** and **peak-rate** parameters within the policer. Define the **policing-action** parameter as **discard**, **discard-tag**, or **count** to set a consequence for the packets that exceed these limits. The consequence of configuring the **discard-tag** statement is usually a higher loss priority so that if those packets encounter downstream congestion, they are discarded first.

On ACX Series routers, policing is cell based and configured in the ingress path of the ATM IMA pseudowire interface at the **[edit firewall]** hierarchy level. The following ATM policing features are supported:

- ATM Adaption Layer 5 (AAL5) pseudowires on which cell-based policing is performed before packet assembly.
- Per-ATM IMA channel policing.
- Traffic classes—Constant bit rate (**cbr**), real-time variable bit rate (**rtvbr**), non-real-time variable bit rate (**nrtvbr**), and unspecified bit rate (**ubr**). All traffic classes must include the **peak-rate** and **cdvt** statements for the configuration to work. With the **peak-rate** statement, you can limit the maximum traffic allowed by specifying the largest number of cells per second that the policer processes before it drops packets. The **cdvt** statement ensures that the configuration functions correctly.
- For nonconforming cells, the **discard**, **discard-tag**, and **count** actions at the **[edit firewall atm-policer policer-name]** hierarchy level. The **discard-tag** action is applicable to variable bit-rate—**nrtvbr** and **rtvbr**—traffic classes.

### Cell-Based ATM Shaping

Cell-based ATM shaping uses cell-based queuing and scheduling to determine the maximum amount of traffic that can be transmitted on an ATM IMA pseudowire. Packet-based shaping is not supported. On ACX Series routers, ATM shaping is configured in the egress path of the ATM IMA pseudowire interface at the `[edit class-of-service]` hierarchy level. The following ATM shaping features are supported:

- Prioritized bit rate—Constant bit rate (**cbr**) is the highest priority, followed by variable bit rate—**nrtvbr** and **rtvbr**. Unspecified bit rate (**ubr**) is similar to the *best-effort* service for Ethernet traffic.
- Constant bit rate shaping—Constant bit rate (**cbr**) shaping uses the peak cell rate to limit the number of cells per second that the shaper processes before it drops packets.
- Variable bit rate shaping—Variable bit rate shaping (**nrtvbr** and **rtvbr**) uses **peak-rate** and **sustained-rate**.
- Unspecified bit rate—Unspecified bit rate (**ubr**) uses **peak-rate** with the lowest transmit priority.

The default shaping parameter is unspecified bit rate, which is similar to the *best-effort* service for Ethernet traffic.

### Fixed Classification

Fixed classifiers map all traffic on an interface to the forwarding class and loss priority. The forwarding class determines the output queue. A scheduler uses the loss priority to control packet discard during periods of congestion by associating different drop profiles with different loss priorities. On ACX Series routers, the fixed classifier is associated with the ingress interface. Packets are assigned on the basis of the type of fixed classification associated with the logical interface. To configure a fixed classifier, include the **forwarding-class class-name** statement at the `[edit class-of-service interface interface-name unit logical-unit-number]` hierarchy level.

#### RELATED DOCUMENTATION

<a href="#">Configuring Fixed Classification on an ATM IMA Pseudowire   101</a>
<a href="#">Configuring Policing on an ATM IMA Pseudowire   113</a>
<a href="#">Configuring Shaping on an ATM IMA Pseudowire   106</a>

### Supported Features on ATM1 and ATM2 IQ Interfaces

Table 9 on page 19 lists the supported features on ATM1 and ATM2 IQ interfaces.

Table 9: ATM1 and ATM2 IQ Supported Features

Item	ATM1	ATM2 IQ	Comments
<b>Encapsulation and Transport Modes</b>			
ATM Adaptation Layer 5 (AAL5) circuit cross-connect (CCC)	Supported	Supported	<p>For ATM1 and ATM2 IQ Physical Interface Cards (PICs), you can configure any combination of AAL5 CCC, nonpromiscuous cell relay, and AAL5 permanent virtual connections (PVCs) on the same PIC at the same time.</p> <p>See <a href="#">“Configuring ATM Interface Encapsulation” on page 56.</a></p>
Cell-relay accumulation mode: The incoming cells (1 to 8) are packaged into a single packet and forwarded to the label-switched path (LSP).	Supported	Not supported	<p>Cell-relay accumulation mode is per PIC, not per port. If you configure accumulation mode, the entire ATM1 PIC uses the configured mode.</p> <p>See <a href="#">“Configuring ATM Interface Encapsulation” on page 56.</a></p>
Cell-relay promiscuous port mode: All cells from 0 through 65,535 of all VPIs (0 through 255) are sent to or received from an LSP.	Supported	Supported	<p>For promiscuous mode, you must configure the port with <b>atm-ccc-cell-relay</b> encapsulation.</p> <p>For ATM2 IQ multiport PICs, you can configure one or more ports in port promiscuous mode, and the other ports with any ATM encapsulation.</p>
Cell-relay promiscuous VPI mode: All cells in the VCI range 0 through 65,535 of a single VPI are sent to or received from an LSP.	Supported	Supported	<p>For ATM2 IQ PICs, you can configure one or more logical interfaces in VPI promiscuous mode, and the other logical interfaces with any ATM encapsulation.</p> <p>For ATM1 PICs, if you configure one port in port mode, all ports on the PIC operate in port mode. Likewise if you configure one logical interface in VPI mode, all logical interfaces on the PIC operate in VPI mode.</p> <p>See <a href="#">“Configuring ATM Cell-Relay Promiscuous Mode” on page 46.</a></p>

Table 9: ATM1 and ATM2 IQ Supported Features (*continued*)

Item	ATM1	ATM2 IQ	Comments
Cell-relay VP shaping	Supported	Supported	For ATM2 PICs, you can configure ATM CC cell relay promiscuous mode. VP promiscuous mode allows incoming traffic on all VCIs under the VPI to be bundled and directed to an LSP. Port promiscuous mode allows all traffic coming in on the entire VPI/VCI range to be forwarded to an LSP. In both modes, traffic shaping is not permitted. The ATM2 PIC supports traffic shaping in VP promiscuous mode and cell relay VC mode.
Cell-relay VCI mode: All cells in a VCI are sent to or received from an LSP.	Supported	Supported	For ATM1 PICs, nonpromiscuous cell-relay VCI, VPI, and port modes are supported on the same PIC with ATM AAL5 PVCs or ATM AAL5 CCC.
Cell-relay VPI mode: All cells in the VCI range (0 through <i>maximum-vc</i> s) of a single VPI are sent to or received from an LSP.	Supported	Not supported	For ATM2 IQ PICs, nonpromiscuous cell-relay VCI mode is supported on the same PIC with ATM AAL5 PVCs or ATM AAL5 CCC.  See <a href="#">“Configuring ATM Interface Encapsulation” on page 56.</a>
Cell-relay port mode: All cells in the VCI range (0 through <i>maximum-vc</i> s) of all VPIs (0 through 255) are sent to or received from an LSP.	Supported	Not supported	For ATM1 PICs, port mode is supported on the same PIC with ATM AAL5 PVCs or ATM AAL5 CCC.  See <a href="#">“Configuring ATM Interface Encapsulation” on page 56.</a>
Ethernet over ATM encapsulation: Allows ATM interfaces to connect to devices that support only bridged-mode protocol data units (PDUs).	Supported	Supported	See <a href="#">“Configuring ATM Interface Encapsulation” on page 56.</a>

Table 9: ATM1 and ATM2 IQ Supported Features (*continued*)

Item	ATM1	ATM2 IQ	Comments
Layer 2 circuit cell-relay, Layer 2 circuit AAL5, and Layer 2 circuit trunk transport modes: Allow you to send ATM cells or AAL5 PDUs between ATM2 IQ interfaces across a Layer 2 circuit-enabled network. Layer 2 circuits are designed to transport Layer 2 frames between provider edge (PE) routers across a Label Distribution Protocol (LDP)-signaled Multiprotocol Label Switching (MPLS) backbone.	Not supported	Supported	<p>Transport mode is per PIC, not per port. If you configure Layer 2 circuit cell-relay, Layer 2 circuit AAL5, or Layer 2 circuit trunk transport mode, the entire ATM2 IQ PIC uses the configured transport mode.</p> <p>Layer 2 circuit cell-relay mode supports both VP- and port-promiscuous modes.</p> <p>See <a href="#">“Configuring Layer 2 Circuit Transport Mode” on page 60</a>.</p>
Layer 2 VPN cell relay and Layer 2 VPN AAL5: Allow you to carry ATM cells or AAL5 PDUs over an MPLS backbone.	Supported	Supported	See the <i>Junos OS VPNs Library for Routing Devices</i> .
Point-to-Point Protocol (PPP) over ATM encapsulation: Associates a PPP link with an ATM AAL5 PVC.	Not supported	Supported	<p>For ATM2 IQ interfaces, the Junos OS supports three PPP over ATM encapsulation types:</p> <ul style="list-style-type: none"> <li>• <b>atm-ppp-llc</b>—PPP over AAL5 logical link control (LLC).</li> <li>• <b>atm-ppp-vc-mux</b>—PPP over AAL5 multiplex.</li> <li>• <b>atm-mlppp-llc</b>—Multilink PPP over AAL5 LLC. Requires a Link Services or Voice Services PIC.</li> </ul> <p>See <a href="#">“Configuring PPP over ATM2 Encapsulation Overview” on page 94</a>.</p>

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#### Other ATM Attributes

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Table 9: ATM1 and ATM2 IQ Supported Features (*continued*)

Item	ATM1	ATM2 IQ	Comments
EPD (early packet discard) threshold: Limits the queue size in ATM cells of a particular VC or forwarding class configured over a VC when using VC tunnel class of service (CoS). When the first ATM cell of a new packet is received, the VC's queue depth is checked against the EPD threshold. If the VC's queue depth exceeds the EPD threshold, the first and all subsequent ATM cells in the packet are discarded.	Not supported	Supported	<p>If you are using VC tunnel CoS, the EPD threshold configured at the logical unit level has no effect. You should configure each forwarding class for congestion management using either an individual EPD threshold (in other words, tail drop) or weighted random early detection (WRED) profile.</p> <p>See <a href="#">“Configuring the ATM2 IQ EPD Threshold” on page 151</a> and <a href="#">“ATM2 IQ VC Tunnel CoS Components Overview” on page 134</a>.</p>
OAM F4 cell flows: Identify and report virtual path connection (VPC) defects and failures.	Not supported	Supported	See <a href="#">“Configuring the OAM F4 Cell Flows” on page 99</a> .
OAM F5 loopback cell responses	Supported	Supported	<p>For ATM1 interfaces, when an OAM F5 loopback request is received, the response cell is sent by the PIC. The request and response cells are not counted in the VC, logical interface, or physical interface statistics.</p> <p>For ATM2 IQ interfaces, when an OAM F5 loopback request is received, the response is sent by the Routing Engine. The OAM, VC, logical interface, and physical interface statistics are incremented.</p> <p>See <a href="#">“Defining the ATM OAM F5 Loopback Cell Period” on page 100</a> and <a href="#">“Configuring the ATM OAM F5 Loopback Cell Threshold” on page 98</a>.</p>
Passive monitoring mode	Supported	Supported	See <a href="#">“Enabling Passive Monitoring on ATM Interfaces” on page 180</a> .
PIC type	Supported	Supported	<p>For ATM1 interfaces, you can include the <b>pic-type atm1</b> statement.</p> <p>For ATM2 IQ interfaces, you can include the <b>pic-type atm2</b> statement.</p> <p>See <a href="#">“Configuring the ATM PIC Type” on page 43</a>.</p>

Table 9: ATM1 and ATM2 IQ Supported Features (*continued*)

Item	ATM1	ATM2 IQ	Comments
Ping	Supported	Supported	<p>For ATM1 and ATM2 IQ interfaces, when you issue the ATM <b>ping</b> command, you must include a logical unit number in the interface name, as shown in the following example:</p> <p><b>ping atm interface at-1/0/0.5 vci 0.123 count 3</b></p> <p>The logical unit number is <b>5</b> on physical interface <b>at-1/0/0</b>.</p> <p>See the <a href="#">CLI Explorer</a>.</p>
Queue length: Limits the queue size in packets of a particular VC.	Supported	Not supported	See <a href="#">“Configuring the ATM1 Queue Length” on page 131</a> .
Real-time variable bit rate (VBR): Supports VBR data traffic with average and peak traffic parameters.	Not supported	Supported	<p>Compared to non-real-time VBR, real-time VBR data is serviced at a higher priority. Real-time VBR is suitable for carrying packetized video and audio.</p> <p>See <a href="#">“Configuring ATM CBR” on page 124</a>.</p>

Table 9: ATM1 and ATM2 IQ Supported Features (*continued*)

Item	ATM1	ATM2 IQ	Comments
Shaping rates: Peak and sustained rates of traffic.	Supported	Supported	<p>For ATM1 OC3 interfaces, the rate can be from 33 kilobits per second (Kbps) through 135.6 megabits per second (Mbps); for ATM1 OC12 interfaces, the rate can be from 33 Kbps through 276 Mbps.</p> <p>For ATM2 IQ OC3 interfaces, the rate can be from 33 Kbps through 135,600,000 bits per second (bps). For ATM2 IQ OC12 interfaces, the rate can be from 33 Kbps through 271,273,396 bps (up to 50 percent of the line rate).</p> <p>For ATM2 IQ OC48 interfaces, the rate can be from 33 Kbps through 2,170,107,168 bits per second (bps).</p> <p>For ATM2 IQ DS3 and E3 interfaces, the rate can be from 33 Kbps to the maximum rate. The maximum rate varies depending on the ATM encapsulation and framing you configure:</p> <ul style="list-style-type: none"> <li>• For DS3 interfaces with direct ATM encapsulation, the maximum rate is 40,038,968 bps.</li> <li>• For DS3 interfaces with Physical Layer Convergence Protocol (PLCP) ATM encapsulation, the maximum rate is 36,864,000 bps.</li> <li>• For E3 interfaces with g.751 framing and direct ATM encapsulation, the maximum rate is 30,801,509 bps.</li> <li>• For E3 interfaces with g.751 framing PLCP ATM encapsulation, the maximum rate is 27,648,000 bps.</li> <li>• For E3 interfaces with g.832 framing, the maximum rate is 30,720,000 bps.</li> </ul> <p>See <a href="#">“Defining the ATM Traffic-Shaping Profile Overview” on page 123</a>.</p>

Table 9: ATM1 and ATM2 IQ Supported Features (*continued*)

Item	ATM1	ATM2 IQ	Comments
VC tunnel CoS: Allows VCs to be opened as VC tunnels.	Not supported	Supported	<p>On M Series routers (except the M320 and M120 routers), a VC tunnel can support four CoS queues. On the M320, M120, and T Series routers, a VC tunnel can support eight CoS queues. Within the VC tunnel, the class-based weighted fair queuing algorithm is used to schedule packet transmission from each queue. You can configure the queue admission policies, such as EPD or WRED, to control the queue size during congestion.</p> <p>See <a href="#">“ATM2 IQ VC Tunnel CoS Components Overview” on page 134.</a></p>
VCI management	Supported	Supported	<p>For ATM1 interfaces, you must specify the maximum number of VCIs by including the <b>maximum-vcs</b> statement in the configuration. This restricts VCIs to the range 0 through <i>maximum-vcs</i>. See <a href="#">“Configuring the Maximum Number of ATM1 VCs on a VP” on page 51.</a></p> <p>For ATM2 interfaces, you must not include the <b>maximum-vcs</b> statement in the configuration. All ATM2 IQ interfaces support VCI numbers from 0 through 65,535. The total number of VCIs that you can open on an ATM2 IQ port depends on two factors:</p> <ul style="list-style-type: none"> <li>• Number of tunnels</li> <li>• Sparseness of VCI numbers (the more sparse, the fewer VCIs supported)</li> </ul> <p>For ATM1 and ATM2 IQ interfaces with promiscuous mode, the allowable maximum number of VCIs is 65,535.</p>
VCI statistics	Supported	Supported	<p>For ATM1 interfaces, multipoint VCI statistics are collected from indirect sources.</p> <p>For ATM2 IQ interfaces, multipoint VCI statistics are collected directly from the PIC.</p> <p>For ATM1 and ATM2 IQ interfaces, point-to-point VCI statistics are the same as logical interface statistics.</p>

## ATM OAM F4 and F5 Cells on ACX Series Routers

Circuit Emulation PICs on ACX Series routers provide Asynchronous Transfer Mode (ATM) support for the following Operations, Administration, and Maintenance (OAM) fault management cell types:

- F4 alarm indication signal (AIS) (end-to-end)
- F4 remote defect indication (RDI) (end-to-end)
- F4 loopback (end-to-end)
- F5 loopback
- F5 AIS
- F5 RDI

ATM OAM is supported on ACX1000, ACX2000, and ACX2200 routers, and on Channelized E1/T1 Circuit Emulation MICs on ACX4000 routers.

The following methods of processing OAM cells that traverse through pseudowires with circuit cross-connect (CCC) encapsulation are supported:

- Virtual path (VP) pseudowires (CCC encapsulation)—In the case of ATM VP pseudowires (all virtual circuits in a VP are transported over a single N-to-one mode pseudowire), all F4 and F5 OAM cells are forwarded through the pseudowire.
- Port pseudowires (CCC encapsulation)—Similar to VP pseudowires, with port pseudowires, all F4 and F5 OAM cells are forwarded through the pseudowire.
- Virtual circuit (VC) pseudowires (CCC encapsulation)—In the case of VC pseudowires, F5 OAM cells are forwarded through the pseudowire, while F4 OAM cells are terminated at the Routing Engine.

For ATM pseudowires, the F4 flow cell is used to manage the VP level. On ACX Series routers with ATM pseudowires (CCC encapsulation), you can configure OAM F4 cell flows to identify and report virtual path connection (VPC) defects and failures. Junos OS supports three types of OAM F4 cells in end-to-end F4 flows:

- Virtual path AIS
- Virtual path RDI
- Virtual path loopback

For OAM F4 and F5 cells, IP termination is not supported. Also, Junos OS does not support segment F4 flows, VPC continuity check, or VP performance management functions. The maximum number of ATM VCs that you can configure on ACX Series routers is 1000.

ACX Series routers do not support the transmission and reception of OAM F5 loopback cells. Therefore, for ATM1 and ATM2 IQ interfaces with an ATM encapsulation, you cannot configure the OAM F5 loopback cell period on virtual circuits on ACX Series routers.

For OAM F4 cells, on each VP, you can configure an interval during which to transmit loopback cells by including the **oam-period** statement at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level. To modify OAM liveness values on a VP, include the **oam-liveness** statement at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level.

For interfaces that are configured for ATM cell-relay promiscuous virtual path identifier (VPI) mode, the show interfaces command output does not display the OAM F4 cell statistics. Also, the **Input OAM cell no buffers** field is not displayed to indicate the number of received OAM cells or raw cells dropped because of non-availability of buffers in the output of the **show interfaces** command for ATM interfaces. You cannot configure a fiber channel separately for OAM cells than the one used for other packets.

Layer 2 cell-relay encapsulation supports the concatenation (aggregation) of multiple ATM cells in a single encapsulated packet that is transmitted on a pseudowire. By default, each frame contains one cell. For ATM interfaces with Layer 2 circuit cell-relay transport mode configured, you can configure the time threshold (in microseconds) that the router uses to concatenate ATM cells and transmit the cells in a single frame on the pseudowire. To set the period for which the ATM cells must be collected to be bundled in a single frame being transmitted on the pseudowire, include the **cell-bundle-timeout** statement at the **[edit interfaces *at-fpc/pic/port* atm-options]** or the **[edit interfaces *at-fpc/pic/port* unit logical-unit-number]** hierarchy level.

You can also configure the maximum number of ATM cells per frame on the physical or logical interface. To set the maximum number of cells per frame, include the **cell-bundle-size** statement at the **[edit interfaces *at-fpc/pic/port* atm-options]** and the **[edit interfaces *at-fpc/pic/port* unit logical-unit-number]** hierarchy levels. The cell bundle size can be from 1 through 26.

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[Configuring the ATM OAM F5 Loopback Cell Threshold | 98](#)

[Configuring the Timeout for Bundling of Layer 2 Circuit Cell-Relay Cells | 90](#)

[Configuring the Layer 2 Circuit Cell-Relay Cell Maximum Overview | 85](#)

# Configuring ATM Interfaces

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## Configuring Inverse Multiplexing for ATM (IMA) on ACX Series

Inverse multiplexing for ATM (IMA) is a standardized technology used to transport ATM traffic over a bundle of T1 or E1 interfaces, also known as an IMA Group, allowing for an increase in the bandwidth capacity. When you configure IMA on ACX Series routers, you must configure the following:



- The aggregated device count—The device count is the number of IMA group interfaces created on the CT1 or CE1 interfaces. The logical ATM interface that is part of the IMA group has the following naming format: **at-fpc/pic/port** with the **port** number taken from the last port on the MIC plus 1. For example, on the ACX2000 router with a 16-port built-in T1/E1 TDM MIC, the IMA group interface numbering starts with **at-0/0/16** and increments by 1 to **at-0/0/17**, and so on. On the ACX1000 router with an 8-port built-in T1/E1 TDM MIC, the IMA group interface numbering starts with **at-0/0/8** and increments by 1 to **at-0/0/9**, and so on
- The framing mode—Emulation is a mechanism that duplicates the essential attributes of a service, such as T1 or E1, over a packet-switched network. The built-in channelized T1 and E1 interfaces (CT1 and CE1) on the ACX Series routers can be configured to work in either T1 or E1 mode, and these child T1 and E1 interfaces can be configured to carry ATM services over the packet-switched network.
- One full T1 or E1 interface on the channelized CT1 or CE1 interface—The built-in channelized interface is a non-configurable interface that requires a child T1 or E1 or ATM interface on which you configure the parameters.
- The T1 or E1 interface as a member of the IMA group of the respective IMA link—Each child T1 or E1 interface of a channelized CT1 or CE1 interface is the physical interface over which the ATM signals are carried. This T1 or E1 interface must be specified as a member of an IMA group so that the IMA link will work.
- IMA group interface configuration—Each IMA group interface (**at-fpc/pic/port**) must be configured with all ATM properties for it to work properly: logical link-layer encapsulation type, the circuit cross-connect protocol suite, and the entire ATM device must be dedicated to the ATM cell relay circuit.

The following sections explain how to create an ATM IMA group and to configure it according to your requirements:

The following sections explain how to create an ATM IMA group and to configure it according to your requirements:

## Creating an IMA Group (ATM Interfaces)

To create an IMA group, perform the following steps:

1. In configuration mode, go to the **[edit chassis]** hierarchy level:

```
[edit]
user@host# edit chassis
```

2. Configure the Flexible Port Concentrator (FPC) slot and the Physical Interface Card (PIC) slot as needed.

```
[edit chassis]
user@host# set fpc fpc-slot pic pic-slot
```

3. Configure the device count. The device count can be set starting from 1 through 42 in the aggregated device options for inverse multiplexing for ATM at the **[edit chassis fpc fpc-slot pic pic-slot]** hierarchy level.

```
[edit chassis fpc fpc-slot pic pic-slot]
user@host# set aggregated-devices ima device-count count
```

This results in the creation of interfaces from  $at-x/y/g$  through  $at-x/y/g+count-1$ , where the variable *count* is the number of interfaces and the variable *g* is picked from 16 onwards.

The PIC is automatically rebooted when a configuration that changes the IMA group count is committed.

### Configuring Group ID for an IMA Link on a T1 Interface or an E1 Interface

A group ID is assigned to all links in an IMA group.

To assign a group ID to a T1 or an E1 interface:

1. In configuration mode, go to the **[edit interfaces interface-name]** hierarchy level, where the interface name is **t1-fpc/pic/port:m:n**, **e1-fpc/pic/port:n**, or **t1|e1-fpc/pic/port**.

```
[edit]
user@host# edit interface interface-name
```

2. Configure the encapsulation as **ima**.

```
[edit interface interface-name]
user@host# set encapsulation ima
```

3. Configure the IMA group ID from 16 through 57. Note that this group ID is the same for all T1/E1 interfaces for a particular ATM IMA interface.

```
[edit interface interface-name]
user@host# set ima-link-options group-id number
```

Implement the aforementioned procedure to apply a group ID for all applicable T1 or E1 interfaces.

## Configuring ATM Encapsulation Options

To configure the logical link-layer encapsulation for an ATM interface to support IMA:

1. In configuration mode, go to the **[edit interfaces *interface-name*]** hierarchy level, where the interface name is **at-*fpc/pic/port***.

```
[edit]
user@host# edit interface interface-name
```

2. Configure the logical interface (unit) as 0 and set the encapsulation for this logical interface as either ATM cell relay for CCC or ATM VC for CCC.

```
[edit interface interface-name]
user@host# set unit 0 encapsulation (atm-ccc-cell-relay | atm-ccc-vc-mux)
```

## Configuring IMA Group Options

To configure the various options for an IMA group on an ATM interface:

1. In configuration mode, go to the **[edit interfaces *interface-name* ima-group-options]** hierarchy level, where the interface name is **at-*fpc/pic/port***.

```
[edit]
user@host# edit interface interface-name ima-group-options
```

2. Configure the maximum differential delay between the links in the IMA group. You can configure the maximum differential delay from 1 millisecond through 56 milliseconds. By default, 25 milliseconds is set.

```
[edit interface interface-name ima-atm-options]
user@host# set differential-delay delay
```

3. Configure the frame length of the ICP cell as 32, 64, 128, or 256. By default, 128 is set.

```
[edit interface interface-name ima-atm-options]
user@host# set frame-length length
```

4. Configure the IMA group frame synchronization state parameters alpha, beta, and gamma.

```
[edit interface interface-name ima-atm-options]
user@host# set alpha number beta number gamma number
```

For the default values and parameter range for alpha, beta, and gamma, see [“Understanding ATM IMA Configuration on ACX Series Router” on page 8](#).

5. Configure IMA group minimum active links. You can configure between 1 to 16 links. 1 is set by default.

```
[edit interface interface-name ima-atm-options]
user@host# set minimum-links links
```

6. Configure the symmetry of the IMA group as either *symmetrical configuration and operation* or *symmetrical configuration and asymmetrical operation*.

```
[edit interface interface-name ima-atm-options]
user@host# set symmetry (symmetrical-config-and-operation | symmetrical-config-asymmetrical-operation)
```

For information about symmetry, see [“Understanding ATM IMA Configuration on ACX Series Router” on page 8](#).

7. Configure a test procedure to start and end the test pattern procedure.

```
[edit interface interface-name ima-atm-options]
user@host# set ima-test-start
user@host# ima-test-stop
user@host# interface interface-name
user@host# pattern number
user@host# period number
```

For information about test procedure, see [“Understanding ATM IMA Configuration on ACX Series Router” on page 8](#).

8. Configure a transmit clock to reflect the primary reference source (PRS) of the clock for each link in a group either in common timing mode or independent timing mode. By default, **common** timing mode is selected.

```
[edit interface interface-name ima-atm-options]
user@host# set transmit-clock (common | independent)
```

9. Configure the IMA specification version as either version 1.0 or version 1.1. By default, IMA version 1.1 is selected.

```
[edit interface interface-name ima-atm-options]
user@host# set version (1.0|1.1)
```

## Example: ATM Pseudowire Base Configuration

### IN THIS SECTION

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- [Overview of an ATM Pseudowire With Cell Mode Base Configuration | 34](#)
- [Configuring an ATM Pseudowire | 34](#)

### Requirements

The following is a list of the hardware and software requirements for this configuration.

- One ACX Series router
- Junos OS Release 12.2 or later

### Overview of an ATM Pseudowire With Cell Mode Base Configuration

The configuration shown here is the base configuration of an ATM pseudowire with ATM cell-relay encapsulation on an ACX Series router. This configuration is for one provider edge router. To complete the configuration of an ATM pseudowire, you need to repeat this configuration on an other provider edge router in the MPLS network.

### Configuring an ATM Pseudowire

#### CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level:

```
set interfaces at-0/0/0 atm-options vpi 0
set interfaces at-0/0/0 unit 0 encapsulation atm-ccc-cell-relay
```

```

set interfaces at-0/0/0 unit 0 vci 0.64
set interfaces ct1-0/0/0 no-partition interface-type at
set interfaces ge-0/2/0 unit 0 family inet address 20.1.1.2/24
set interfaces ge-0/2/0 unit 0 family mpls
set interfaces lo0 unit 0 family inet address 70.1.1.1/32
set protocols rsvp interface ge-0/2/0.0
set protocols mpls no-cspf
set protocols mpls label-switched-path PE1-to-PE2 to 40.1.1.1
set protocols mpls interface ge-0/2/0.0
set protocols ospf traffic-engineering
set protocols ospf area 0.0.0.0 interface ge-0/2/0.0
set protocols ospf area 0.0.0.0 interface lo0.0 passive
set protocols ldp interface ge-0/2/0.0
set protocols ldp interface lo0.0
set protocols l2circuit neighbor 40.1.1.1 interface at-0/0/0.0 virtual-circuit-id
1

```

**NOTE:** To configure an ATM pseudowire with ATM virtual circuit (VC) multiplex encapsulation on CCC circuits, include the **atm-ccc-vc-mux** statement at the **[edit interfaces at-0/0/0 unit 0 encapsulation]** hierarchy level instead of the **atm-ccc-cell-relay** statement shown in this example.

### Step-by-Step Procedure

1. Create an ATM interface on a channelized T1 interface (**ct1**) and enable full channelization with the **no-partition** statement. On the ATM interface, set the ATM virtual circuit identifier (VCI), the virtual path identifier (VPI), and set the encapsulation cell mode.

```

[edit]
user@host# edit interfaces
[edit interfaces]
user@host# set ct1-0/0/0 no-partition interface-type at
user@host# set at-0/0/0 unit 0 vci 0.64
user@host# set at-0/0/0 atm-options vpi 0
user@host# set at-0/0/0 unit 0 encapsulation atm-ccc-cell-relay

```

2. Create a Gigabit Ethernet interface and enable MPLS on that interface. Create the loopback (**lo0**) interface:

```

[edit interfaces]

```

```

user@host# set ge-0/2/0 unit 0 family inet address 20.1.1.2/24
user@host# set ge-0/2/0 unit 0 family mpls
user@host# set lo0 unit 0 family inet address 70.1.1.1/32

```

3. Enable the MPLS and RSVP protocols on the MPLS interface—**ge-0/2/0.0**:

```

[edit]
user@host# edit protocols
[edit protocols]
user@host# set rsvp interface ge-0/2/0.0
user@host# set mpls interface ge-0/2/0.0

```

4. Configure LDP. If you configure RSVP for a pseudowire, you must also configure LDP:

```

[edit protocols]
user@host# set protocols ldp interface ge-0/2/0.0
user@host# set protocols ldp interface lo0.0

```

5. Configure a point-to-point label-switched path (LSP) and disable constrained-path LSP computation:

```

[edit protocols]
user@host# set mpls label-switched-path PE1-to-PE2 to 40.1.1.1
user@host# set mpls no-cspf

```

6. Configure OSPF and enable traffic engineering on the MPLS interface—**ge-0/2/0.0**, and on the loopback (**lo0**) interface:

```

[edit protocols]
user@host# set ospf traffic-engineering
user@host# set ospf area 0.0.0.0 interface ge-0/2/0.0
user@host# set ospf area 0.0.0.0 interface lo0.0 passive

```

7. Uniquely identify a Layer 2 circuit for the ATM pseudowire:

```

[edit protocols]
user@host# set l2circuit neighbor 40.1.1.1 interface at-0/0/0.0 virtual-circuit-id 1

```

## Results

```
[edit]
user@host# show
interfaces {
  at-0/0/0 {
    atm-options {
      vpi 0;
    }
    unit 0 {
      encapsulation atm-ccc-cell-relay;
      vci 0.64;
    }
  }
  ct1-0/0/0 {
    no-partition interface-type at;
  }
  ge-0/2/0 {
    unit 0 {
      family inet {
        address 20.1.1.2/24;
      }
      family mpls;
    }
  }
  lo0 {
    unit 0 {
      family inet {
        address 70.1.1.1/32;
      }
    }
  }
}
protocols {
  rsvp {
    interface ge-0/2/0.0;
  }
  mpls {
    no-cspf;
    label-switched-path PE1-to-PE2 {
      to 40.1.1.1;
    }
    interface ge-0/2/0.0;
  }
}
```



```

ospf {
    traffic-engineering;
    area 0.0.0.0 {
        interface ge-0/2/0.0;
        interface lo0.0 {
            passive;
        }
    }
}
ldp {
    interface ge-0/2/0.0;
    interface lo0.0;
}
l2circuit {
    neighbor 40.1.1.1 {
        interface at-0/0/0.0 {
            virtual-circuit-id 1;
        }
    }
}
}

```

## RELATED DOCUMENTATION

*Pseudowire Overview for ACX Series Universal Metro Routers*

[ATM Pseudowire Overview](#) | 4

## Example: Configuring ATM1 Interfaces

The following configuration is sufficient to get an ATM1 OC3 or OC12 interface up and running. By default, ATM interfaces use ATM PVC encapsulation.

```

[edit interfaces]
at-fpc/pic/port {
    atm-options {
        vpi vpi-identifier maximum-vcs maximum-vcs-value;
        unit 0 { # one unit per VC
            vci vpi-identifier.vci-identifier;
        }
    }
}

```

```

    family inet {
        address local-address {
            destination address;
        }
    }
}
unit 1 { # second VC
...
}

```

### Complex Configuration Example

```

[edit interfaces]
at-0/0/0 {
    encapsulation atm-pvc;
    atm-options {
        vpi 0 maximum-vcs 1200;
    }
    unit 2 {
        encapsulation atm-snap;
        inverse-arp;
        vci 0.80;
        family inet {
            mtu 1500;
            address 192.168.0.3/32 {
                destination 192.168.0.1;
            }
        }
    }
    unit 3 {
        encapsulation atm-snap;
        vci 0.32;
        oam-period 60;
        family inet {
            mtu 1500;
            address 192.168.4.3/32 {
                destination 192.168.4.2;
            }
        }
    }
}
at-0/2/0 {

```

```

encapsulation atm-pvc;
atm-options {
    vpi 0 maximum-vcs 1200;
}
unit 2 {
    encapsulation atm-snap;
    inverse-arp;
    vci 0.82;
    family inet {
        mtu 1500;
        address 192.168.5.3/32 {
            destination 192.168.5.2;
        }
    }
}
}
at-0/3/0 {
    encapsulation atm-pvc;
    atm-options {
        vpi 0 maximum-vcs 1200;
    }
    unit 140 {
        encapsulation atm-snap;
        multipoint;
        family inet {
            address 192.168.7.4/24 {
                multipoint-destination 192.168.7.5;
                vci 0.100;
                inverse-arp;
            }
        }
    }
}
at-7/3/0 {
    encapsulation atm-pvc;
    atm-options {
        vpi 0 maximum-vcs 1200;
    }
    unit 0 {
        encapsulation atm-snap;
        vci 0.32;
        family inet {

```

```

        address 192.168.12.3/32 {
            destination 192.168.12.2;
        }
    }
}

```

## RELATED DOCUMENTATION

[ATM Interfaces Overview | 2](#)

[Configuring the Maximum Number of ATM1 VCs on a VP | 51](#)

[Displaying the Status of a Specific ATM1 Interface | 221](#)

[Verifying the Configuration of an ATM1 Interface | 208](#)

[Displaying ATM1 and ATM2 Alarms and Errors | 279](#)

## Example: Configuring ATM2 IQ Interfaces

Configure VP tunnel-shaping and OAM F4 on an ATM2 IQ interface:

```

interfaces {
  at-5/2/0 {
    atm-options {
      vpi 0 {
        shaping {
          vbr peak 10m sustained 6m burst 12;
        }
        oam-period 10;
        oam-liveness {
          up-count 6;
          down-count 5;
        }
      }
    }
    vpi 4 {
      shaping {
        vbr peak 7m sustained 4m burst 24;
      }
    }
  }
}

```

```

    }
    vpi 5 {
        oam-period 10;
        oam-liveness {
            up-count 6;
            down-count 5;
        }
    }
    vpi 6;
}
unit 0 {
    vci 0.128;
    transmit-weight 20;
    family inet {
        address 192.168.9.225/32 {
            destination 192.168.9.224;
        }
    }
}
unit 1 {
    vci 0.129;
    transmit-weight 30;
    family inet {
        address 192.168.9.226/32 {
            destination 192.168.9.227;
        }
    }
}
unit 2 {
    vci 5.123;
    shaping {
        vbr peak 60m sustained 4m burst 24;
    }
    family inet {
        address 192.168.9.227/32 {
            destination 192.168.9.230;
        }
    }
}
}
}

```

[RELATED DOCUMENTATION](#)

Configuring the ATM2 IQ Transmission Weight   154
Displaying the Status of a Specific ATM2 IQ Interface   227
Monitoring ATM2 IQ Interfaces   227
Supported Features on ATM1 and ATM2 IQ Interfaces   18
Verifying the Configuration of an ATM2 IQ Interface   209

## Configuring the ATM PIC Type

For ATM1 and ATM2 IQ interfaces, the Junos OS does not determine from the interface name **at-fpc/pic/port** whether your router has an ATM1 or ATM2 IQ PIC installed. You can configure the PIC type as ATM1 or ATM2 IQ by including the **pic-type** statement at the **[edit interfaces interface-name atm-options]** hierarchy level:

```
[edit interfaces interface-name atm-options]
pic-type (atm1 | atm2);
```

On MX Series routers with ATM MICs with SFP, you do not have to configure the PIC type because Junos OS automatically configures the PIC type as ATM MIC.

**NOTE:** This topic uses the term PIC for ATM MICs where the reference is to a CLI or Junos OS entity.

The following guidelines apply to configuring the ATM PIC type:

- If you include the **pic-type** statement in the configuration, and you include other statements at the **[edit interfaces interface-name atm-options]** hierarchy level that do not match the configured PIC type, the configuration does not commit. For example, you cannot commit a configuration that includes the **pic-type atm2** statement and the **maximum-vcs** statement.
- If you do not include the **pic-type** statement and you do include the **maximum-vcs** statement in the configuration, Junos OS assumes you are configuring an ATM1 interface, and sets the PIC type option accordingly. If you do not include the **maximum-vcs** statement in the configuration, Junos OS assumes you are configuring an ATM2 IQ interface, and sets the PIC type option accordingly.
- On MX Series routers with ATM MICs with SFP, Junos OS automatically sets the PIC type to ATM MIC.
- If you include the **promiscuous-mode** statement in the configuration of an ATM2 interface, you must also include the **pic-type atm2** statement.

Configure the PIC type on an ATM1 and an ATM2 interface.

**NOTE:** On MX Series routers with ATM MICs with SFP, Junos OS automatically sets the PIC type to ATM MIC.

To configuring the ATM PIC Type:

- **On an ATM1 Interface**

```
[edit interfaces]
at-1/0/0 {
  atm-options {
    pic-type atm1;
    vpi 0 maximum-vcs 256;
    vpi 1 maximum-vcs 512;
  }
  ...
}
```

- **On an ATM2 IQ Interface**

```
[edit interfaces]
at-1/1/0 {
  atm-options {
    pic-type atm2;
    vpi 0;
    vpi 2 {
      oam-period 6;
    }
  }
  ...
}
```

- **On an ATM MIC Interface**

```
[edit interfaces]
at-1/1/0 {
  atm-options {
    vpi 7;
  }
  ...
}
```

## RELATED DOCUMENTATION

| [ATM Interfaces Overview](#) | 2



## Configuring ATM Cell-Relay Promiscuous Mode

For ATM1 and ATM2 IQ with **atm-ccc-cell-relay** encapsulation, you can map all incoming cells from either an interface port or a virtual path (VP) to a single LSP without restricting the VCI number. Promiscuous mode allows you to map traffic from all 65,535 VCIs to a single LSP, or from all 256 VPIs to a single LSP.

To map incoming traffic from a port or VC to an LSP, include the **promiscuous-mode** statement at the **[edit interfaces *interface-name* atm-options]** hierarchy level:

```
[edit interfaces interface-name]
atm-options {
  promiscuous-mode {
    vpi vpi-identifier;
  }
}
```

You can include multiple **vpi** statements in the configuration.

To enable all VCIs in a VPI to open in ATM CCC cell-relay mode, you must also map the logical interface to a VPI by including the **vpi** statement in the logical interface configuration:

```
vpi vpi-identifier;
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number*]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]**

Also, note the following:

- For promiscuous mode, you must configure the port with **atm-ccc-cell-relay** encapsulation.
- For ATM1 PICs and ATM2 IQ PICs, changing modes between promiscuous and nonpromiscuous causes all physical interfaces to be deleted and re-added.
- For ATM1 PICs, and ATM2 IQ PICs, when you configure promiscuous mode, you cannot configure VCIs.
- For ATM1 PICs, if you configure one port in port mode, all ports on the PIC operate in port mode. Likewise if you configure one logical interface in VPI mode, all logical interfaces on the PIC must operate in VPI mode.
- For ATM2 IQ PICs, you can configure one or more logical interfaces in VPI promiscuous mode, and the other logical interfaces with any ATM encapsulation.
- For ATM2 IQ PICs, when you configure promiscuous mode, you must also include the **pic-type atm2** statement. For more information, see [“Configuring the ATM PIC Type” on page 43](#).
- For ATM2 IQ multiport PICs, you can configure one or more ports in port promiscuous mode, and the other ports with any ATM encapsulation.

- For interfaces that are configured for cell-relay promiscuous virtual path identifier (VPI) mode, the **show interfaces** command output does not show OAM F4 cell statistics.

To configure ATM Cell-Relay Promiscuous Mode:

1. Use the following statements to configure the port-promiscuous mode:

#### Configuring Port-Promiscuous Mode

```
[edit interfaces]
at-0/2/1 {
  encapsulation atm-ccc-cell-relay; # at the physical interface level only
  atm-options {
    pic-type atm2;
    promiscuous-mode;
  }
  unit 0 {
    allow-any-vci;
  }
}
```

2. Use the following statements to configure the VP-Promiscuous mode:

#### Configuring VP-Promiscuous Mode

```
[edit interfaces]
at-0/2/0 {
  atm-options {
    pic-type atm2;
    promiscuous-mode {
      vpi 0;
      vpi 1;
    }
    vpi 2;
    vpi 3;
  }
  unit 0 {
    encapsulation atm-ccc-cell-relay; # at the logical interface level only
    vpi 0;
  }
  unit 1 {
    encapsulation atm-ccc-cell-relay;
    vpi 1;
  }
}
```

```

unit 2 {
    encapsulation atm-snap;
    vci 2.100;
}
unit 3 {
    encapsulation atm-vc-mux;
    vci 3.100;
}
}

```

3. To map incoming traffic from a port to an LSP, include the **allow-any-vci** statement at the **[edit interfaces interface-name unit 0]** hierarchy level. When you include the **allow-any-vci** statement, you cannot configure other logical interfaces in the same physical interface. Next, you must map **unit 0** to an LSP using the CCC connection.

#### Mapping Incoming Traffic from a Port to an LSP

```

[edit interfaces at-1/2/0]
encapsulation atm-ccc-cell-relay;
atm-options {
    promiscuous-mode;
}
unit 0 {
    allow-any-vci;
}

```

4. To map unit 0 to an LSP:

#### Mapping Unit 0 to an LSP

```

protocols {
    connections {
        remote-interface-switch router-a-router-c {
            interface at-1/2/0.0;
        }
        lsp-switch router-a-router-c {
            transmit-lsp lsp1
            receive-lsp lsp2;
        }
    }
}

```

5. To map a VPI to an LSP, you must define the allowed VPIs. You can configure one or more logical interfaces, each mapped to a different VPI. You can then route traffic from each of these interfaces to different LSPs.

### Mapping a VPI to an LSP

```
[edit interfaces at-1/1/0]
encapsulation atm-ccc-cell-relay;
atm-options {
  pic-type atm1;
  promiscuous-mode {
    vpi 10;
    vpi 20;
  }
}
unit 0 {
  encapsulation atm-ccc-cell-relay;
  vpi 10;
}
unit 1 {
  encapsulation atm-ccc-cell-relay;
  vpi 20;
}
[edit interfaces at-3/1/0]
encapsulation atm-ccc-cell-relay;
atm-options {
  pic-type atm2;
  promiscuous-mode {
    vpi 10;
    vpi 20;
  }
}
unit 0 {
  encapsulation atm-ccc-cell-relay;
  vpi 10;
}
unit 1 {
  encapsulation atm-ccc-cell-relay;
  vpi 20;
}
[edit protocols]
mpls {
  connections {
    interface-switch router-a-router-c {
      interface at-1/1/0.0;
```

```

        interface at-3/1/0.0;
    }
    interface-switch router-a-router-d {
        interface at-1/1/0.1;
        interface at-3/1/0.1;
    }
}

```

## RELATED DOCUMENTATION

| [ATM Interfaces Overview](#) | 2

## Configuring the Maximum Number of ATM1 VCs on a VP

For ATM1 interfaces, you must configure the maximum number of virtual circuits (VCs) allowed on a virtual path (VP) so that sufficient memory on the ATM1 PIC can be allocated for each VC.

To configure the highest-numbered VCs on a VP, include the **maximum-vcs** and **vpi** statements at the **[edit interfaces *interface-name* atm-options]** hierarchy level:

```

[edit interfaces interface-name atm-options]
vpi vpi-identifier {
    maximum-vcs maximum-vcs;
}

```

The VP identifier can be a value from 0 through 255. For most interfaces, you can define a maximum of 4090 VCs per interface, and some interfaces have higher limits. Promiscuous mode removes these limits. For more information, see [“Configuring ATM Cell-Relay Promiscuous Mode” on page 46](#).

All VPIs that you configure in the **atm-options** statement are stored in a single table. If you modify the VPIs—for example, by editing them in configuration mode or by issuing a **load override** command—all VCs on the interface are closed and then reopened, resulting in a temporary loss of connectivity for all the VCs on the interface.

You can also include some of the statements in the **sonet-options** statement to set SONET/SDH parameters on ATM interfaces, as described in [“Configuring SONET/SDH Parameters on ATM Interfaces” on page 55](#).

## Configuring Communication with Directly Attached ATM Switches and Routers

For ATM1 and ATM2 IQ interfaces, you can configure communication with directly attached ATM switches and routers to enable querying of the IP addresses and switch port numbers. You query the switch or router by entering the following **show** command:

```
user@host> show ilmi interface interface-name
```

The router uses VC 0.16 to communicate with the ATM switch or router.

To configure communication between the router and its directly attached ATM switches and routers, include the **ilmi** statement at the **[edit interfaces *interface-name* atm-options]** hierarchy level:

```
[edit interfaces interface-name atm-options]  
ilmi;
```

For example, to configure Communication with Directly Attached ATM Switches and Routers:

1. Enable an interface to communicate directly with an ATM switch or router:

```
[edit interfaces]  
at-0/1/0 {  
  atm-options {  
    vpi 0;  
    ilmi;  
  }  
  unit 0 {  
    vci 0.120;  
    family inet {  
      address 10.33.33.1/30;  
    }  
  }  
}
```

### RELATED DOCUMENTATION

| [ilmi](#) | 349

## Enabling ILMI for Cell Relay

The Junos OS supports standard AAL5 and three Layer 2 circuit transport modes: Layer 2 circuit AAL5, Layer 2 circuit cell-relay, and Layer 2 circuit trunk transport mode.

Integrated local management interface (ILMI) is supported on standard AAL5 interfaces, regardless of encapsulation. To enable ILMI on interfaces with cell-relay encapsulation, you must configure an ATM2 IQ PIC to use Layer 2 circuit trunk transport mode. ILMI is not supported with cell-relay encapsulation when the ATM2 IQ PIC is configured with Layer 2 AAL5 or Layer 2 circuit cell-relay transport mode, as shown in as shown in [Table 10 on page 53](#).

Layer 2 circuit cell-relay trunk mode is not supported on ATM OC48 PICs.

**Table 10: ILMI Support by Encapsulation Type**

Encapsulation Type	ILMI Support
Standard AAL5, with any encapsulation type	Yes
Layer 2 circuit AAL5 mode	No
Layer 2 circuit cell-relay mode	No
Layer 2 circuit trunk mode	Yes

For more information about Layer 2 circuit transport modes, see [“Configuring Layer 2 Circuit Transport Mode” on page 60](#).

1. To configure ILMI on an interface with cell-relay encapsulation, include the following statements:

```
[edit chassis fpc slot-number pic pic-number]
atm-l2circuit-mode trunk trunk;
[edit interfaces at-fpc/pic/port]
encapsulation atm-ccc-cell-relay;
atm-options {
  ilmi;
  pic-type atm2;
}
unit logical-unit-number {
  trunk-id number;
}
```

For more information about ILMI, see [“Configuring Communication with Directly Attached ATM Switches and Routers” on page 52](#).



2. On an ATM2 IQ PIC with Layer 2 circuit trunk transport mode, enable ILMI on an interface with cell-relay encapsulation:

```
[edit chassis]
fpc 0 {
  pic 1 {
    atm-l2circuit-mode trunk uni;
  }
}
[edit interfaces]
at-0/0/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    ilmi;
  }
}
```

## RELATED DOCUMENTATION

| [ATM Interfaces Overview](#) | 2

## Configuring E3 and T3 Parameters on ATM Interfaces

For ATM1 and ATM2 IQ interfaces, you can configure ATM E3 and T3 interfaces by including the following statements at the **[edit interfaces at-*fpc/pic/port* ]** hierarchy level:

```
[edit interfaces at-fpc/pic/port]
e3-options {
  atm-encapsulation (direct | plcp);
  buildout feet;
  framing (g.751 | g.832);
  loopback (local | remote);
  (payload-scrambler | no-payload-scrambler);
}
t3-options {
  atm-encapsulation (direct | plcp);
  buildout feet;
  (cbit-parity | no-cbit-parity);
```

```

loopback (local | payload | remote);
(payload-scrambler | no-payload-scrambler);
}

```

The following options and default values differ from those described in *E3 Interfaces Overview* and *T3 Interfaces Overview*:

- **atm-encapsulation**—PLCP is the default value. The E3 **line-format** option **g.832** supports the **direct** ATM-encapsulation option only.
- **buildout**—The default value is 10 feet. The number of feet can be any integer value. The range is from 0 through 450 feet (about 137 meters).
- **cbit-parity**—The default option is to enable cbit parity.
- **framing**—There is no default option for E3 interfaces; T3 interfaces use the **cbit-parity** statement in place of the **framing** statement.
- **loopback**—By default, loopback is disabled.
- **payload-scrambler**—The default option is to enable payload scrambling.

In addition, the ATM E3 and T3 PICs support the **clocking** statement at the interface level, as do the SONET/SDH PICs. For more information about E3- and T3-specific parameters, see *E3 Interfaces Overview* and *T3 Interfaces Overview*.

**NOTE:** You must configure all the ports on an ATM E3 or T3 PIC with the same framing and encapsulation. Otherwise, the system will set all the ports on the PIC to the slowest framing and encapsulating configuration. For ATM T3, this is PLCP. For ATM E3, this is G.751 PLCP.

## Configuring SONET/SDH Parameters on ATM Interfaces

When configuring ATM1 and ATM2 IQ SONET/SDH interfaces, you can also include the following statements in the **sonet-options** statement to set SONET/SDH parameters on ATM interfaces:

```

[edit interfaces at-fpc/pic/port]
sonet-options {
  aps {
    advertise-interval milliseconds;
    authentication-key key;
    force;
  }
}

```

```

    hold-time milliseconds;
    lockout;
    neighbor address;
    paired-group group-name;
    protect-circuit group-name;
    request;
    revert-time seconds;
    working-circuit group-name;
}
bytes {
    e1-quiet value;
    f1 value;
    f2 value;
    s1 value;
    z3 value;
    z4 value;
}
loopback (local | remote);
(payload-scrambler | no-payload-scrambler);
rfc-2615;
trigger {
    defect ignore {
        hold-time up milliseconds down milliseconds;
    }
}
(z0-increment | no-z0-increment);
}

```

For information about configuring specific SONET/SDH statements, see *SONET/SDH Interfaces Overview*.

## Configuring ATM Interface Encapsulation

To configure ATM encapsulation on a physical interface, include the **encapsulation** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```

[edit interfaces interface-name]
encapsulation (atm-ccc-cell-relay | atm-pvc | ethernet-over-atm);

```

For ATM interfaces, the physical interface encapsulation can be one of the following:

- ATM cell-relay—This encapsulation connects two remote virtual circuits or ATM physical interfaces with an LSP. Traffic on the circuit is ATM cells.

- ATM PVC—ATM PVC encapsulation is defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*.
- Ethernet over ATM—As defined in RFC 1483 (the previous version of RFC 2684), this encapsulation type allows ATM interfaces to connect to devices that support only bridged-mode protocol data units (BPDUs). The Junos OS does not completely support bridging, but accepts BPDU packets as a default gateway. If you use the router as an edge device, then the router acts as a default gateway. It accepts Ethernet LLC/SNAP frames with IP or ARP in the payload, and drops the rest. For packets destined to the Ethernet LAN, a route lookup is done using the destination IP address. If the route lookup yields a full address match, the packet is encapsulated with an LLC/SNAP and media access control (MAC) header, and the packet is forwarded to the ATM interface.

Generally, you configure an interface's encapsulation at the **[edit interfaces *interface-name*]** hierarchy level. However, for ATM encapsulations, you can also configure the encapsulation type that is used inside the ATM cell itself. To do this, include the **encapsulation** statement:

```
encapsulation (atm-ccc-cell-relay | atm-ccc-vc-mux | atm-cisco-nlpid | atm-mlppp-llc | atm-nlpid | atm-ppp-llc |
atm-ppp-vc-mux | atm-snap | atm-tcc-snap | atm-vc-mux | atm-tcc-vc-mux | ether-over-atm-llc |
ether-vpls-over-atm-llc);
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number*]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]**

[Table 11 on page 57](#) shows the logical interface encapsulation types for ATM interfaces.

**Table 11: ATM Logical Interface Encapsulation Types**

Encapsulation Types	Comments
ATM CCC cell relay	<p>This encapsulation type connects two remote virtual circuits or ATM physical interfaces with an LSP.</p> <p>This encapsulation type carries traffic in ATM cells.</p> <p>When you use this encapsulation type, you can configure the <b>ccc</b> family only.</p>
ATM CCC VC multiplex	<p>This encapsulation type is for CCC circuits.</p> <p>When you use this encapsulation type, you can configure the <b>ccc</b> family only.</p>
ATM network layer protocol identifier (NLPID)	<p>When you use this encapsulation type, you can configure the <b>inet</b> family only.</p>
ATM SNAP	

Table 11: ATM Logical Interface Encapsulation Types (*continued*)

Encapsulation Types	Comments
ATM SNAP encapsulation on translational cross-connect (TCC) circuits	When you use this encapsulation type, you can configure the <b>tcc</b> family only.
ATM VC multiplex	When you use this encapsulation type, you can configure the <b>inet</b> family only.
ATM VC multiplex on TCC circuits	When you use this encapsulation type, you can configure the <b>tcc</b> family only.
Cell-relay accumulation mode (CAM)	<p>In this mode, the incoming 1 to 8 cells are packaged into a single packet and forwarded to the LSP. To configure CAM, include the <b>atm-cell-relay-accumulation</b> statement at the <b>[edit chassis fpc slot-number pic pic-number]</b> hierarchy level.</p> <p>This encapsulation type is for ATM1 interfaces only.</p> <p>For more information about CAM, see the <i>Junos OS Administration Library</i>.</p>
Cisco ATM NLPID	When you use this encapsulation type, you can configure the <b>inet</b> family only.
Ethernet over ATM	<p>This encapsulation type is for interfaces that carry IPv4 traffic.</p> <p>When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.</p>
Ethernet VPLS over ATM	<p>This encapsulation type enables a VPLS instance to support bridging between Ethernet interfaces and ATM interfaces, as described in RFC 2684.</p> <p>Use this encapsulation type to support IEEE 802.1p classification binding on ATM VCs.</p> <p>This encapsulation type is for ATM2 IQ interfaces only.</p> <p>When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.</p>
Multilink PPP over AAL5 LLC	<p>This encapsulation type is for ATM2 IQ interfaces only.</p> <p>When you use this encapsulation type, your router must be equipped with a Link Services or Voice Services PIC.</p>
PPP over AAL5 LLC	<p>This encapsulation type is for ATM2 IQ interfaces only.</p> <p>When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.</p>

Table 11: ATM Logical Interface Encapsulation Types (*continued*)

Encapsulation Types	Comments
PPP over AAL5 multiplex	<p>This encapsulation type is for ATM2 IQ interfaces only.</p> <p>When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.</p>

## Configuring Layer 2 Circuit Transport Mode

On ATM2 IQ interfaces only, you can configure Layer 2 circuit cell-relay, Layer 2 circuit AAL5, or Layer 2 circuit trunk transport mode.

Layer 2 circuit cell-relay and Layer 2 circuit AAL5 are defined in Internet draft draft-martini-l2circuit-encap-mpls-07.txt, *Encapsulation Methods for Transport of Layer 2 Frames Over IP and MPLS Networks* (expires December 2004).

Layer 2 circuit cell-relay and Layer 2 circuit AAL5 transport modes allow you to send ATM cells between ATM2 IQ interfaces across a Layer 2 circuit-enabled network. Layer 2 circuits are designed to transport Layer 2 frames between PE routers across an LDP-signaled MPLS backbone. You use Layer 2 circuit AAL5 transport mode to send AAL5 segmentation and reassembly protocol data units (SAR-PDUs) over the Layer 2 circuit.

A trunk is a collection of ATM VPs. Layer 2 circuit trunk transport mode allows you to send ATM cells over MPLS trunking.

By default, ATM2 IQ PICs are in standard AAL5 transport mode. Standard AAL5 allows multiple applications to tunnel the protocol data units of their Layer 2 protocols over an ATM virtual circuit. Encapsulation of these Layer 2 protocol data units allows a number of these emulated virtual circuits to be carried in a single tunnel. Protocol data units are segmented at one end of the tunnel and reassembled at the other end. The ingress router reassembles the protocol data units received from the incoming VC and transports each PDU as a single packet.

In contrast, Layer 2 circuit cell-relay and Layer 2 circuit AAL5 transport modes accept a stream of ATM cells, convert these to an encapsulated Layer 2 format, then tunnel them over an MPLS or IP backbone, where a similarly configured router segments these packets back into a stream of ATM cells, to be forwarded to the virtual circuit configured for the far-end router.

In Layer 2 circuit cell-relay transport mode, ATM cells are bundled together and transported in packet form to the far-end router, where they are segmented back into individual ATM cells and forwarded to the ATM virtual circuit configured for the far-end router.

**NOTE:** When you configure the **cell-bundle-size** statement at the **[edit interfaces at -fpc/pic/port atm-options]** hierarchy level is 1 and the **atm-ccc-cell-relay** trunk statement is included at the **[edit interfaces interface-name encapsulation]** hierarchy level, ATM cells are not bundled. Each ATM cell is forwarded as a single MPLS packet.

The uses for the four transport modes are defined as follows:

- To tunnel IP packets over an ATM backbone, use the default standard AAL5 transport mode.
- To tunnel a stream of AAL5-encoded ATM SAR-PDUs over an MPLS or IP backbone, use Layer 2 circuit AAL5 transport mode.



- To tunnel a stream of ATM cells over an MPLS or IP backbone, use Layer 2 circuit cell-relay transport mode.
- To transport ATM cells over an MPLS core network that is implemented between other vendors' switches or routers, use Layer 2 circuit trunk transport mode.

**NOTE:** You can transport AAL5-encoded traffic with Layer 2 circuit cell-relay transport mode, because Layer 2 circuit cell-relay transport mode ignores the encoding of the cell data presented to the ingress interface.

When you configure AAL5 mode Layer 2 circuits, the control word carries cell loss priority (CLP) information by default.

The Layer 2 circuit trunk transport mode is not supported on the ATM2 IQ OC48c/STM16 PIC.

To configure Layer 2 circuit AAL5, Layer 2 circuit cell-relay, or Layer 2 circuit trunk mode, you must perform the following tasks:

1. Identify the interface as an ATM2 IQ interface by including the **pic-type atm2** statement at the **[edit interfaces at-fpc/pic/port atm-options]** hierarchy level:

```
[edit interfaces at-fpc/pic/port atm-options]
pic-type atm2;
```

2. Include the **atm-l2circuit-mode** statement at the **[edit chassis fpc slot-number pic pic-number]** hierarchy level, specifying **aal5**, **cell**, or **trunk**:

```
[edit chassis fpc slot-number pic pic-number]
atm-l2circuit-mode (aal5 | cell | trunk trunk );
[edit chassis]
```

By default, the trunk mode uses user-to-network interface (UNI) mode. The trunk option can be UNI or network-to-network interface (NNI). For more information about UNI and NNI, see the *Junos OS VPNs Library for Routing Devices*.

Transport mode is per PIC, not per port. If you do not include the **atm-l2circuit-mode** statement in the configuration, the ATM2 IQ PIC uses standard AAL5 transport mode. If you configure Layer 2 circuit cell-relay, Layer 2 circuit AAL5 transport mode, or Layer 2 circuit trunk mode, the entire ATM2 PIC uses the configured transport mode.

3. For Layer 2 circuit trunk mode only, you must also configure a trunk identification number by including the **trunk-id** statement:

```
trunk-id number;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The trunk identification number can be from 0 through 31; each trunk on an interface must have a unique trunk ID. When you associate a trunk ID number with a logical interface, you are in effect specifying the interfaces that are allowed to send ATM traffic over an LSP. For UNI mode, the trunk ID range is from 0 through 7. For NNI mode, the trunk ID range is from 0 through 31. Trunk IDs on connecting trunks do not need to be the same.

For information about proportional bandwidth sharing in trunk mode, see [“Configuring Layer 2 Circuit Trunk Mode Scheduling Overview” on page 86](#).

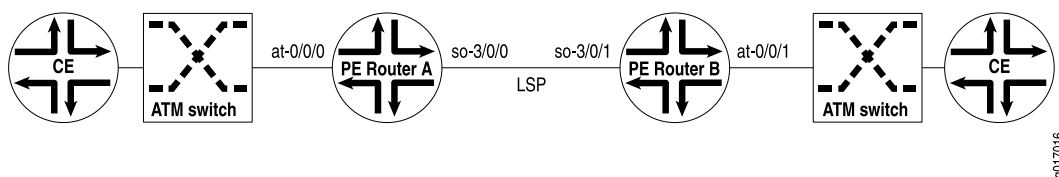
For example:

### Configuring Layer 2 Circuit Trunk Transport Mode

In [Figure 3 on page 63](#), Router A is a local PE router. Router B is a remote PE router. Both Juniper Networks routers have Layer 2 circuit cell-relay capability. You configure an ATM physical interface on Router A in Layer 2 circuit trunk mode and specify trunks that are allowed to send traffic over the LSP. As a cell is received on this interface, it is classified using the CoS bits in the cell header, and encapsulated as a labeled packet. It is then queued on one of the outgoing queues according to its classification and sent over the LSP to Router B. At Router B, the packet label is removed and the raw cell is put on one of the queues of the ATM interface and forwarded to the second ATM switch. To carry the CoS information and CLP of the cell over the network, the CoS and CLP bits are copied into the EXP bits of the MPLS label. This CoS information is used to select the output queues. Using EPD profiles, the CLP is used to determine whether the cell should be dropped.

For more information about ATM CoS capability, see [“ATM2 IQ VC Tunnel CoS Components Overview” on page 134](#).

Figure 3: Layer 2 Circuit Trunk Topology



## On Router A

```
[edit chassis]
fpc 0 {
  pic 1 {
    atm-l2circuit-mode trunk uni;
  }
}
[edit interfaces]
at-0/0/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    ilmi;
  }
  unit 0 {
    trunk-id 0;
    epd-threshold 10240;
  }
  unit 1 {
    trunk-id 1;
    epd-threshold 10240;
  }
  unit 2 {
    trunk-id 2;
    epd-threshold 10240;
  }
  unit 3 {
    trunk-id 3;
    epd-threshold 10240;
  }
  unit 4 {
    trunk-id 4;
    epd-threshold 10240;
  }
  unit 5 {
    trunk-id 5;
    epd-threshold 10240;
  }
  unit 6 {
    trunk-id 6;
    epd-threshold 10240;
  }
}
```

```

    unit 7 {
        trunk-id 7;
        epd-threshold 10240;
    }
}
so-3/0/0 {
    mtu 9192;
    unit 0 {
        family inet {
            address 10.0.1.1/24;
        }
        family mpls;
    }
}
lo0 {
    unit 0 {
        family inet {
            address 172.16.0.1/32;
            address 10.255.245.1/32;
        }
    }
}
[edit protocols]
rsvp {
    interface all;
}
mpls {
    interface all;
}
ldp {
    interface all;
}
ospf {
    traffic-engineering;
    reference-bandwidth 4g;
    area 0.0.0.0 {
        interface all;
        interface fxp0.0 {
            disable;
        }
    }
}
l2circuit {
    neighbor 10.255.245.2 {

```

```

interface at-0/1/0.0 {
    virtual-circuit-id 100;
}
interface at-0/1/0.1 {
    virtual-circuit-id 101;
}
interface at-0/1/0.2 {
    virtual-circuit-id 102;
}
interface at-0/1/0.3 {
    virtual-circuit-id 103;
}
interface at-0/1/0.4 {
    virtual-circuit-id 104;
}
interface at-0/1/0.5 {
    virtual-circuit-id 105;
}
interface at-0/1/0.6 {
    virtual-circuit-id 106;
}
interface at-0/1/0.7 {
    virtual-circuit-id 107;
}
}
}

```

### On Router B

```

[edit chassis]
fpc 0 {
    pic 1 {
        atm-l2circuit-mode trunk uni;
    }
}
[edit interfaces]
at-0/0/1 {
    encapsulation atm-ccc-cell-relay;
    atm-options {
        pic-type atm2;
    }
    unit 0 {
        trunk-id 0;
        epd-threshold 10240;
    }
}

```

```

}
unit 1 {
    trunk-id 1;
    epd-threshold 10240;
}
unit 2 {
    trunk-id 2;
    epd-threshold 10240;
}
unit 3 {
    trunk-id 3;
    epd-threshold 10240;
}
unit 4 {
    trunk-id 4;
    epd-threshold 10240;
}
unit 5 {
    trunk-id 5;
    epd-threshold 10240;
}
unit 6 {
    trunk-id 6;
    epd-threshold 10240;
}
unit 7 {
    trunk-id 7;
    epd-threshold 10240;
}
}
so-3/0/1 {
    mtu 9192;
    unit 0 {
        family inet {
            address 10.0.1.2/24;
        }
        family mpls;
    }
}
lo0 {
    unit 0 {
        family inet {
            address 172.16.0.1/32;
            address 10.255.245.2/32;

```

```

    }
  }
}
[edit protocols]
  rsvp {
    interface all;
  }
  mpls {
    interface all;
  }
  ldp {
    interface all;
  }
  ospf {
    traffic-engineering;
    reference-bandwidth 4g;
    area 0.0.0.0 {
      interface all;
      interface fxp0.0 {
        disable;
      }
    }
  }
}
l2circuit {
  neighbor 10.255.245.1 {
    interface at-0/1/0.0 {
      virtual-circuit-id 100;
    }
    interface at-0/1/0.1 {
      virtual-circuit-id 101;
    }
    interface at-0/1/0.2 {
      virtual-circuit-id 102;
    }
    interface at-0/1/0.3 {
      virtual-circuit-id 103;
    }
    interface at-0/1/0.4 {
      virtual-circuit-id 104;
    }
    interface at-0/1/0.5 {
      virtual-circuit-id 105;
    }
    interface at-0/1/0.6 {

```

```

        virtual-circuit-id 106;
    }
    interface at-0/1/0.7 {
        virtual-circuit-id 107;
    }
}

```

4. For Layer 2 circuit AAL5 mode, configure logical interface encapsulation by including the **encapsulation** statement, specifying the **atm-ccc-vc-mux** encapsulation type:

```
encapsulation atm-ccc-vc-mux;
```

```

unit 0 {
    encapsulation atm-ccc-vc-mux;
    point-to-point;
    vci 0.32;
}

```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For example:

### Configuring Layer 2 Circuit AAL5 Transport Mode

```

[edit chassis]
fpc 0 {
    pic 1 {
        atm-l2circuit-mode aal5;
    }
}
[edit interfaces]
at-0/1/0 {
    atm-options {
        pic-type atm2;
        vpi 0;
    }
    unit 0 {

```



```

    encapsulation atm-ccc-vc-mux;
    point-to-point;
    vci 0.32;
  }
}

```

5. For Layer 2 circuit cell-relay and Layer 2 circuit trunk modes, configure physical interface encapsulation by including the **encapsulation** statement at the **[edit interfaces *interface-name*]** hierarchy level, specifying the **atm-ccc-cell-relay** encapsulation type:

```

[edit interfaces interface-name]
  encapsulation atm-ccc-cell-relay;

```

You can also include the **encapsulation atm-ccc-cell-relay** statement at the **[edit interface *interface-name* unit *logical-unit-number*]** hierarchy level. When you use the configuration given in the preceding steps,, keep the following points in mind:

- This configuration interoperates between Juniper routers running Junos OS Release 8.2 or earlier.
- This configuration does not interoperate with other network equipment, including a Juniper router running Junos OS Release 8.3 or later.
- For a Juniper router running Junos OS Release 8.3 or later to interoperate with another Juniper router running Junos OS Release 8.2 or earlier, include the **use-null-cw** statement at the **[edit interfaces *interface-name* atm-options]** hierarchy level on the router running Junos OS Release 8.3 or later.
- The **use-null-cw** statement inserts (for sending traffic) or strips (for receiving traffic) an extra null control word in the MPLS packet.
- The **use-null-cw** statement is not supported on a router running Junos OS Release 8.2 or earlier.

For more information about Layer 2 circuits, see the *Junos OS VPNs Library for Routing Devices* and the *Junos OS Routing Protocols Library*.

For example:

### Configuring Layer 2 Circuit Cell-Relay Transport Mode

```

[edit chassis]
  fpc 0 {
    pic 1 {
      atm-l2circuit-mode cell;
    }
  }
[edit interfaces]
  at-0/1/0 {

```

```

encapsulation atm-ccc-cell-relay;
atm-options {
    pic-type atm2;
    vpi 0;
}
unit 0 {
    encapsulation atm-ccc-cell-relay;
    point-to-point;
    vci 0.32;
}
}

```

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview | 134](#)

*Junos OS VPNs Library for Routing Devices*

*Junos OS Routing Protocols Library*

## Layer 2 Circuit Transport Mode on ATM MICs Overview

On MX Series routers with ATM MICs, you can configure Layer 2 circuit cell relay or Layer 2 circuit ATM Adaptation Layer 5 (AAL5). Layer 2 circuit cell relay and Layer 2 circuit AAL5 are defined in *Encapsulation Methods for Transport of Asynchronous Transfer Mode (ATM) Over MPLS Networks* (RFC 4717). Layer 2 circuit cell-relay and Layer 2 circuit AAL5 transport modes allow you to send ATM cells between ATM interfaces across a Layer 2 circuit-enabled network. Layer 2 circuits are designed to transport Layer 2 frames between provider edge (PE) routers across an MPLS backbone.

Layer 2 circuit cell-relay and Layer 2 circuit AAL5 transport modes accept a stream of ATM cells, convert these to an encapsulated Layer 2 format, and then tunnel them over an MPLS or IP backbone, where a similarly configured router segments these packets back into a stream of ATM cells, to be forwarded to the virtual circuit configured for the far-end router. In Layer 2 circuit cell-relay transport mode, ATM cells are bundled together and transported in packet form to the far-end router, where they are segmented back into individual ATM cells and forwarded to the ATM virtual circuit configured for the far-end router. You use Layer 2 circuit AAL5 transport mode to send AAL5 segmentation and reassembly protocol data units (SAR-PDUs) over the Layer 2 circuit.

## RELATED DOCUMENTATION

## Configuring Layer 2 Circuit Transport Mode on ATM MICs

To configure Layer 2 circuit AAL5 or Layer 2 circuit cell relay, perform the following tasks:

- For Layer 2 circuit AAL5 mode, configure logical interface encapsulation by including the **encapsulation** statement, specifying the **atm-ccc-vc-mux** encapsulation type:

```
encapsulation atm-ccc-vc-mux;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]
- For Layer 2 circuit cell-relay mode, configure physical interface encapsulation by including the **encapsulation** statement at the [edit interfaces *interface-name*] hierarchy level, specifying the **atm-ccc-cell-relay** encapsulation type:

```
[edit interfaces interface-name]  
encapsulation atm-ccc-cell-relay;
```

You can also include the **encapsulation atm-ccc-cell-relay** statement at the [edit interface *interface-name* unit *logical-unit-number*] hierarchy level.

When you use the configuration given in the preceding steps, keep the following points in mind:

- The chassis-level configuration for **atm-l2-circuit-mode** is not available for ATM MICs.
- The absence of the chassis-level configuration for **atm-l2-circuit-mode** does not indicate null control word.

For more information about Layer 2 circuits, see the *Junos OS VPNs Library for Routing Devices* and the *Junos OS Routing Protocols Library*.

### RELATED DOCUMENTATION

## Example: Configuring Layer 2 Circuit Transport Mode on ATM MICs

### IN THIS SECTION

- [Requirements | 73](#)
- [Overview | 73](#)
- [Configuration | 73](#)

This example shows how to configure Layer 2 circuit transport mode on ATM MICs.

### Requirements

This example uses the following hardware and software components:

- Junos OS Release 12.1 or later for MX Series routers
- A single MX Series router with an ATM MIC with SFP

### Overview

This example provides information about configuring the Layer 2 circuit transport mode on MX Series routers with ATM MICs with SFP. You can configure the Layer 2 circuit cell-relay or Layer 2 circuit AAL5 transport mode. Layer 2 circuit cell-relay and Layer 2 circuit AAL5 transport modes allow you to send ATM cells between ATM interfaces across a Layer 2 circuit-enabled network. Layer 2 circuits are designed to transport Layer 2 frames between provider edge (PE) routers across an MPLS backbone. In Layer 2 circuit cell-relay transport mode, ATM cells are bundled together and transported in packet form to the far-end router, where they are segmented back into individual ATM cells and forwarded to the ATM virtual circuit configured for the far-end router. You use Layer 2 circuit AAL5 transport mode to send AAL5 segmentation and reassembly protocol data units (SAR-PDUs) over the Layer 2 circuit.

### Configuration

#### IN THIS SECTION

- [Configuring Layer 2 Circuit AAL5 Transport Mode | 74](#)
- [Configuring Layer 2 Circuit Cell-Relay Transport Mode | 75](#)

To configure Layer 2 circuit transport mode, perform these tasks:

### **Configuring Layer 2 Circuit AAL5 Transport Mode**

#### **CLI Quick Configuration**

To quickly configure interface-level Layer 2 circuit AAL5 transport mode, copy and paste the following commands into the CLI:

```
[edit]
set interface at-0/2/2 atm-options vpi 9
set interface at-0/2/2 unit 0 encaps atm-ccc-vc-mux
set interface at-0/2/2 unit 0 vci 9.9
```

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

#### **Step-by-Step Procedure**

To configure Layer 2 circuit AAL5 transport mode on the ATM MIC with SFP, perform the following tasks:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level and set the interface as **at-0/2/2**.

```
[edit]
user@host# edit interfaces at-0/2/2
```

2. Set the ATM virtual path identifier (VPI) to 9, by including the **vpi 9** statement.

```
[edit interfaces at-0/2/2]
user@host# set vpi 9
```

3. Configure unit 0 and the physical interface encapsulation.

```
[edit interfaces at-0/2/2]
user@host# edit unit 0
[edit interfaces at-0/2/2 unit 0]
user@host# set encapsulation atm-ccc-vc-mux
```

4. Specify the ATM virtual circuit identifier (VCI) as 9.9.

```
[edit interfaces at-0/2/2 unit 0]
user@host# set vci 9.9
```

## Results

To view the configuration of AAL5 transport mode:

```
[edit]
user@host# show
[edit interfaces]
  at-0/1/0 {
    atm-options {
      vpi 9;
    }
    unit 0 {
      encapsulation atm-ccc-vc-mux;
      vci 9.9;
    }
  }
}
```

## Configuring Layer 2 Circuit Cell-Relay Transport Mode

### CLI Quick Configuration

To quickly configure interface-level Layer 2 circuit cell-relay transport mode, copy and paste the following commands into the CLI:

```
[edit]
set interface at-0/2/2 atm-options vpi 10
set interface at-0/2/2 unit 0 encaps atm-ccc-cell-relay
set interface at-0/2/2 unit 0 vci 10.100
```

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

### Step-by-Step Procedure

To configure Layer 2 circuit cell-relay transport mode on the ATM MIC with SFP, perform the following tasks:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level and set the interface as **at-0/2/2**.

```
[edit]
user@host# edit interfaces at-0/2/2
```

2. Set the ATM virtual path identifier (VPI) to 10, by including the **vpi 10** statement.

```
[edit interfaces at-0/2/2]
```

```
user@host# set vpi 10
```

3. Configure unit 0 and the physical interface encapsulation.

```
[edit interfaces at-0/2/2]
user@host# edit unit 0
[edit interfaces at-0/2/2]
user@host# set encapsulation atm-ccc-cell-relay
```

4. Specify the ATM virtual circuit identifier (VCI) as 10.100.

```
[edit interfaces at-0/2/2 unit 0]
user@host# set vci 10.100
```

## Results

To view the configuration of cell-relay transport mode:

```
[edit]
user@host# show
[edit interfaces]
  at-0/1/0 {
    atm-options {
      vpi 10;
    }
    unit 0 {
      encapsulation atm-ccc-cell-relay;
      vci 10.100;
    }
  }
```

## RELATED DOCUMENTATION

| [Configuring Layer 2 Circuit Transport Mode on ATM MICs](#) | 72

## Configuring a Point-to-Multipoint Connection on ATM MICs

Starting in Junos OS Release 18.2R1, MX Series routers containing an ATM MIC (model number: MIC-3D-8OC3-2OC12-ATM) with SFP can communicate with multiple devices through ATM links. With this multipoint support, an ATM MIC can communicate with multiple Layer 3 peers in the ATM network through an ATM switch that is connected to multiple devices or ports, using different virtual circuit identifier (VCI). These devices can be accessed through multipoint port of ATM MIC.

**NOTE:** **epd-threshold** and **shaping** options are not supported on **multipoint-destination** configuration statement for ATM MICs.

To enable the multipoint support on an ATM MIC, configure:

- The **multipoint** option at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy to enable communication with multiple Layer 3 peers on an ATM interface.
- The **multipoint-destination** option with its corresponding **vci** at the **[edit interfaces *interface-name* unit *logical-unit-number* family *family address address*]** hierarchy to enable multipoint support on ATM interface.

The **inverse-arp** option (an optional configuration) to enable inverse ARP for **multipoint-destination** at the **[edit interfaces *at-fpc/pic/port* unit *logical-unit-number* family *family address address* *multipoint-destination address*]** hierarchy. Only responding to inverse ARP request is supported. Generation of Inverse ARP is not supported.

**NOTE:**

- Multipoint-destination address must be configured under **[edit interfaces *interface-name* unit *logical-unit-number* family *family address address*]** hierarchy. The ***multipoint-destination address*** is the IP Address of the device that need to be accessed. It is also mandatory to mention VCI for a particular device for multipoint destination support. While, **inverse-arp** is optional configuration which is required to enable inverse ARP.
- It is mandatory to configure multipoint destination address along with the VCI and VPI for a point-to-multipoint interface.

To configure the multipoint support on ATM MIC, perform the following tasks:

1. In configuration mode, to enable multipoint support navigate to the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

[edit ]



```
user@host# edit interfaces interface-name unit logical-unit-number
```

For example:

```
[edit ]
user@host# edit interfaces at-1/0/0 unit 0
```

2. By default, all interfaces are assumed to be point-to-point connections. To configure an interface to be a multipoint connection, include the multipoint statement at the **[edit interfaces interface-name unit logical-unit-number]** hierarchy level.

```
[edit interfaces interface-name unit logical-unit-number]
user@host# set multipoint
```

For example:

```
[edit interfaces at-1/0/0 unit 0]
user@host# set multipoint
```

3. After enabling multipoint, set the source address. To configure the source address, navigate to the **[edit interfaces interface-name unit logical-unit-number family family]** hierarchy level.

```
[edit interfaces interface-name unit logical-unit-number]
user@host# edit family family address address
```

For example:

```
[edit interfaces at-1/0/0 unit 0]
user@host# edit family inet address 7.0.0.2/24
```

4. Configure the **multipoint-destination address** along with the virtual circuit identifier (VCI) and virtual path identifier (VPI).

**NOTE:** It is mandatory to configure multipoint destination address along with the VCI and VPI for a point-to-multipoint interface.

```
[edit interfaces interface-name unit logical-unit-number family family address address ]
```

```
user@host# set multipoint-destination address vci vpi-identifier.vci-identifier
```

For example:

```
[edit interfaces at-1/0/0 unit 0 family inet address 7.0.0.2/24 ]
user@host# set multipoint-destination 7.0.0.3 vci 100.100
```

##### 5. (Optional) Configure inverse ARP.

```
[edit interfaces interface-name unit logical-unit-number family family address address multipoint-destination
address]
user@host# set inverse-arp
```

For example:

```
[edit interfaces at-1/0/0 unit 0 family inet address 7.0.0.2/24 multipoint-destination 7.0.0.3]
user@host# set inverse-arp
```

##### 6. Execute the **show interfaces** command to verify whether the interface shows the configured multipoint parameters correctly.

```
user@host# show interfaces
interfaces {
  at-1/0/0 {
    atm-options {
      vpi 100;
    }
    unit 0 {
      encapsulation atm-snap;
      multipoint;
      family inet {
        address 7.0.0.2/24 {
          multipoint-destination 7.0.0.3 {
            vci 100.100;
            inverse-arp;
          }
        }
      }
    }
  }
}
```

- Execute **show interface at-1/0/0** command to verify that point-to-multipoint is shown under the IFL flag field.

```

user@host# show interface at-1/0/0
Logical interface at-1/0/0.0 (Index 362) (SNMP ifIndex 911)
  Flags: Up Point-To-Multipoint << No-Multicast SNMP-Traps 0x4000 Encapsulation:
  ATM-SNAP
    Input packets : 3
    Output packets: 3
    Protocol inet, MTU: 9176
    Max nh cache: 0, New hold nh limit: 0, Curr nh cnt: 0, Curr new hold cnt: 0,
  NH drop cnt: 0
    Flags: Sendbcst-pkt-to-re
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 7.0.2/24, Local: 7.0.0.2, Broadcast: 7.0.0.255
  VCI 100.120
    Flags: Active, Inverse-ARP
    Multipoint destination: 7.0.0.5 <<<
    Total down time: 0 sec, Last down: Never
    ARP statistics
      Received: 0, Sent: 0, Denied: 0, Operation not supported: 0,
      Bad packet length: 0, Bad protocol: 0, Bad protocol length: 0,

```

### Release History Table

Release	Description
<a href="#">18.2R1</a>	Starting in Junos OS Release 18.2R1, MX Series routers containing an ATM MIC (model number: MIC-3D-8OC3-2OC12-ATM) with SFP can communicate with multiple devices through ATM links.

### RELATED DOCUMENTATION

*multipoint*

[family](#) | [332](#)

[multipoint-destination](#) | [362](#)

[inverse-arp](#) | [350](#)

## Configuring ATM Cell-Relay Pseudowire

### IN THIS SECTION

- [Configuring ATM Cell-Relay Pseudowire in Port-Promiscuous Mode | 81](#)
- [Configuring ATM Cell-Relay Pseudowire in VP-Promiscuous Mode | 82](#)
- [Configuring ATM Cell-Relay Pseudowire in VCC Mode | 83](#)

In ATM cell-relay mode, one or more ATM cells are bundled together to form a packet that is sent across the packet-switched network (PSN) using MPLS. In this mode, each ATM cell and its header are transported over the MPLS cloud. The ATM header consisting of the VPI and VCI values is transported across the MPLS cloud or the backhaul network.

By default, all incoming cells are mapped from a single virtual circuit to an ATM pseudowire. For ATM logical interfaces configured with **atm-ccc-cell-relay** encapsulation, you can configure ATM cell-relay pseudowire in VP-promiscuous mode, port-promiscuous mode, and VCC mode.

Promiscuous mode allows you to map all incoming cells from either an interface port or a virtual path (VP) to a single LSP without restricting the VCI number. You can map traffic from all 65,535 VCIs to a single LSP, or from all 256 VPIs to a single LSP. For promiscuous-mode configuration guidelines, see [“Configuring ATM Cell-Relay Promiscuous Mode” on page 46](#).

This topic includes the following tasks:

### Configuring ATM Cell-Relay Pseudowire in Port-Promiscuous Mode

To configure ATM cell-relay pseudowire in port-promiscuous mode:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level and set the interface as at-0/2/2.

```
[edit]
user@host#edit interfaces at-0/2/2
```

2. To map incoming traffic, include the **promiscuous mode** statement at the **[edit interfaces interface-name atm-options]** hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set atm-options promiscuous-mode
```

3. To configure ATM encapsulation on unit 0, include the **encapsulation** statement at the **[edit interfaces *interface-name*]** hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set unit 0 encapsulation atm-ccc-cell-relay
```

4. Include the **allow-any-vci** statement at the **[edit interfaces *interface-name*]** hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set unit 0 allow-any-vci
```

5. To verify the configuration, you can issue the following operational mode command in configuration mode:

```
[edit]
user@host#show at-0/2/2
```

```
atm-options{
  promiscuous-mode;
}
unit 0{
  encapsulation atm-ccc-cell-relay;
  allow-any-vci;
}
```

## Configuring ATM Cell-Relay Pseudowire in VP-Promiscuous Mode

To configure ATM cell-relay pseudowire in VP-promiscuous mode:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level and set the interface as at-0/2/2.

```
[edit]
user@host#edit interfaces at-0/2/2
```

2. To map incoming traffic to a single LSP and to specify the VPI value as 8, include the **promiscuous mode** statement and **vpi *vpi-identifier*** statement at the **[edit interfaces *interface-name* atm-options]** hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set atm-options promiscuous-mode vpi 8
```

3. To configure ATM encapsulation on unit 0, include the **encapsulation** statement at the **[edit interfaces interface-name]** hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set unit 0 encapsulation atm-ccc-cell-relay
```

4. To specify 8 as the VPI value on unit 0, include the **vpi vpi-identifier** statement at the **[edit interfaces interface-name]** hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set unit 0 vpi 8
```

5. To verify the configuration, you can issue the following operational mode command in configuration mode:

```
[edit]
user@host#show at-0/2/2
```

```
atm-options{
  vpi 8;
  promiscuous-mode;
}
unit 0{
  encapsulation atm-ccc-cell-relay;
  vpi 8;
}
```

## Configuring ATM Cell-Relay Pseudowire in VCC Mode

To configure ATM cell-relay pseudowire in VCC mode:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level and set the interface as at-0/2/2.

```
[edit]
user@host#edit interfaces at-0/2/2
```

2. To map incoming traffic to a single LSP and to specify the VPI value as 9, include the **promiscuous mode** statement and **vpi vpi-identifier** statement at the [edit interfaces *interface-name* atm-options] hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set atm-options promiscuous-mode vpi 9
```

3. To configure ATM encapsulation on unit 0, include the **encapsulation** statement at the [edit interfaces *interface-name*] hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set unit 0 encapsulation atm-ccc-cell-relay
```

4. To specify the VCI value as 9.99 on unit 0, include the **vci vci-identifier** statement at the [edit interfaces *interface-name*] hierarchy level.

```
[edit interfaces at-0/2/2]
user@host#set unit 0 vci 9.99
```

5. To verify the configuration, you can issue the following operational mode command in configuration mode:

```
[edit]
user@host#show at-0/2/2
```

```
atm-options{
  vpi 9;
  promiscuous-mode;
}
unit 0{
  encapsulation atm-ccc-cell-relay;
  vci 9.99;
}
```

## RELATED DOCUMENTATION

ATM Cell Relay Pseudowire VPI/VCI Swapping Overview

Configuring ATM Cell-Relay Pseudowire VPI/VCI Swapping

[allow-any-vci](#) | [294](#)

[no-vpivci-swapping](#)

[psn-vci](#) (ATM CCC Cell-Relay Promiscuous Mode VPI/VCI Swapping)

[psn-vpi](#) (ATM CCC Cell-Relay Promiscuous Mode VPI/VCI Swapping)

[vci](#) | [414](#)

[vpi](#) | [418](#)

## Configuring the Layer 2 Circuit Cell-Relay Cell Maximum Overview

By default, each frame contains one cell. For ATM interfaces with Layer 2 circuit cell-relay transport mode configured, you can configure the maximum number of ATM cells per frame on the physical or logical interface. To set the maximum number of cells per frame, include the **cell-bundle-size** statement:

```
cell-bundle-size cells;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* atm-options]
- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The cell bundle size can be from 1 through 176.

After 125 microseconds, cell bundling times out. This means that after 125 microseconds if the frame does not contain the configured value, the frame is transmitted anyway.

If you include the **cell-bundle-size** statement at the [edit interfaces *interface-name* atm-options] hierarchy level, then the configured value becomes the default for all the logical interface units configured for that physical interface. If you include the **cell-bundle-size** statement for a logical interface, the logical interface configuration overrides the value configured at the physical interface level.

The transmit rates you configure on the routers at each end of the connection must be the same value.



## Class-Based Cell Bundling

For Layer 2 circuit trunk mode only, cell bundling is enhanced by a set of CoS and traffic shaping rules, as follows:

- CBR and real-time variable bit rate (RTVBR) cells are not bundled. They are always sent as single-cell packets.
- Cells with the same CLP bits are bundled together. This means all the cells in a bundle contain the same CLP value.
- Cells with the same CoS bits are bundled together. This means all the cells in a bundle belong to the same class of service.
- As alluded to in the previous rules, several triggers cause early packet transmission, meaning that the packet is transmitted before the number of cells received is equal to the value configured with the **cell-bundle-size** statement. These triggers are as follows:
  - The next cell is of type CBR or RTVBR.
  - The next cell has a different CLP bit.
  - The next cell has different CoS bits.
  - The 125-microsecond timer expires.

CoS-based cell bundling optimizes the release of a bundle by sending out the cell that triggers early packet transmission as a single-cell packet. This means that when a cell triggers early packet transmission, that cell is not bundled. Consequently, certain input data patterns might cause primarily single-cell packets to be transmitted. For example, say the output interface receives a steady pattern of two cells from a non-RTVBR queue, followed by two cells from a UBR queue. In this case, all transmitted packets contain a single cell because the first cell triggers a transition and is transmitted by itself. The second cell is also transmitted by itself because the third cell triggers another transition, and so on. This effect might not be dramatic with a mix of traffic; it is most evident with steady traffic patterns, as generated by ATM test equipment programmed to emit regular sequences of CoS queue transitions.

## Configuring Layer 2 Circuit Trunk Mode Scheduling Overview

For ATM2 IQ interfaces configured to use Layer 2 circuit trunk mode, you can share a scheduler among 32 trunks on an ATM port. A weighted round robin scheduling algorithm ensures each trunk receives a proportional share of the bandwidth when all trunks are active, and redistributes bandwidth that would have otherwise been reserved by an inactive trunk, thus minimizing the latency on each trunk. For general information about Layer 2 circuit trunk mode, see [“Configuring Layer 2 Circuit Transport Mode” on page 60](#).

For general information about ATM CoS scheduling, see [“ATM2 IQ VC Tunnel CoS Components Overview” on page 134](#).

Each trunk is associated with a trunk bandwidth. The trunk bandwidth is the maximum bandwidth used each time a trunk is serviced. We recommend configuring trunk bandwidths so that the ratio between the minimum and maximum bandwidths does not exceed 1:500.

To minimize latency, the Junos OS does not shape the trunks. As cells are received, they are immediately transmitted.

To configure trunk bandwidth, include the **trunk-bandwidth** statement:

```
trunk-bandwidth rate;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The trunk bandwidth can be from 1,000,000 through 542,526,792 bps. You can specify the rate in bits per second or cells per second (cps). You can specify a bits-per-second value either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000). You can specify a cells-per-second value by entering a decimal number followed by the abbreviation **c**; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps.

The Junos OS rounds off the configured value. Therefore, we recommend that you configure a minimum trunk bandwidth of **1m**. From **1m**, configure values in increments of **500k**.

## RELATED DOCUMENTATION

[Configuring Layer 2 Circuit Transport Mode | 60](#)

[ATM2 IQ VC Tunnel CoS Components Overview | 134](#)

## Configuring CoS Queues in Layer 2 Circuit Trunk Mode

On ATM2 IQ interfaces, you can configure ATM CoS scheduling for AAL5 mode and Layer 2 circuit trunk mode. For general information about ATM CoS, see [“ATM2 IQ VC Tunnel CoS Components Overview” on page 134](#).

When you configure CoS scheduling in Layer 2 circuit trunk mode, the trunk is defined on the logical interface, and four CoS queues are opened in the trunk. For each CoS queue, you specify a priority and a

transmit weight. CoS queues are serviced using a weighted round robin (WRR) algorithm. One queue is serviced with strictly high priority and the remaining queues are serviced with the WRR.

For Layer 2 circuit trunk mode, only strict mode is supported. Alternate mode is not supported.

To configure CoS queues in Layer 2 circuit trunk mode, perform the following tasks:

1. Include the **encapsulation atm-ccc-cell-relay** statement at the **[edit interfaces at-*fpc/pic/port*]** hierarchy level:

```
[edit interfaces at-fpc/pic/port]  
encapsulation (atm-ccc-cell-relay | ether-vpls-over-atm-llc);
```

2. Include the **scheduler-maps** statement at the **[edit interfaces at-*fpc/pic/port* atm-options]** hierarchy level:

```
[edit interfaces at-fpc/pic/port atm-options]  
scheduler-maps map-name {  
  forwarding-class (class-name | assured-forwarding | best-effort | expedited-forwarding | network-control);  
  vc-cos-mode strict;  
}
```

3. Include the **atm-scheduler-map**, **trunk-bandwidth**, and **trunk-id** statements at the **[edit interfaces at-*fpc/pic/port* unit logical-unit-number]** hierarchy level:

```
[edit interfaces at-fpc/pic/port unit logical-unit-number]  
atm-scheduler-map (map-name | default);  
trunk-bandwidth rate;  
trunk-id number;
```

For information about ATM scheduler maps, see [“Configuring an ATM Scheduler Map” on page 137](#).

For information about trunk identification numbers, see [“Configuring Layer 2 Circuit Transport Mode” on page 60](#). For information about trunk bandwidths, see [“Configuring Layer 2 Circuit Trunk Mode Scheduling Overview” on page 86](#).

Strict mode CoS queue priority works as follows:

- Scheduling—One queue has strictly high priority and is always serviced before the remaining queues are serviced by a weighted round robin. This means the packets in a **high** priority queue are sent first until the queue is empty. Then **low** priority queues send packets until their weight quota becomes zero or negative.
- Latency—Each trunk is associated with a trunk bandwidth. The trunk bandwidth is the maximum bandwidth used each time a trunk is serviced. In the scheduling process, each trunk is serviced in a

WRR. The maximum latency for any trunk to begin transmitting is equal to the sum of the weights of all previously queued trunks. Trunks without data do not affect output scheduling. As long as all the trunks have data, the exact weight proportions are maintained. If a trunk runs out of data during its turn, it is no longer included in the WRR. When the trunk gets more data, the trunk is placed at the end of the queue. For more information, see [“Configuring Layer 2 Circuit Trunk Mode Scheduling Overview” on page 86](#).

Within a single trunk, the maximum latency of a **high** priority queue is the time it takes to transmit one ATM cell. The latency of a **low** priority queue is the sum of **high** priority queue burst time and the transmission time of the remaining **low** priority queues' weight.

- Bandwidth distribution—Trunks are serviced in a WRR based on the trunk bandwidth.

Within a single trunk, the **high** priority queue consumes the bandwidth first regardless of its weight. The remaining bandwidth is distributed to the **low** priority queues in proportion to their weights.

Consider the following example:

- You configure a trunk with weights of 10 percent, 20 percent, 30 percent, and 40 percent for queues 0, 1, 2, and 3, respectively.
- You configure queue 0 to be a high priority queue.
- Queue 0 does not have cells to transmit.

In this scenario, queues 1, 2 and 3 receive 2/9, 3/9, and 4/9 of the bandwidth, respectively.

**NOTE:** Constant bit rate (CBR) traffic always enters the strictly **high** priority queue.

For more information about strict and alternate modes, see [“ATM2 IQ VC Tunnel CoS Components Overview” on page 134](#).

For general information about Layer 2 circuit trunk mode, see [“Configuring Layer 2 Circuit Transport Mode” on page 60](#).

For interfaces configured in trunk mode, you can also configure dual EPD thresholds depending on packet loss priorities (PLPs). For more information, see [“Configuring Two EPD Thresholds per Queue” on page 153](#).

## RELATED DOCUMENTATION

[Configuring Layer 2 Circuit Transport Mode | 60](#)

[Configuring an ATM Scheduler Map | 137](#)

[Configuring Layer 2 Circuit Trunk Mode Scheduling Overview | 86](#)

## Configuring the Timeout for Bundling of Layer 2 Circuit Cell-Relay Cells

Layer 2 cell-relay encapsulation supports the concatenation (aggregation) of multiple ATM cells in a single encapsulated packet that is transmitted on a pseudowire. By default, each packet contains one cell. For ATM interfaces with Layer 2 circuit cell-relay transport mode configured, you can configure the time threshold (in microseconds) that the router uses to concatenate ATM cells and transmit the cells in a single frame on the pseudowire. To set the period for which the ATM cells must be collected to be bundled in a single frame being transmitted on the pseudowire, include the **cell-bundle-timeout** statement at the [edit interfaces *interface-name* atm-options] or the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level.

Based on this configuration, the router attempts to collect and concatenate ATM cells in a single ATM cell relay-encapsulated packet and transmit the packet on a pseudowire connection. When the router detects that the allotted time interval has expired, the router forwards the packet even if it contains fewer than the specified maximum number of aggregated cells per packet. The cell concatenation or bundling functionality is controlled by the timeout value and the maximum number of cells to be concatenated.

To configure the period for which the ATM cells are aggregated and bundled before they are transmitted in a single frame on a pseudowire connection:

- Specify the number of microseconds for which the ATM cells must be bundled before the timer expires and the cells are transmitted in a single frame.

```
[edit interfaces interface-name atm-options]  
user@host# set cell-bundle-timeout microseconds
```

When the router detects that the allotted time interval has expired, the router forwards the MPLS packet even if it contains fewer than the specified maximum number of aggregated cells per packet.

### RELATED DOCUMENTATION

[Configuring the Layer 2 Circuit Cell-Relay Cell Maximum Overview | 85](#)

[cell-bundle-timeout | 312](#)

## Configuring an ATM1 Cell-Relay Circuit Overview

### IN THIS SECTION

- [Example: Configuring an ATM1 Cell-Relay Circuit | 91](#)

For ATM1 interfaces, you can create an ATM cell-relay circuit by configuring an entire ATM physical device or an individual VC. When you configure an entire device, only cell-relay encapsulation is allowed on the logical interfaces; for ATM1 PICs, you use the **atm-options** statement to control the number and location of VCs. The configuration of allowed VCs on both ingress and egress ATM interfaces should be the same. For most interfaces, you can define a maximum of 4090 VCs per interface. The highest-numbered VC value you can configure is 4089. Promiscuous mode removes these limits. For more information, see [“Configuring ATM Cell-Relay Promiscuous Mode” on page 46](#).

For ATM1 interfaces, if you are dedicating the entire device to a cell-relay circuit, include the **allow-any-vci** statement in the configuration of **unit 0**:

```
allow-any-vci;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit 0]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit 0]

Once you include this statement, you cannot configure other logical interfaces in the same physical interface.

**NOTE:** When you use ATM CCC cell-relay encapsulation, you must configure the logical encapsulation as **atm-ccc-cell-relay**. You cannot mix different logical encapsulation types on an interface that you have configured with ATM CCC cell-relay physical encapsulation.

### Example: Configuring an ATM1 Cell-Relay Circuit

To configure an ATM1 cell-relay circuit:

```
[edit interfaces at-1/2/0]  
encapsulation atm-ccc-cell-relay;
```

```

atm-options {
    pic-type atm1;
    vpi 0 maximum-vcs 256;
}
unit 0 {
    point-to-point;
    encapsulation atm-ccc-cell-relay;
    allow-any-vci;
}

```

### ***Configuring an Individual VC on a Logical Interface***

To configure an individual VC on a logical interface:

```

[edit interfaces at-1/1/0]
encapsulation atm-ccc-cell-relay;
atm-options {
    pic-type atm1;
    vpi 0 maximum-vcs 256;
}
unit 120 {
    encapsulation atm-ccc-cell-relay;
    vci 0.120;
}

```

### ***Configuring Non-promiscuous port mode***

To configure non-promiscuous port mode:

```

[edit interfaces at-0/0/1]
encapsulation atm-ccc-cell-relay;
atm-options {
    pic-type atm1;
    vpi 0 {
        maximum-vcs 100;
    }
    vpi 1 {
        maximum-vcs 300;
    }
    vpi 4 {
        maximum-vcs 200;
    }
}
unit 0 {
    encapsulation atm-ccc-cell-relay;
}

```

```

    allow-any-vci;
}

```

### **Configuring Nonpromiscuous VPI Mode**

To configure non-promiscuous VPI mode:

```

[edit interfaces at-0/0/1]
encapsulation atm-ccc-cell-relay;
atm-options {
    pic-type atm1;
    vpi 0 {
        maximum-vcs 100;
    }
}
unit 0 {
    encapsulation atm-ccc-cell-relay;
    vpi 0;
}

```

### **Configuring Nonpromiscuous VCI Mode**

To configure non-promiscuous VCI mode:

```

[edit interfaces at-0/0/1]
encapsulation atm-ccc-cell-relay;
atm-options {
    pic-type atm1;
    vpi 0 {
        maximum-vcs 100;
    }
}
unit 0 {
    encapsulation atm-ccc-cell-relay;
    vci 0.50
}

```

## RELATED DOCUMENTATION

---

[allow-any-vci](#) | 294

---

[atm-options](#) | 301

---

[atm-encapsulation](#) | 298

---



[encapsulation \(Logical Interface\) | 317](#)

[encapsulation | 322](#)

[unit | 398](#)

## Configuring PPP over ATM2 Encapsulation Overview

For ATM2 IQ interfaces, you can configure PPP over AAL5 encapsulation, as described in RFC 2364, *PPP over AAL5*. PPP over ATM encapsulation associates a PPP link with an ATM AAL5 PVC.

The Junos OS supports three PPP over ATM encapsulation types:

- **atm-ppp-llc**—PPP over AAL5 LLC.
- **atm-ppp-vc-mux**—PPP over ATM AAL5 multiplex.
- **atm-mlppp-llc**—Multilink PPP over ATM AAL5 LLC. For this encapsulation type, your router must be equipped with a Link Services or Voice Services PIC. MLPPP over ATM encapsulation is not supported on ATM2 IQ OC48 interfaces.

To enable PPP over ATM encapsulation, include the **encapsulation** statement, specifying the **atm-mlppp-llc**, **atm-ppp-llc**, or **atm-ppp-vc-mux** encapsulation type:

```
encapsulation (atm-mlppp-llc | atm-ppp-llc | atm-ppp-vc-mux);
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number*]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]**

When you configure PPP over ATM encapsulation, you can enable PPP Challenge Handshake Authentication Protocol (CHAP) and keepalives on the logical interface. For more information about PPP CHAP and keepalives, see *Configuring the PPP Challenge Handshake Authentication Protocol* and *Configuring Keepalives*.

**NOTE:** When you use PPP over ATM encapsulation, we recommend that you not include the **oam-period** statement in the configuration. Instead, we recommend that you enable keepalives to detect connection failures.

### Example: Configuring PPP over ATM2 IQ Encapsulation

To configure three logical interfaces with PPP over ATM encapsulation:

```

[edit interfaces]
at-0/1/0 {
  atm-options {
    pic-type atm2;
    vpi 0;
    vpi 2;
  }
  unit 0 {
    encapsulation atm-ppp-llc;
    ppp-options {
      chap {
        access-profile pe-B-ppp-clients;
        local-name "pe-A-at-0/1/0";
      }
    }
    keepalives interval 5 up-count 6 down-count 4;
    vci 0.120;
    family inet address 192.168.13.13/30;
  }
  unit 1 {
    encapsulation atm-ppp-vc-mux;
    vci 2.120;
    keepalives interval 6 up-count 6 down-count 4;
    family inet address 192.168.14.13/30;
  }
  unit 2 {
    encapsulation atm-ppp-vc-mux;
    ppp-options {
      chap {
        passive;
        access-profile pe-A-ppp-clients;
        local-name "pe-A-at-0/1/0";
      }
    }
    keepalives interval 5 up-count 6 down-count 4;
    vci 2.121;
    family inet address 192.168.15.13/30;
  }
}

```

## Configuring Multilink PPP over ATM2 IQ Encapsulation

To configure multilink PPP over ATM2 IQ encapsulation:

```

[edit interfaces]
at-0/0/0 {
  atm-options {
    pic-type atm2;
    vpi 10;
  }
  unit 0 {
    encapsulation atm-mlppp-llc;
    ppp-options {
      chap {
        access-profile pe-B-ppp-clients;
        local-name " pe-A-at-0/0/0";
      }
    }
    keepalive interval 5 up-count 6 down-count 4;
    vci 10.120;
    family mlppp {
      bundle ls-0/3/0.0;
    }
  }
}
at-0/0/1 {
  atm-options {
    pic-type atm2;
    vpi 11;
  }
  unit 1 {
    encapsulation atm-mlppp-llc;
    ppp-options {
      chap {
        access-profile pe-B-ppp-clients;
        local-name " pe-A-at-0/0/0";
      }
    }
    keepalive interval 5 up-count 6 down-count 4;
    vci 11.120;
    family mlppp {
      bundle ls-0/3/0.0;
    }
  }
}
at-1/2/3 {
  atm-options {
    pic-type atm2;

```

```

        vpi 12;
    }
    unit 2 {
        encapsulation atm-mlppp-llc;
        ppp-options {
            chap {
                access-profile pe-B-ppp-clients;
                local-name " pe-A-at-0/0/0";
            }
        }
        keepalive interval 5 up-count 6 down-count 4;
        vci 12.120;
        family mlppp {
            bundle ls-0/3/0.0;
        }
    }
}
...
ls-0/3/0 {
    encapsulation multilink-ppp;
    interleave-fragments;
    keepalive;
    unit 0 {
        mrru 4500;
        short-sequence;
        fragment-threshold 16320;
        drop-timeout 2000;
        encapsulation multilink-ppp;
        interleave-fragments;
        minimum-links 8;
        family inet {
            address 10.10.0.1/32 {
                destination 10.10.0.2;
            }
        }
        family iso;
        family inet6 {
            address 8090::0:1/128 {
                destination 8090::0:2;
            }
        }
    }
}
...
}

```

## RELATED DOCUMENTATION

[Configuring the PPP Challenge Handshake Authentication Protocol](#)

[Configuring Keepalives](#)

[encapsulation](#) | [317](#)

## Configuring a Multicast-Capable ATM1 or ATM2 IQ Connection

For ATM1 and ATM2 IQ interfaces, you can configure a multicast-capable connection. By default, ATM connections assume unicast traffic. If your ATM switch performs multicast replication, you can configure the connection to support multicast traffic by including the **multicast-vci** statement:

```
multicast-vci vpi-identifier.vci-identifier;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**vci-identifier** and **vpi-identifier** are the VCI and VPI identifiers, which define the ATM VCI over which the switch is expecting to receive multicast packets for replication.

You can configure multicast support only on point-to-multipoint ATM connections.

## Configuring the ATM OAM F5 Loopback Cell Threshold

For ATM1 and ATM2 IQ interfaces with an ATM encapsulation, you can configure the OAM F5 loopback cell threshold on VCs. This is the minimum number of consecutive OAM F5 loopback cells received before a VC is declared up, or the minimum number of consecutive OAM F5 loopback cells lost before a VC is declared down.

By default, when five consecutive OAM F5 loopback cells are received, the VC is considered to be up, and when five consecutive cells are lost, the VC is considered to be down. To modify these values, include the **oam-liveness** statement:

```
oam-liveness {
  up-count cells;
  down-count cells;
}
```

For a list of hierarchy levels at which you can include this statement, see [oam-liveness](#).

The cell count can be a value from 1 through 255.

## Configuring the OAM F4 Cell Flows

For ATM2 IQ interfaces, the F4 flow cell is used for management of the VP level. If your router is equipped with an ATM2 IQ PIC, you can configure OAM F4 cell flows to identify and report VPC defects and failures. The Junos OS supports three types of OAM F4 cells in end-to-end F4 flows:

- Virtual Path Alarm Indication Signal (VP-AIS)
- Virtual Path Remote Defect Indication (VP-RDI)
- Virtual Path Loopback

The Junos OS does not support segment F4 flows, VPC continuity check, or VP performance management functions.

On each VP, you can configure an interval during which to transmit loopback cells by including the **oam-period** statement at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level:

```
[edit interfaces interface-name atm-options vpi vpi-identifier]
oam-period (disable | seconds);
```

When you add a VPI at the **atm-options** hierarchy, an end-to-end F4 VCI is automatically opened to send and receive OAM F4, VP-AIS, and VP-RDI cells. If you enable OAM by including the **oam-period** statement in the configuration, the router sends and receives OAM F4 loopback cells.

If the physical ATM interface is configured with encapsulation type **atm-ccc-cell-relay**, then F4 VCIs are not created, and F4 OAM processing is not performed for the VPIs configured on that interface.

To modify OAM liveness values on a VP, include the **oam-liveness** statement at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level:

```
[edit interfaces interface-name atm-options vpi vpi-identifier]
oam-liveness {
  up-count cells;
  down-count cells;
}
```

**up-count** is the minimum number of consecutive OAM F4 loopback cells received on a VPI before it is declared up.

**down-count** is the minimum number of consecutive OAM F4 loopback cells lost before a VPI is declared down.

When a VP-AIS or VP-RDI cell is received, the VPI is marked down. When a VP-AIS cell is received on a VPI, a VP-RDI is generated and transmitted on the same VPI. When an OAM F4 loopback request cell is received, the router sends a loopback reply cell, even if the **oam-period** statement is not included in the configuration of the VPI.

When a VPI is marked down because the VPI receives VP-AIS, VP-RDI, VC-AIS, or VC-RDI cells, or because the VPI does not receive down-count consecutive OAM F4 loopback replies, all the VCI that belong to the VPI are marked down. When a VPI is marked up, all the VCI that belong to the VPI are marked up. The status of logical interfaces is also changed when the status of the last VCI on that interface is changed.

For a configuration example, see [“Example: Configuring ATM2 IQ Interfaces” on page 41](#).

**NOTE:** For interfaces that are configured for cell-relay promiscuous virtual path identifier (VPI) mode, the **show interfaces** command output does not show (OAM) F4 cell statistics.

## Defining the ATM OAM F5 Loopback Cell Period

For ATM1 and ATM2 IQ interfaces with an ATM encapsulation, you can configure the OAM F5 loopback cell period on virtual circuits. This is the interval at which OAM F5 loopback cells are transmitted.

By default, no OAM F5 loopback cells are sent. To send OAM F5 loopback cells, include the **oam-period** statement:

```
oam-period (disable | seconds);
```

For a list of hierarchy levels at which you can include this statement, see [oam-period](#).

The period can be from 1 through 900 seconds. You can also choose the **disable** option to disable the OAM loopback cell transmit feature.

OAM VC-AIS and VC-RDI defect indication cells are used for identifying and reporting VC defects end-to-end. When a physical link or interface failure occurs, intermediate nodes insert OAM AIS cells into all the downstream VCs affected by the failure. Upon receiving an AIS cell on a VC, the router marks the logical interface down and sends an RDI cell on the same VC to notify the remote end of the error status. When an RDI cell is received on a VC, the router sets the logical interface status to down. When no AIS or RDI cells are received for 3 seconds, the router sets the logical interface status to up. You do not need to configure anything to enable defect indication.

## Configuring Fixed Classification on an ATM IMA Pseudowire

You configure fixed classification on the ATM IMA pseudowire logical interface (unit) by specifying a forwarding class, which is applied to all packets received by the logical interface. To complete this configuration, you can define a forwarding class at the **[edit class-of-service forwarding-classes]** hierarchy level. If you do not define a forwarding class, the default class is used.

The following steps require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

**NOTE:** CoS fixed classification on an ATM IMA pseudowire is not applicable on ACX5048 and ACX5096 routers.

To configure CoS fixed classification on an ATM IMA pseudowire:

1. Define the ATM IMA pseudowire. For information about defining the ATM IMA pseudowire, see [“Configuring Inverse Multiplexing for ATM \(IMA\) on ACX Series” on page 29](#).

2. In configuration mode, go to the **[edit class-of-service]** hierarchy level:

```
[edit]
user@host# edit class-of-service
```

3. Define the forwarding class to apply to the input logical interface, if the default forwarding class is not used:

```
[edit class-of-service]
user@host# set forwarding-classes class class-name queue-num queue-num
```

4. Specify the ATM IMA interface on which to include the forwarding class:

```
[edit class-of-service]
user@host# edit interfaces at-fpc/pic/port
```

5. Configure the logical unit:

```
[edit class-of-service interfaces at-fpc/pic/port]
user@host# edit unit logical-unit-number
```



6. Apply the forwarding class to the logical interface:

```
[edit class-of-service interfaces at-fpc/pic/port unit logical-unit-number]  
user@host# set forwarding-class class-name
```

After you have configured fixed classification, enter the **commit** command in configuration mode.

## RELATED DOCUMENTATION

[Understanding CoS on ATM IMA Pseudowire Interfaces Overview | 16](#)

[Example: Configuring Fixed Classification on an ATM IMA Pseudowire | 102](#)

[Configuring Policing on an ATM IMA Pseudowire | 113](#)

[Configuring Shaping on an ATM IMA Pseudowire | 106](#)

## Example: Configuring Fixed Classification on an ATM IMA Pseudowire

### IN THIS SECTION

- [Requirements | 103](#)
- [Overview | 103](#)
- [Configuration | 103](#)

This example shows the configuration of fixed classification on an ATM IMA pseudowire. Fixed classification is configured on the logical interface (unit) of the ATM IMA pseudowire. The software assigns the fixed classification to packets on the basis of the fixed classification parameters associated with the logical interface on which the ATM cells are received.

**NOTE:** This example is not applicable on ACX5048 and ACX5096 routers.

## Requirements

This example uses the following hardware and software components:

- ACX Series router
- Junos OS Release 12.2 or later
- A previously configured ATM IMA pseudowire. For steps to configure an ATM IMA pseudowire, see [“Configuring Inverse Multiplexing for ATM \(IMA\) on ACX Series” on page 29](#).

## Overview

In this example, the configured forwarding class **fc-1** is applied to all packets received on the ingress logical interface **at-0/0/16 unit 0**. The fixed classification classifies all traffic on the logical interface unit zero (0) to **queue-num 1**.

## Configuration

### IN THIS SECTION

- [Configuring a Forwarding Class | 103](#)
- [Applying the Forwarding Class | 104](#)
- [Results | 104](#)

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure fixed classification on an ATM IMA Pseudowire, perform these tasks:

### CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level:

```
set class-of-service forwarding-classes class fc-1 queue-num 1
set class-of-service interfaces at-0/0/16 unit 0 forwarding-class fc-1
```

### Configuring a Forwarding Class

#### Step-by-Step Procedure

To define a forwarding class, which is applied to the ingress logical interface:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit class-of-service forwarding-classes
```

2. Define the forwarding class to apply to the input logical interface:

```
[edit class-of-service forwarding-classes]
user@host# set class fc-1 queue-num 1
```

### *Applying the Forwarding Class*

#### **Step-by-Step Procedure**

To apply the forwarding class to the logical ATM IMA pseudowire:

1. Specify the ATM IMA interface on which to include the forwarding class:

```
[edit class-of-service]
user@host# edit interfaces at-0/0/16
```

2. Configure the logical interface:

```
[edit class-of-service interfaces at-0/0/16 ]
user@host# edit unit 0
```

3. Apply the previously configured forwarding class to the logical interface:

```
[edit class-of-service interfaces at-0/0/16 unit 0]
user@host# set forwarding-class fc-1
```

### **Results**

From configuration mode, confirm your configuration by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

In the following example, all packets coming into the router from the **at-0/0/16 unit 0** interface are assigned to the **fc-1** forwarding class:

```
[edit class-of-service]
user@host# show
forwarding-classes {
    class fc-1 queue-num 1;
}
interfaces {
    at-0/0/16 {
        unit 0 {
            forwarding-class fc-1;
        }
    }
}
```

After you have completed the configuration, enter the **commit** command from configuration mode.

## RELATED DOCUMENTATION

---

[Understanding CoS on ATM IMA Pseudowire Interfaces Overview | 16](#)

---

[Configuring Fixed Classification on an ATM IMA Pseudowire | 101](#)

---

[Example: Configuring Policing on an ATM IMA Pseudowire | 117](#)

---

[Example: Configuring Shaping on an ATM IMA Pseudowire | 108](#)

## Configuring Shaping on an ATM IMA Pseudowire

On ACX Series routers, ATM shaping is applied in the egress direction only. Only cell-based shaping is supported. A traffic control profile, which defines the ATM scheduling parameters, is configured at the **[edit class-of-service]** hierarchy level. The traffic control profile is then applied to the ATM logical interface configured at the **[edit class-of-service]** hierarchy level.

**NOTE:** The configuration of ATM shaping requires the inclusion of the **per-unit scheduler** statement at the **[edit interfaces interface-name]** hierarchy level.

**NOTE:** Configuring shaping on an ATM IMA pseudowire is not applicable on ACX5048 and ACX5096 routers.

The following steps require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure a traffic-shaping profile on an ATM IMA pseudowire:

1. Define the ATM IMA pseudowire. For information about defining the ATM IMA pseudowire, see [“Configuring Inverse Multiplexing for ATM \(IMA\) on ACX Series” on page 29](#).
2. In configuration mode, go to the **[edit class-of-service]** hierarchy level:

```
[edit]
user@host# edit class-of-service
```

3. Specify the traffic-shaping profile:

```
[edit class-of-service]
user@host# edit traffic-control-profiles profile-name
```

The following steps describe the traffic control profile options that you can configure. The options include **atm-service**, **delay-buffer-rate**, **max-burst-size**, **peak-rate**, and **sustained-rate**.

4. (Optional) Specify the service category that determines the traffic-shaping parameter for the ATM queue at the ATM IMA pseudowire:

```
[edit class-of-service traffic-control-profiles profile-name]
```

```
user@host# set atm-service (cbr | nrt-vbr | rt-vbr)
```

Select one of the following service traffic categories, depending on the needs of your network: constant bit rate (**cbr**), non-real-time variable bit rate (**nrtvbr**), or real-time variable bit rate (**rtvbr**). All service traffic categories must include the **peak-rate** and **cdvt** statements for the configuration to work. The **peak-rate** statement limits the maximum traffic allowed and the **cdvt** statement ensures that the configuration functions correctly.

5. (Optional) Specify the delay-buffer calculation:

```
[edit class-of-service traffic-control-profiles profile-name]
user@host# set delay-buffer-rate cps
```

The delay-buffer calculation can be specified as cells per second—1000 cells per second (cps) through 160,000,000,000 cps.

6. (Optional) Define the maximum number of cells that a burst of traffic can contain, from 1 through 4000 cells:

```
[edit class-of-service traffic-control-profiles profile-name]
user@host# set max-burst-size max-burst-size
```

7. Define the largest number of cells per second that the shaper processes before it drops packets, from 61 cps through 38,641 cps:

```
[edit class-of-service traffic-control-profiles profile-name]
user@host# set peak-rate peak-rate
```

The maximum peak rate value depends on the number of links in the IMA bundle—the more the number of links, the higher the possible peak rate.

8. (Optional) Define the normal traffic rate averaged over time, from 61 cps through 38,641 cps:

```
[edit class-of-service traffic-control-profiles profile-name]
user@host# set sustained-rate cps
```

9. To complete the configuration, configure the per-unit scheduler:

```
[edit interfaces interface-name]
user@host# set per-unit scheduler
```

After you have configured shaping on the ATM IMA interface, enter the **commit** command from configuration mode.

## RELATED DOCUMENTATION

[Understanding CoS on ATM IMA Pseudowire Interfaces Overview | 16](#)

[Example: Configuring Shaping on an ATM IMA Pseudowire | 108](#)

[Configuring Fixed Classification on an ATM IMA Pseudowire | 101](#)

[Configuring Policing on an ATM IMA Pseudowire | 113](#)

## Example: Configuring Shaping on an ATM IMA Pseudowire

### IN THIS SECTION

- [Requirements | 108](#)
- [Overview | 109](#)
- [Configuration | 109](#)

The following example shows the configuration of shaping on an ATM IMA pseudowire. On ACX Series routers, the ATM shaper is applied on the egress logical (unit) interface.

**NOTE:** This example is not applicable on ACX5048 and ACX5096 routers.

### Requirements

This example uses the following hardware and software components:

- ACX Series router
- Junos OS Release 12.2 or later
- A previously configured ATM IMA pseudowire. For steps to configure an ATM IMA pseudowire, see [“Configuring Inverse Multiplexing for ATM \(IMA\) on ACX Series” on page 29](#).

## Overview

In this example, an ATM IMA pseudowire logical interfaces (**unit 0**) is configured with two egress ATM shapers—**profile-1** and **profile-2**. The ATM shaping profiles are configured with the following parameters:

- **atm-service**—ATM service category used to define the bit rate at which traffic is policed.
- **peak-rate**—Top rate at which traffic can burst. This is a mandatory statement that must be included for the configuration to work correctly.
- **sustained-rate**—Normal traffic rate averaged over time.
- **maximum-burst-size**—Maximum number of cells that a burst of traffic can contain.

In addition to the configuration of shaping, this example includes the configuration of tracing operations for the class-of-service (CoS) configuration.

## Configuration

### IN THIS SECTION

- [Configuring Shaping on an ATM IMA Pseudowire | 110](#)
- [Configuring Tracing Operations | 111](#)
- [Results | 112](#)

To configure shaping on an ATM IMA pseudowire, perform these tasks:

### CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level:

```
set class-of-service traffic-control-profiles profile-1 atm-service rtvbr
set class-of-service traffic-control-profiles profile-1 peak-rate 5k
set class-of-service traffic-control-profiles profile-1 sustained-rate 3k
set class-of-service traffic-control-profiles profile-1 max-burst-size 400
set class-of-service traffic-control-profiles profile-2 atm-service cbr
set class-of-service traffic-control-profiles profile-2 peak-rate 1k
set class-of-service interfaces at-0/0/16 unit 0 output-traffic-control-profile profile-1
set interfaces at-0/0/16 per-unit-scheduler
set class-of-service traceoptions file cos
```



```
set class-of-service traceoptions file size 1000000000
set class-of-service traceoptions flag all
```

### *Configuring Shaping on an ATM IMA Pseudowire*

#### **Step-by-Step Procedure**

The following steps require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure shaping on an ATM IMA pseudowire:

1. In configuration mode, go to the **[edit class-of-service]** hierarchy level:

```
[edit]
user@host# edit class-of-service
```

2. Specify the first traffic control profile:

```
[edit class-of-service]
user@host# edit traffic-control-profiles profile-1
```

3. Specify the ATM real-time variable bit rate **rtvbr** service traffic category:

```
[edit class-of-service traffic-control-profiles profile-1]
user@host# set atm-service rtvbr
```

4. Define the largest number of cells per second that the shaper processes before it drops packets:

```
[edit class-of-service traffic-control-profiles profile-1]
user@host# set peak-rate 5k
```

5. Define the normal traffic rate averaged over time, from 61 cps through 38,641 cps:

```
[edit class-of-service traffic-control-profiles profile-1]
user@host# set sustained-rate 3k
```

6. Define the maximum number of cells that a burst of traffic can contain, from 1 through 4000 cells:

```
[edit class-of-service traffic-control-profiles profile-1]
```

```
user@host# set max-burst-size 400
```

7. Specify the second traffic control profile:

```
[edit class-of-service traffic-control-profiles profile-2]
user@host# edit traffic-control-profiles profile-2
```

8. Specify the ATM constant bit rate **cbr** service traffic category:

```
[edit class-of-service traffic-control-profiles profile-2]
user@host# set atm-service cbr
```

9. Define the largest number of cells per second that the shaper processes before it drops packets:

```
[edit class-of-service traffic-control-profiles profile-2]
user@host# set peak-rate 1k
```

10. Define the largest number of cells per second that the shaper processes before it drops packets:

```
[edit class-of-service traffic-control-profiles profile-2]
user@host# set peak-rate 1k
```

11. Apply the first shaping traffic profile to the ATM IMA pseudowire logical interface:

```
[edit class-of-service]
user@host# edit interfaces at-0/0/16 unit 101 output-traffic-control-profile profile-1
```

12. Configure the per-unit scheduler:

```
[edit interfaces at-0/0/16]
user@host# set interfaces at-0/0/16 per-unit-scheduler
```

## Configuring Tracing Operations

### Step-by-Step Procedure

To define tracing operations for the class-of-service (CoS) configuration:

1. Configure class-of-service (CoS) tracing options:

```
[edit]
user@host# edit class of service traceoptions
```

2. Create the file to receive the tracing operation output:

```
[edit class-of-service traceoptions]
user@host# set file cos
```

3. Define the maximum size of the file:

```
[edit class-of-service traceoptions]
user@host# set file size 1000000000
```

4. Specify the tracing operation to perform:

```
[edit class-of-service traceoptions]
user@host# set flag all
```

### Results

From configuration mode, confirm your configuration by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit class-of-service]
user@host# show
traffic-control-profiles {
  profile-1 {
    atm-service rtvbr;
    peak-rate 5k;
    sustained-rate 3k;
    max-burst-size 400;
  }
  profile-2 {
    atm-service cbr;
    peak-rate 1k;
  }
}
interfaces {
  at-0/0/16 {
    unit 101 {
```

```

        output-traffic-control-profile profile-1;
    }
}
}
traceoptions {
    file cos size 1000000000;
    flag all;
}

```

```

[edit interfaces]
user@host# show
at-0/0/16 {
    per-unit-scheduler;
}
}

```

After you have completed the configuration, enter the **commit** command from configuration mode.

## RELATED DOCUMENTATION

[Understanding CoS on ATM IMA Pseudowire Interfaces Overview | 16](#)

[Configuring Shaping on an ATM IMA Pseudowire | 106](#)

[Example: Configuring Fixed Classification on an ATM IMA Pseudowire | 102](#)

[Example: Configuring Policing on an ATM IMA Pseudowire | 117](#)

## Configuring Policing on an ATM IMA Pseudowire

On ACX Series routers, the ATM policer is attached to the ingress path of the ATM IMA interface, making it an input policer configured at the **[edit firewall]** hierarchy level. This input policer is then applied to an ATM IMA logical interface. The ATM IMA logical interface must have circuit cross-connect (CCC) family encapsulation configured for the configuration to work.

The following steps require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

**NOTE:** Configuring policing on an ATM IMA pseudowire is not applicable on ACX5048 and ACX5096 routers.

This topic includes the following tasks:

1. [Configuring an Input Policer | 114](#)
2. [Configuring the ATM IMA Interface | 116](#)

## Configuring an Input Policer

To configure policing on an ATM IMA pseudowire:

1. Define the ATM IMA pseudowire. For information about defining the ATM IMA pseudowire, see [“Configuring Inverse Multiplexing for ATM \(IMA\) on ACX Series” on page 29](#).
2. In configuration mode, go to the **[edit firewall]** hierarchy level:

```
[edit]
user@host# edit firewall
```

3. Define the policer:

```
[edit firewall]
user@host# edit atm-policer atm-policer-name
```

The following steps describe the ATM policer options that you can configure. The options include: **atm-service**, **cdvt**, **logical-interface-policer**, **max-burst-size**, **peak-rate**, **policing-action**, and **sustained-rate**.

4. Specify the ATM service category:

```
[edit firewall atm-policer atm-policer-name]
user@host# set atm-service (cbr | nrt-vbr | rt-vbr | ubr)
```

Select one of the following service categories, depending on the policing needs of your network: constant bit rate (**cbr**), nonreal-time variable bit rate (**nrtvbr**), real-time variable bit rate (**rtvbr**), and unspecified bit rate **ubr**. All service categories must include the **peak-rate** and **cdvt** statements for the configuration to work. The **peak-rate** statement limits the maximum traffic allowed and the **cdvt** statement ensures that the configuration functions correctly.

5. Apply limits to the traffic flow by configuring the cell delay variation tolerance (**cdvt**), from 1 microsecond through 1,800,000,000 microseconds:

```
[edit firewall atm-policer atm-policer-name]
user@host# set cdvt cdvt-time
```

6. (Optional) Define the policer as a logical interface policer:

```
[edit firewall atm-policer atm-policer-name]
user@host# set logical-interface-policer
```

The logical interface policer is associated with the interface on which the policer is applied. To configure the policer on multiple interfaces, you must apply this policer on each interface explicitly.

7. (Optional) Define the maximum number of cells that a burst of traffic can contain, from 1 through 4000 cells:

```
[edit firewall atm-policer atm-policer-name]
user@host# set max-burst-size max-burst-size
```

8. Apply limits to the traffic flow by specifying the largest number of cells per second that the policer processes before it drops packets, from 61 cells per second (cps) through 38,641 cps:

```
[edit firewall atm-policer atm-policer-name]
user@host# set peak-rate peak-rate
```

The maximum peak rate value depends on the number of links in the IMA bundle—the more links, the higher the possible peak rate.

9. Define the policing-action parameter to set a consequence for the packets that exceed the traffic limits:

```
[edit firewall atm-policer atm-policer-name]
user@host# set policing-action (discard | discard-tag | count)
```

10. Define the normal traffic rate averaged over time, from 61 cps through 38,641 cps:

```
[edit firewall atm-policer atm-policer-name]
user@host# set sustained-rate cps
```

After you have configured policing, enter the **commit** command from configuration mode.

## Configuring the ATM IMA Interface

To create the ATM IMA interface on which to apply the ATM policer:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level:

```
[edit]
user@host# edit interfaces
```

2. Define the ATM interface:

```
[edit interfaces]
user@host# edit at-fpc/pic/port
```

3. Specify the ATM interface unit:

```
[edit interfaces at-fpc/pic/port]
user@host# edit unit logical-unit-number
```

4. Apply the ATM policer:

```
[edit interfaces at-fpc/pic/port unit logical-unit-number]
user@host# set atm-policer input-atm-policer policer-name
```

5. Specify the encapsulation family type:

```
[edit interfaces at-fpc/pic/port unit logical-unit-number]
user@host# set family ccc
```

After you have configured the ATM IMA interface, enter the **commit** command in configuration mode.

## RELATED DOCUMENTATION

[Understanding CoS on ATM IMA Pseudowire Interfaces Overview | 16](#)

[Example: Configuring Policing on an ATM IMA Pseudowire | 117](#)

[Configuring Fixed Classification on an ATM IMA Pseudowire | 101](#)

[Configuring Shaping on an ATM IMA Pseudowire | 106](#)

## Example: Configuring Policing on an ATM IMA Pseudowire

### IN THIS SECTION

- [Requirements | 117](#)
- [Overview | 117](#)
- [Configuration | 118](#)

This example shows the configuration of policing on an ATM IMA pseudowire. On ACX Series routers, the ATM policer is an input policer that is applied to the ATM IMA logical interface. The ATM IMA logical interface must have the circuit cross-connect (CCC) encapsulation family configured for the configuration to work.

**NOTE:** This example is not applicable on ACX5048 and ACX5096 routers.

### Requirements

This example uses the following hardware and software components:

- ACX Series router
- Junos OS Release 12.2 or later
- A previously configured ATM IMA pseudowire. For steps to configure an ATM IMA pseudowire, see [“Configuring Inverse Multiplexing for ATM \(IMA\) on ACX Series” on page 29](#).

### Overview

In this example, the ATM IMA pseudowire logical interfaces (**unit 0**, **unit 1** and **unit 2**) are configured with three input ATM policers—**policer-1**, **policer-2**, and **policer-3**. The ATM policers are configured with the following parameters:

- **logical-interface-policer**—The logical interface policer is configured explicitly on each logical interface (unit).
- **atm-service**—The ATM service category used to define the bit rate at which traffic is policed.



- **peak-rate**—The peak rate is the top rate at which traffic can burst. This is a mandatory statement that must be included for the configuration to work correctly.
- **sustained-rate**—The sustained rate is the normal traffic rate averaged over time.
- **maximum-burst-size**—The maximum burst size is the maximum number of cells that a burst of traffic can contain.
- **cdvt**—The Cell Delay Variation Tolerance is a mandatory statement that must be included for the configuration to work correctly.
- **policing-action**—The specified policing action used when the traffic exceeds the limits set for the policer.

## Configuration

### IN THIS SECTION

- [Configuring an ATM Policer | 119](#)
- [Applying the ATM Policer on the ATM IMA Logical Interface | 120](#)
- [Results | 121](#)

The following steps require you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure policing on an ATM IMA pseudowire, perform these tasks:

### CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level:

```
set firewall atm-policer policer-1 logical-interface-policer
set firewall atm-policer policer-1 atm-service rtvbr
set firewall atm-policer policer-1 peak-rate 2k
set firewall atm-policer policer-1 sustained-rate 1800
set firewall atm-policer policer-1 max-burst-size 400
set firewall atm-policer policer-1 cdvt 900001
set firewall atm-policer policer-1 policing-action discard-tag
set firewall atm-policer policer-2 logical-interface-policer
set firewall atm-policer policer-2 atm-service nrtvbr
set firewall atm-policer policer-2 peak-rate 1800
```

```

set firewall atm-policer policer-2 sustained-rate 1500
set firewall atm-policer policer-2 max-burst-size 300
set firewall atm-policer policer-2 cdvt 999991
set firewall atm-policer policer-2 policing-action discard
set firewall atm-policer policer-3 logical-interface-policer
set firewall atm-policer policer-3 atm-service cbr
set firewall atm-policer policer-3 peak-rate 2k
set firewall atm-policer policer-3 cdvt 800001
set firewall atm-policer policer-3 policing-action count
set interfaces at-0/0/16 unit 0 atm-policer input-atm-policer policer-1
set interfaces at-0/0/16 unit 0 family ccc
set interfaces at-0/0/16 unit 1 atm-policer input-atm-policer policer-2
set interfaces at-0/0/16 unit 1 family ccc
set interfaces at-0/0/16 unit 2 atm-policer input-atm-policer policer-3
set interfaces at-0/0/16 unit 2 family ccc

```

### *Configuring an ATM Policer*

#### **Step-by-Step Procedure**

To configure the ATM policer, which is applied to the logical ATM IMA pseudowire:

1. Define the policer:

```

[edit]
user@host# edit firewall atm-policer policer-1

```

2. Specify the parameters for **policer-1**:

```

[edit firewall atm-policer policer-1]
user@host# set logical-interface-policer
user@host# set atm-service rtvbr
user@host# set peak-rate 2k
user@host# set sustained-rate 1800
user@host# set max-burst-size 400
user@host# set cdvt 900001
user@host# set policing-action discard-tag

```

3. Specify the parameters for **policer-2**:

```

[edit firewall atm-policer policer-2]
user@host# set logical-interface-policer
user@host# set atm-service nrtvbr

```

```

user@host# set peak-rate 1800
user@host# set sustained-rate 1500
user@host# set max-burst-size 300
user@host# set cdvt 999991
user@host# set policing-action discard

```

4. Specify the parameters for **policer-3**:

```

[edit firewall atm-policer policer-3]
user@host# set logical-interface-policer
user@host# set atm-service cbr
user@host# set peak-rate 2k
user@host# set cdvt 999991
user@host# set policing-action count

```

After you have configured the ATM policers, enter the **commit** command from configuration mode.

### *Applying the ATM Policer on the ATM IMA Logical Interface*

#### **Step-by-Step Procedure**

To create the ATM IMA logical interface on which to apply the ATM policers:

1. Define the ATM interface:

```

[edit interfaces]
user@host# edit interfaces at-0/0/16

```

2. Specify the ATM interface unit and apply the first input policer:

```

[edit interfaces at-0/0/16]
user@host# set unit 0 atm-policer input-atm-policer policer-1

```

3. Specify the encapsulation family type for **unit 0**:

```

[edit interfaces at-0/0/16]
user@host# set unit 0 family ccc

```

4. Specify the ATM interface unit and apply the second input policer:

```

[edit interfaces at-0/0/16]

```

```
user@host# set unit 1 atm-policer input-atm-policer policer-2
```

5. Specify the encapsulation family type for **unit 1**:

```
[edit interfaces at-0/0/16]
user@host# set unit 1 family ccc
```

6. Specify the ATM interface unit and apply the third input policer:

```
[edit interfaces at-0/0/16]
user@host# set unit 2 atm-policer input-atm-policer policer-3
```

7. Specify the encapsulation family type for **unit 2**:

```
[edit interfaces at-0/0/16]
user@host# set unit 2 family ccc
```

## Results

From configuration mode, confirm your configuration by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit firewall]
user@host# show
atm-policer policer-1 {
    logical-interface-policer;
    atm-service rtvbr;
    peak-rate 2k;
    sustained-rate 1800;
    max-burst-size 400;
    cdvt 900001;
    policing-action discard-tag;
}
atm-policer policer-2 {
    logical-interface-policer;
    atm-service nrtvbr;
    peak-rate 1800;
    sustained-rate 1500;
    max-burst-size 300;
    cdvt 999991;
```

```

        policing-action discard;
    }
    atm-policer policer-3 {
        logical-interface-policer;
        atm-service cbr;
        peak-rate 2k;
        cdvt 800001;
        policing-action count;
    }

```

```

[edit interfaces]
user@host# show
at-0/0/16 {
    unit 0 {
        atm-policer {
            input-atm-policer policer-1;
        }
        family ccc;
    }
    unit 1 {
        atm-policer {
            input-atm-policer policer-2;
        }
        family ccc;
    }
    unit 2 {
        atm-policer {
            input-atm-policer policer-3;
        }
        family ccc;
    }
}

```

After you have completed the configuration, enter the **commit** command from configuration mode.

## RELATED DOCUMENTATION

[Understanding CoS on ATM IMA Pseudowire Interfaces Overview | 16](#)

[Configuring Policing on an ATM IMA Pseudowire | 113](#)

[Example: Configuring Fixed Classification on an ATM IMA Pseudowire | 102](#)

## Defining the ATM Traffic-Shaping Profile Overview

### IN THIS SECTION

- [Configuring ATM CBR | 124](#)
- [Configuring ATM2 IQ Real-Time VBR | 125](#)
- [Configuring ATM VBR | 125](#)
- [Specifying ATM1 Shaping Values | 126](#)
- [Specifying ATM2 IQ Shaping Values | 130](#)

When you use an ATM encapsulation on ATM1 and ATM2 IQ interfaces, you can define bandwidth utilization, which consists of either a constant rate or a peak cell rate, with sustained cell rate and burst tolerance.

These values are used in the ATM generic cell-rate algorithm, which is a leaky bucket algorithm that defines the short-term burst rate for ATM cells, the maximum number of cells that can be included in a burst, and the long-term sustained ATM cell traffic rate.

If your router is equipped with an ATM2 IQ PIC, each VC can have independent shaping parameters. For more information, see [“Defining Virtual Path Tunnels” on page 130](#).

**NOTE:** When the DS3 or E3 port parameters are not identical on all ports of a multiport ATM DS3 or E3 PIC, the ATM PIC driver might not always use the minimum port shaping rate (of all the ports on a multiport ATM DS3 or E3 PIC) selected for cell transmission shaping. The PIC's shaping rate is always updated to conform to the last port setting updated by the PIC software driver, rather than use the minimum port (shaping) rate. There is no syslog message to inform the user of the shaping rate decision applied by the software driver.

By default, the bandwidth utilization is unlimited; that is, unspecified bit rate (UBR) is used. Also, by default, buffer usage by VCs is unregulated.

To define limits to bandwidth utilization, include the **shaping** statement:

```

shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
  queue-length number;
}

```

For a list of hierarchy levels at which you can include this statement, see [shaping](#).

The **rtvbr** statement is supported on ATM2 IQ PICs only. The **queue-length** statement is supported on ATM1 PICs only.

To configure VP tunnels on ATM2 IQ interfaces, include the **shaping** statement at the **[edit interfaces interface-name atm-options vpi vpi-identifier]** hierarchy level:

```

[edit interfaces interface-name atm-options vpi vpi-identifier]
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
}

```

When configuring ATM traffic shaping, you can do the following:

### Configuring ATM CBR

For traffic that does not require the ability to periodically burst to a higher rate, you can specify a constant bit rate (CBR).

To specify a CBR on ATM1 and ATM2 IQ interfaces, include the **cbr** statement:

```

cbr rate;

```

For a list of hierarchy levels at which you can include this statement, see [cbr](#).

For ATM1 OC3 interfaces, the rate can be from 33 Kbps through 135.6 Mbps; for ATM1 OC12 interfaces, the rate can be from 33 Kbps through 276 Mbps.

For ATM2 IQ OC3 and OC12 interfaces, the rate can be from 33 Kbps through 542,526,792 bps.

For ATM2 IQ OC48 interfaces, the rate can be from 33 Kbps through 2,170,107,168 bps.

For ATM2 IQ DS3 and E3 interfaces, the rate can be from 33 Kbps to the maximum rate. The maximum rate varies depending on the ATM encapsulation and framing you configure, as shown in [Table 12 on page 125](#).

Table 12: Shaping Rate Range by Interface Type

Interface Type	Maximum Rate
DS3 with direct ATM encapsulation	40,038,968 bps
DS3 with PLCP ATM encapsulation	36,864,000 bps
E3 with g.751 framing and direct ATM encapsulation	30,801,509 bps
E3 with g.751 framing PLCP ATM encapsulation	27,648,000 bps
E3 with g.832 framing	30,720,000 bps

## Configuring ATM2 IQ Real-Time VBR

By default, ATM interfaces use UBR; that is, bandwidth utilization is unlimited. For ATM2 IQ interfaces only, you can configure RTVBR, which supports variable bit rate data traffic with average and peak traffic parameters. Compared to non-real-time VBR, RTVBR data is serviced at a higher priority with a relatively small sustainable cell rate (SCR) limit to minimize the delay. Real-time VBR is suitable for carrying packetized video and audio.

To configure RTVBR, include the **rtvbr** statement:

```
rtvbr peak rate sustained rate burst length;
```

For a list of hierarchy levels at which you can include this statement, see [rtvbr](#).

When configuring RTVBR, you can define the following shaping properties:

- Peak rate—Top rate at which traffic can burst.
- Sustained rate—Normal traffic rate averaged over time.
- Burst length—Maximum number of cells that a burst of traffic can contain. It can be a value from 1 through 4000 cells.

The peak and sustained rates can be from 33 Kbps through 542,526,792 bps.

## Configuring ATM VBR

By default, ATM interfaces use UBR; that is, bandwidth utilization is unlimited. For ATM1 and ATM2 IQ interfaces, you can configure non-real-time VBR, which supports variable bit rate data traffic with average



and peak traffic parameters. Compared to RTVBR, non-real-time VBR is scheduled with a lower priority and with a larger SCR limit, allowing it to recover bandwidth if it falls behind. Non-real-time VBR is suitable for packet data transfers.

To define VBR on ATM1 and ATM2 IQ interfaces, include the **vbr** statement:

```
vbr peak rate sustained rate burst length;
```

For a list of hierarchy levels at which you can include this statement, see [vbr](#).

When configuring VBR, you can define the following shaping properties:

- Peak rate—Top rate at which traffic can burst.
- Sustained rate—Normal traffic rate averaged over time.
- Burst length—Maximum number of cells that a burst of traffic can contain. It can be a value from 1 through 4000 cells.

## Specifying ATM1 Shaping Values

For ATM1 interfaces, you can specify the rates in bits per second or cells per second. For OC3c interfaces, the highest rate is 135,631,698 bps (353,207.55 cps), which corresponds to 100 percent of the available line rate. For OC12c interfaces, the highest rate is 271,263,396 bps (706,415.09 cps), which corresponds to 50 percent of the available line rate. [Table 13 on page 127](#) lists some of the other rates you can specify. If you specify a rate that is not listed, it is rounded to the nearest rate.

The exact number of values differs between OC12c and OC3c interfaces. OC12c interfaces have about four times as many value increments as OC3c interfaces.

For OC12c rates between 1/2 of the line rate and 1/128 of the line rate, there are 128 steps between each 1/*n* value. This means that there is 128 steps between the 1/2 and 1/3 line rate values, and another 128 steps between 1/3 and 1/4 and so on. For rates smaller than 1/127, there are (16,384 minus 127) or 16, 257 values. The reason for this is that fractional shaping is ignored at rates below 1/127. This results in a total of about 32,384 distinct rates for OC12c. When *n* is larger than or equal to 127, the steps are 1/*n*.

For OC3c, the starting point is full line rate, the fraction/integer breakpoint is about 1/31, and there is a maximum of 4096 scheduler slots for use after 1/31 of line rate, producing about 8032 total distinct rates. When *n* is larger than or equal to 31, the steps are 1/*n*.

For ATM1 interfaces, the following formula can be used to predict the actual shaping rate:

- OC3 shaping settings between 135,631,698 bps (OC3 ATM cell line rate) and 4,375,216 bps (1/31 of OC3 ATM cell line rate).

- OC12 shaping settings between 271,263,396 bps (half OC12 ATM cell line rate – the highest rate supported) and 4,271,864 bps (1/127 of OC12 ATM cell line rate).

$$\text{actual-rate} = (128 * \text{line-rate}) / (\text{trunc} ((128 * \text{line-rate}) / \text{desired-rate}))$$

**line-rate** is the maximum available rate on the interface (in bits per second) after factoring out the overhead for SONET/SDH and ATM (per-cell) overheads. For OC3c interfaces, the line rate is calculated as follows:

$$\text{line-rate} = 155,520,000 \text{ bps} * (26/27) * (48/53) = 135,631,698.1 \text{ bps}$$

For OC12c interfaces, the line rate is calculated as follows:

$$\text{line-rate} = 622,080,000 \text{ bps} * (26/27) * (48/53) = 542,526,792.45 \text{ bps}$$

**desired-rate** is the rate you enter in the **vbr** statement, in bits per second.

The **trunc** operator indicates that all digits to the right of the decimal point should be dropped.

For shaping settings smaller than 1/31 of OC3 ATM cell line rate (4,375,216 bps) and 1/127 of OC12 ATM cell line rate (4,271,864 bps), you can predict the actual shaping rate using the following formula:

$$\text{actual-rate} = ( 1 / ( \text{trunc} ( \text{line-rate} / \text{desired-rate} ) + 1 ) ) * \text{line-rate}$$

For example, for OC12 interfaces, the actual rates for shaping below 4,271,864 bps are calculated as follows:

$$\begin{aligned} 1 / 127 * 542,526,792.45 \text{ bps} &= 4,271,864 \text{ bps (11124 cells/second)} \\ 1 / 128 * 542,526,792.45 \text{ bps} &= 4,238,490 \text{ bps (11038 cells/second)} \\ 1 / 129 * 542,526,792.45 \text{ bps} &= 4,205,634 \text{ bps (10952 cells/second)} \\ &\dots \end{aligned}$$

Buffers are shared among all VCs, and by default, there is no limit to the buffer size for a VC. If a VC is particularly slow, it might use all the buffer resources.

[Table 13 on page 127](#) shows ATM1 traffic-shaping rates.

**Table 13: ATM1 Traffic-Shaping Rates**

Interface Type	Line Rate (bps)	Line Rate (cps)	Percentage of Total Line Rate
<b>OC3</b>			
	135,600,000	353,125	100.00

Table 13: ATM1 Traffic-Shaping Rates (*continued*)

Interface Type	Line Rate (bps)	Line Rate (cps)	Percentage of Total Line Rate
	134,542,320	350,370.66	99.22
	133,511,760	347,686.88	98.46
	132,494,760	345,038.44	97.71
	131,491,320	342,425.31	96.97
	130,501,440	339,847.5	96.24
	129,525,120	337,305	95.52
	128,562,360	334,797.81	94.81
	127,626,720	332,361.25	94.12
	126,691,080	329,924.69	93.43
<b>OC12</b>			
	271,263,396	706,415.09	50.00
	270,207,897	703,666.40	49.81
	269,160,579	700,939.01	49.61
	268,121,349	698,232.68	49.42
	267,090,113	695,547.17	49.23
	266,066,779	692,882.24	49.04
	265,051,257	690,237.65	48.85
	264,043,458	687,613.17	48.67
	263,043,293	685,008.58	48.48
	262,050,677	682,423.64	48.30

**Example: Specifying ATM1 Shaping Values**

Determine the actual rate in ATM1 interfaces when the desired rate is 80 percent of the maximum rate:

- OC3c:

$$135,600,000 \text{ bps} * 0.8 = 108,480,000 \text{ bps}$$

Because 108,480,000 bps is greater than 1/31 of OC3 ATM cell line rate:

$$\begin{aligned} \text{actual-rate} &= (128 * 135,600,000.1) / (\text{trunc} ((128 * 135,600,000.1) / 108,480,000)) \\ \text{actual-rate} &= 17,356,800,013 / (\text{trunc} (17,356,800,013 / 108,480,000)) \\ \text{actual-rate} &= 17,356,800,013 / 160 \\ \text{actual-rate} &= 108,480,000 \text{ bps} \end{aligned}$$

- OC12c:

$$271,263,396 \text{ bps} * 0.8 = 217,010,716.8 \text{ bps}$$

Because 217,010,716.8 bps is greater than 1/127 of OC12 ATM cell line rate:

$$\begin{aligned} \text{actual-rate} &= (128 * 542,526,792.45) / (\text{trunc} ((128 * 542,526,792.45) / 217,010,716.8)) \\ \text{actual-rate} &= 69,443,429,434 / (\text{trunc} (69,443,429,434 / 217,010,716.8)) \\ \text{actual-rate} &= 69,443,429,434 / 320 \\ \text{actual-rate} &= 217,010,717 \text{ bps} \end{aligned}$$

Determine the actual rate in ATM1 interfaces when the desired rate is 3,000,000 bps:

- OC3c:

Because 3,000,000 bps is smaller than 1/31 of OC3 ATM cell line rate:

$$\begin{aligned} \text{actual-rate} &= (1 / (\text{trunc} (\text{line-rate} / \text{desired-rate}) + 1)) * \text{line-rate} \\ \text{actual-rate} &= (1 / (\text{trunc} (135,631,698 / 3,000,000) + 1)) * 135,631,698 \\ \text{actual-rate} &= (1 / (45 + 1)) * 135,631,698 \\ \text{actual-rate} &= (1 / 46) * 135,631,698 \\ \text{actual-rate} &= 2,948,515 \text{ bps} \end{aligned}$$

- OC12c:

Because 3,000,000 bps is smaller than 1/127 of OC12 ATM cell line rate:

$$\begin{aligned} \text{actual-rate} &= (1 / (\text{trunc} (\text{line-rate} / \text{desired-rate}) + 1)) * \text{line-rate} \\ \text{actual-rate} &= (1 / (\text{trunc} (542,526,792 / 3,000,000) + 1)) * 542,526,792 \\ \text{actual-rate} &= (1 / (180 + 1)) * 542,526,792 \end{aligned}$$

```
actual-rate = ( 1 / 181 ) * 542,526,792
actual-rate = 2,997,386 bps
```

## Specifying ATM2 IQ Shaping Values

For ATM2 IQ OC3c interfaces, the maximum available rate is 100 percent of line rate, or 135,600,000 bps. For ATM2 IQ OC12c interfaces, the maximum available rate is 50 percent of line rate, or 271,273,396 bps. You can specify the rates in bits per second or cells per second. Fractional shaping is accurate within 0.5 percent of the desired rate.

## Defining Virtual Path Tunnels

For ATM2 IQ interfaces, you can configure shaping on a VPI. When you do this, the VPI is called a VP tunnel. If your router is equipped with an ATM2 IQ PIC, you can configure VP tunnels and a weight for each VC. Each VC is serviced in WRR mode. When VCs have data to send, they send the number of cells equal to their weight before passing control to the next active VC. This allows proportional bandwidth sharing between multiple VCs within a rate-shaped VP tunnel. VP tunnels are not supported on point-to-multipoint interfaces.

If you change or delete VP tunnel traffic shaping, all logical interfaces on a VP are deleted and re-added.

All VPIs you configure on logical interfaces must also be configured on the physical interface, at the **[edit interfaces *interface-name* atm-options]** hierarchy level.

When you configure a VPI without shaping parameters, the VPI is a regular VPI; no shaping is attached. VCI that belong to non-shaped VPIs can have VCI shaping.

For point-to-point interfaces, include the **shaping** statement at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level:

```
[edit interfaces interface-name atm-options vpi vpi-identifier]
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
  queue-length number;
}
```

For **cbr**, **vbr**, and **burst** statement usage guidelines, see [“Defining the ATM Traffic-Shaping Profile Overview” on page 123](#). For information about ATM2 IQ shaping values, see *Defining the ATM Traffic-Shaping Profile Overview*.

## Configuring the ATM1 Queue Length

ATM1 PICs contain a transmit buffer pool of 16,382 buffers, which are shared by all the PVCs that you configure on the PIC. Even multiple-port ATM PICs have a single buffer pool shared by all the ports.

By default, the ATM1 PIC allows PVCs to consume all the buffers they require. If the sustained traffic rate for a PVC exceeds its shaped rate, buffers are consumed. Eventually, all buffers on the PIC are consumed, and the other PVCs are underserved. This results in head-of-line blocking.

For each PVC, you prevent this situation by configuring the queue length of the PVC. The queue length is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are dropped.

To limit the queue size of a PVC, include the **queue-length** statement:

```
queue-length number;
```

For a list of hierarchy levels at which you can include this statement, see [queue-length](#).

The length can be from 1 through 16,383 packets. The default is 16,383 packets. You should include the **queue-length** statement in the configuration of all the PVCs that you configure on an ATM1 PIC. The **queue-length** statement performs two functions:

- It prevents head-of-line blocking because it limits the number of packets and therefore buffers that can be consumed by each configured PVC.
- It sets the maximum lifetime that can be sustained by packets over the PVC when traffic has oversubscribed the configured shaping contract.

The total value of all the queue lengths must not exceed the total number of packets that can be held in the buffer space available on the PIC. The total number of packets the buffers can hold depends on the size of the physical interface MTU, including all encapsulation overhead. You can use the following formula to calculate the total number of packets the buffer space can hold:

$$16,382 / ( \text{Round Up} ( \text{MTU} / 480 ) )$$

For example, assuming default MTU settings for all ATM1 interfaces on a PIC, the total number of packets that can be held is:

$$16,382 / ( \text{Round Up} ( 4482 / 480 ) ) = 1638 \text{ packets}$$

Thus, you can configure up to 1638 for the combined queue length of all the PVCs on an ATM1 PIC that uses default MTU settings for all interfaces.

If you set a queue length to a very low value, small bursts in packets transiting the PVC might not be buffered.

The maximum lifetime that packets can sustain while transiting a PVC depends on the shaping rate you configure for the PVC, the setting for the **queue-length** statement, and the physical interface MTU. You can use the following formula to calculate the maximum lifetime that packets can sustain while transiting a PVC:

$$( \text{PVC queue-length in packets} \times \text{MTU} ) / ( \text{PVC shaping in bps} / 8 )$$

For example, if you configure a PVC on an ATM1 interface with the default MTU, a CBR shaping rate of 3,840,000 bps (10,000 cps), and a queue length of 25 packets. The maximum lifetime is:

$$( 25 \times 4482 ) / ( 3,840,000 / 8 ) = 233 \text{ ms}$$

This is the worst-case lifetime assuming all packets in the queue are MTU sized, and the traffic using the PVC is oversubscribing its configured shaping contract.

In general, we recommend that you use a maximum lifetime under 500 ms.

If you add or change the queue-length setting on the VC, the logical interface associated with the VC is deleted and re-added.

## Configuring a Point-to-Point ATM1 or ATM2 IQ Connection

When you use ATM encapsulation on an interface, you must map each logical interface to a VCI. You can optionally map logical interfaces to a VPI.

For ATM1 and ATM2 IQ interfaces, you can configure a VCI and a VPI on a point-to-point ATM interface by including the **vci** statement:

```
vci vpi-identifier.vci-identifier;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For each VCI, configure the VCI and VPI identifiers. The default VPI identifier is 0. For ATM1 interfaces, the VCI identifier cannot exceed the highest-numbered VC configured for the interface with the **vpi** statement, as described in [“Configuring the Maximum Number of ATM1 VCs on a VP” on page 51](#).

VCIs 0 through 31 are reserved for specific ATM values designated by the ATM Forum.

ATM2 IQ interfaces support only one invalid VC counter for all ports. The invalid VC counter is recorded at port 0 only.

When you are configuring point-to-point connections, the maximum transmission unit (MTU) sizes on both sides of the connections must be the same.

## Configuring a Point-to-Multipoint ATM1 or ATM2 IQ Connection

An ATM interface can be a point-to-point interface or a point-to-multipoint (also called a multipoint non-broadcast multiaccess [NBMA]) connection.

For ATM1 and ATM2 IQ interfaces, you can configure an NBMA ATM connection by including the following statements:

```

multipoint;
family inet {
  address ip-address {
    multipoint-destination address {
      epd-threshold cells;
      inverse-arp;
      oam-liveness {
        up-count cells;
        down-count cells;
      }
      oam-period (disable | seconds);
      shaping {
        (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
        queue-length number;
      }
      vci vpi-identifier.vci-identifier;
    }
  }
}

```

**ip-address** is the interface's address. The address must include the destination prefix (for example, /24).

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* ]



For each destination, include one **multipoint-destination** statement. **address** is the address of the remote side of the connection, and **vci-identifier** and **vpi-identifier** are the VCI and optional VPI identifiers for the connection.

When you configure point-to-multipoint connections, all interfaces in the subnet must use the same MTU size.

## Configuring Inverse ATM1 or ATM2 ARP

For ATM1 and ATM2 IQ interfaces, you can configure inverse ATM Address Resolution Protocol (ARP), as described in RFC 2225, *Classical IP and ARP over ATM*. When inverse ATM ARP is enabled, the router responds to received inverse ATM ARP requests by providing IP address information to the requesting ATM device.

The router does not initiate inverse ATM ARP requests.

By default, inverse ATM ARP is disabled. To configure a VC to respond to inverse ATM ARP requests, include the **inverse-arp** statement:

```
inverse-arp;
```

For a list of hierarchy levels at which you can include this statement, see [inverse-arp](#).

You must configure ATM LLC subnetwork attachment point (SNAP) encapsulation on the logical interface to support inverse ARP. No other ATM encapsulation types are allowed. For more information, see [“Configuring ATM Interface Encapsulation” on page 56](#).

## ATM2 IQ VC Tunnel CoS Components Overview

### IN THIS SECTION

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- [Configuring Linear RED Profiles | 136](#)
- [Configuring an ATM Scheduler Map | 137](#)
- [Enabling Eight Queues on ATM2 IQ Interfaces | 139](#)
- [Example: Enabling Eight Queues on T Series, M120, and M320 Routers | 140](#)
- [Configuring VC CoS Mode | 146](#)
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- [Configuring ATM CoS on the Logical Interface | 147](#)
- [Example: Configuring ATM2 IQ VC Tunnel CoS Components | 147](#)

The ATM2 IQ interface allows multiple IP queues into each VC. On M Series routers (except the M320 and M120 router), a VC tunnel can support four CoS queues. On the M320, M120, and T Series routers for all ATM2 IQ PICs except the OC48 PIC, a VC tunnel can support eight CoS queues. Within a VC tunnel, the WRR algorithm schedules the cell transmission of each queue. You can configure the queue admission policies, such as EPD or WRED, to control the queue size during congestion.

For information about CoS components that apply to all interfaces, see the *Class of Service User Guide (Routers and EX9200 Switches)*.

## Configuring ATM2 IQ VC Tunnel CoS Components

To configure ATM2 IQ VC tunnel CoS components, include the following statements at the **[edit interfaces at-fpc/pic/port]** hierarchy level:

```
[edit chassis fpc slot-number pic pic-number]
max-queues-per-interface number;
[edit interfaces at-fpc/pic/port]
atm-options {
  linear-red-profiles profile-name {
    high-plp-max-threshold percent;
    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
  }
  plp-to-clp;
  scheduler-maps map-name {
    forwarding-class class-name {
      epd-threshold cells plp1 cells;
      linear-red-profile profile-name;
      priority (high | low);
      transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
  }
}
unit 0 {
  atm-scheduler-map (map-name | default);
  family family {
    address address {
      destination address;
    }
  }
  plp-to-clp;
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
  }
  vci vpi-identifier.vci-identifier;
}
```

This section contains the following topics:

### Configuring Linear RED Profiles

Linear RED profiles define CoS virtual circuit drop profiles. You can configure up to 32 linear RED profiles

per port. When a packet arrives, RED checks the queue fill level. If the fill level corresponds to a nonzero drop probability, the RED algorithm determines whether to drop the arriving packet.

To configure linear RED profiles, include the **linear-red-profiles** statement at the **[edit interfaces at-fpc/pic/port atm-options]** hierarchy level:

```
[edit interfaces at-fpc/pic/port atm-options]
linear-red-profiles profile-name {
  high-plp-max-threshold percent;
  low-plp-max-threshold percent;
  queue-depth cells high-plp-threshold percent low-plp-threshold percent;
}
```

The **queue-depth**, **high-plp-threshold**, and **low-plp-threshold** statements are mandatory.

You can define the following options for each RED profile:

- **high-plp-max-threshold**—Define the drop profile fill-level for the high PLP CoS VC. When the fill level exceeds the defined percentage, all packets with high PLP are dropped.
- **low-plp-max-threshold**—Define the drop profile fill-level for the low PLP CoS VC. When the fill level exceeds the defined percentage, all packets with low PLP are dropped.
- **queue-depth**—Define maximum queue depth in the CoS VC drop profile. Packets are always dropped beyond the defined maximum. The range you can configure is from 1 through 64,000 cells.
- **high-plp-threshold**—Define CoS VC drop profile fill-level percentage when linear RED is applied to cells with high PLP. When the fill level exceeds the defined percentage, packets with high PLP are randomly dropped by RED.
- **low-plp-threshold**—Define CoS VC drop profile fill-level percentage when linear RED is applied to cells with low PLP. When the fill level exceeds the defined percentage, packets with low PLP are randomly dropped by RED.

## Configuring an ATM Scheduler Map

To define a scheduler map, you associate it with a forwarding class. Each class is associated with a specific queue, as follows:

- **best-effort**—Queue 0
- **expedited-forwarding**—Queue 1
- **assured-forwarding**—Queue 2
- **network-control**—Queue 3

**NOTE:** For M320, M120, and T Series routers only, you can configure more than four forwarding classes and queues.

When you configure an ATM scheduler map, the Junos OS creates these CoS queues for a VC. The Junos OS prefixes each packet delivered to the VC with the next-hop rewrite data associated with each queue.

To configure an ATM scheduler map, include the **scheduler-maps** statement at the [edit interfaces **at-fpc/pic/port atm-options**] hierarchy level:

```
edit interfaces at-fpc/pic/port atm-options]
scheduler-maps map-name {
  forwarding-class class-name {
    epd-threshold cells plp1 cells;
    linear-red-profile profile-name;
    priority (high | low);
    transmit-weight (cells number | percent number);
  }
}
```

You can define the following options for each forwarding class:

- **epd-threshold** or **linear-red-profile**—An EPD threshold provides a queue of cells that can be stored with tail drop. When a BOP cell is received, the VC's queue depth is checked against the EPD threshold. If the VC's queue depth exceeds the EPD threshold, the BOP cell and all subsequent cells in the packet are discarded.

A linear RED profile defines the number of cells using the **queue-depth** statement within the RED profile. (You configure the **queue-depth** statement at the [edit interfaces **at-fpc/pic/port atm-options linear-red-profiles profile-name**] hierarchy level.)

By default, if you include the **scheduler-maps** statement at the [edit interfaces **at-fpc/pic/port atm-options**] hierarchy level, the interface uses an EPD threshold that is determined by the Junos OS based on the available bandwidth and other parameters. You can override the default EPD threshold by setting an EPD threshold or a linear RED profile.

- **priority**—By default, queue 0 is high-priority, and the remaining queues are low-priority. You can configure high or low queuing priority for each queue.
- **transmit-weight**—By default, the transmit weight is 95 percent for queue 0, and 5 percent for queue 3. You can configure the transmission weight in number of cells or percentage. Each CoS queue is serviced in WRR mode. When CoS queues have data to send, they send the number of cells equal to their weight before passing control to the next active CoS queue. This allows proportional bandwidth sharing between multiple CoS queues within a rate-shaped VC tunnel. A CoS queue can send from 1 through 32,000 cells

or from 5 through 100 percent of queued traffic before passing control to the next active CoS queue within a VC tunnel.

The AAL5 protocol prohibits cells from being interleaved on a VC; therefore, a complete packet is always sent. If a CoS queue sends more cells than its assigned weight because of the packet boundary, the deficit is carried over to the next time the queue is scheduled to transmit. If the queue is empty after the cells are sent, the deficit is waived, and the queue's assigned weight is reset.

**NOTE:** If you include the **scheduler-maps** statement at the **[edit interfaces at-fpc/pic/port atm-options]** hierarchy level, the **epd-threshold** statement at the **[edit interfaces interface-name unit logical-unit-number]** or **[edit interfaces interface-name unit logical-unit-number address address family family multipoint-destination address]** hierarchy level has no effect because either the default EPD threshold, the EPD threshold setting in the forwarding class, or the linear RED profile takes effect instead.

For more information about forwarding classes, see the *Class of Service User Guide (Routers and EX9200 Switches)*.

## Enabling Eight Queues on ATM2 IQ Interfaces

By default, ATM2 IQ PICs on T Series, M120, and M320 routers are restricted to a maximum of four egress queues per interface. You can enable eight egress queues on ATM2 IQ interfaces by including the **max-queues-per-interface** statement at the **[edit chassis fpc slot-number pic pic-number]** hierarchy level:

```
[edit chassis fpc slot-number pic pic-number]
max-queues-per-interface number;
```

The numerical value can be **4** or **8**.

If you include the **max-queues-per-interface** statement, all ports on the ATM2 IQ PIC use the configured mode.

When you include the **max-queues-per-interface** statement and commit the configuration, all physical interfaces on the ATM2 IQ PIC are deleted and re-added. Also, the PIC is taken offline and then brought back online immediately. You do not need to manually take the PIC offline and online. You should change modes between four queues and eight queues, or vice versa, only when there is no active traffic going to the ATM2 IQ PIC.

For general information about configuring up to eight forwarding classes and queues on PICs other than ATM2 IQ PICs, see the *Class of Service User Guide (Routers and EX9200 Switches)*.

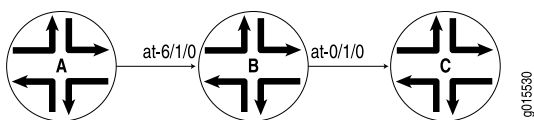
**NOTE:** When you are considering enabling eight queues on an ATM2 IQ interface, you should note the following:

- ATM2 IQ interfaces using Layer 2 circuit trunk transport mode support only four CoS queues.
- ATM2 IQ OC48 interfaces support only four CoS queues.
- ATM2 IQ interfaces with MLPPP encapsulation support only four CoS queues.
- You can configure only four RED profiles for the eight queues. Thus, queue 0 and queue 4 share a single RED profile, as do queue 1 and queue 5, queue 2 and queue 6, and queue 3 and queue 7. There is no restriction on EPD threshold per queue.
- The default chassis scheduler allocates resources for queue 0 through queue 3, with 25 percent of the bandwidth allocated to each queue. When you configure the chassis to use more than four queues, you must configure and apply a custom chassis scheduler to override the default. To apply a custom chassis scheduler, include the **scheduler-map-chassis** statement at the **[edit class-of-service interfaces at-fpc/pic/\*]** hierarchy level. For more information about configuring and applying a custom chassis scheduler, see the *Class of Service User Guide (Routers and EX9200 Switches)*.

### Example: Enabling Eight Queues on T Series, M120, and M320 Routers

In [Figure 4 on page 140](#), Router A generates IP packets with different IP precedence settings. Router B is an M320, M120, or T Series router with two ATM2 IQ interfaces. On Router B, interface **at-6/1/0** receives traffic from Router A, while interface **at-0/1/0** sends traffic to Router C. This example shows the CoS configuration for Router B.

**Figure 4: Example Topology for Router with Eight Queues**



On Router B:

```
[edit chassis]
fpc 0 {
  pic 1 {
    max-queues-per-interface 8;
  }
}
fpc 6 {
```

```

pic 1 {
    max-queues-per-interface 8;
}
}
[edit interfaces]
at-0/1/0 {
    atm-options {
        linear-red-profiles {
            red_1 queue-depth 1k high-plp-threshold 50 low-plp-threshold 80;
            red_2 queue-depth 2k high-plp-threshold 40 low-plp-threshold 70;
            red_3 queue-depth 3k high-plp-threshold 30 low-plp-threshold 60;
            red_4 queue-depth 4k high-plp-threshold 20 low-plp-threshold 50;
        }
        scheduler-maps {
            sch_red {
                vc-cos-mode strict;
                forwarding-class fc_q0 {
                    priority high;
                    transmit-weight percent 5;
                    linear-red-profile red_1;
                }
                forwarding-class fc_q1 {
                    priority low;
                    transmit-weight percent 10;
                    linear-red-profile red_2;
                }
                forwarding-class fc_q2 {
                    priority low;
                    transmit-weight percent 15;
                    linear-red-profile red_3;
                }
                forwarding-class fc_q3 {
                    priority low;
                    transmit-weight percent 20;
                    linear-red-profile red_4;
                }
                forwarding-class fc_q4 {
                    priority low;
                    transmit-weight percent 5;
                    linear-red-profile red_1;
                }
                forwarding-class fc_q5 {
                    priority low;
                    transmit-weight percent 10;

```



```
        linear-red-profile red_2;
    }
    forwarding-class fc_q6 {
        priority low;
        transmit-weight percent 15;
        linear-red-profile red_3;
    }
    forwarding-class fc_q7 {
        priority low;
        transmit-weight percent 20;
        linear-red-profile red_4;
    }
}
sch_epd {
    vc-cos-mode alternate;
    forwarding-class fc_q0 {
        priority high;
        transmit-weight percent 5;
        epd-threshold 1024;
    }
    forwarding-class fc_q1 {
        priority low;
        transmit-weight percent 10;
        epd-threshold 2048;
    }
    forwarding-class fc_q2 {
        priority low;
        transmit-weight percent 15;
        epd-threshold 3072;
    }
    forwarding-class fc_q3 {
        priority low;
        transmit-weight percent 20;
        epd-threshold 4096;
    }
    forwarding-class fc_q4 {
        priority low;
        transmit-weight percent 5;
        epd-threshold 2048;
    }
    forwarding-class fc_q5 {
        priority low;
        transmit-weight percent 10;
        epd-threshold 3072;
    }
}
```

```

    }
    forwarding-class fc_q6 {
        priority low;
        transmit-weight percent 15;
        epd-threshold 4096;
    }
    forwarding-class fc_q7 {
        priority low;
        transmit-weight percent 20;
        epd-threshold 5120;
    }
}
}
}
atm-options {
    vpi 0;
}
unit 0 {
    vci 0.100;
    shaping {
        cbr 1920000;
    }
    atm-scheduler-map sch_red;
    family inet {
        address 172.16.0.1/24;
    }
}
unit 1 {
    vci 0.101;
    shaping {
        vbr peak 1m sustained 384k burst 256;
    }
    atm-scheduler-map sch_epd;
    family inet {
        address 172.16.1.1/24;
    }
}
}
at-6/1/0 {
    atm-options {
        vpi 0;
    }
    unit 0 {
        vci 0.100;

```

```

    family inet {
        address 10.10.0.1/24;
    }
}
unit 1 {
    vci 0.101;
    family inet {
        address 10.10.1.1/24;
    }
}
}
[edit class-of-service]
classifiers {
    inet-precedence inet_classifier {
        forwarding-class fc_q0 {
            loss-priority low code-points 000;
        }
        forwarding-class fc_q1 {
            loss-priority low code-points 001;
        }
        forwarding-class fc_q2 {
            loss-priority low code-points 010;
        }
        forwarding-class fc_q3 {
            loss-priority low code-points 011;
        }
        forwarding-class fc_q4 {
            loss-priority low code-points 100;
        }
        forwarding-class fc_q5 {
            loss-priority low code-points 101;
        }
        forwarding-class fc_q6 {
            loss-priority low code-points 110;
        }
        forwarding-class fc_q7 {
            loss-priority low code-points 111;
        }
    }
}
forwarding-classes {
    queue 0 fc_q0;
    queue 1 fc_q1;
    queue 2 fc_q2;
    queue 3 fc_q3;
}

```

```

    queue 4 fc_q4;
    queue 5 fc_q5;
    queue 6 fc_q6;
    queue 7 fc_q7;
}
interfaces {
  at-6/1/0 {
    unit * {
      classifiers {
        inet-precedence inet_classifier;
      }
    }
  }
}
}
[edit routing-options]
static {
  route 10.10.20.2/32 {
    next-hop at-0/1/0.0;
    retain;
    no-readvertise;
  }
  route 10.10.1.2/32 {
    next-hop at-0/1/0.1;
    retain;
    no-readvertise;
  }
}
}

```

### Verifying the Configuration

To see the results of this configuration, you can issue the following operational mode commands:

- **show interfaces at-0/1/0 extensive**
- **show interfaces queue at-0/1/0**
- **show class-of-service forwarding-class**

## Configuring VC CoS Mode

VC CoS mode defines the CoS queue scheduling priority. By default, the VC CoS mode is **alternate**. When it is a queue's turn to transmit, the queue transmits up to its weight in cells as specified by the **transmit-weight** statement at the **[edit interfaces at-*fpc/pic/port* atm-options scheduler-maps *map-name* forwarding-class *class-name*]** hierarchy level. The number of cells transmitted can be slightly over the configured or default transmit weight, because the transmission always ends at a packet boundary.

To configure the VC CoS mode, include the **vc-cos-mode** statement at the **[edit interfaces at-*fpc/pic/port* atm-options scheduler-maps]** hierarchy level:

```
edit interfaces at-fpc/pic/port atm-options scheduler-maps]
  vc-cos-mode (alternate | strict);
```

Two modes of CoS scheduling priority are supported:

- **alternate**—Assign **high** priority to one queue. The scheduling of the queues alternates between the **high** priority queue and the remaining queues. Every other scheduled packet is from the **high** priority queue.
- **strict**—Assign strictly **high** priority to one queue. A queue with strictly **high** priority is always scheduled before the remaining queues. The remaining queues are scheduled in round-robin fashion.

## Enabling the PLP Setting to Be Copied to the CLP Bit

For a PE router with customer edge (CE)-facing, egress, ATM2 IQ interfaces configured with standard AAL5 encapsulation, you can enable the PLP setting to be copied into the CLP bit.

**NOTE:** This configuration setting is not applicable to Layer 2 circuit encapsulations because the control word captures and preserves CLP information. For more information about Layer 2 circuit encapsulations, see [“Configuring Layer 2 Circuit Transport Mode” on page 60](#).

By default, at egress ATM2 IQ interfaces configured with standard AAL5 encapsulation, the PLP information is not copied to the CLP bit. This means the PLP information is not carried beyond the egress interface onto the CE router.

You can enable the PLP information to be copied into the CLP bit by including the **plp-to-clp** statement:

```
plp-to-clp;
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* atm-options]**

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

## Configuring ATM CoS on the Logical Interface

To apply the ATM scheduler map to a logical interface, include the **atm-scheduler-map** statement:

```
atm-scheduler-map (map-name | default);
```

For ATM CoS to take effect, you must configure the VCI and VPI identifiers and traffic shaping on each VC by including the following statements:

```
vci vpi-identifier.vci-identifier;
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For more information, see [“Configuring a Point-to-Point ATM1 or ATM2 IQ Connection” on page 132](#) and [“Defining the ATM Traffic-Shaping Profile Overview” on page 123](#).

You can also apply a scheduler map to the chassis traffic that feeds the ATM interfaces. For more information, see the *Class of Service User Guide (Routers and EX9200 Switches)*.

## Example: Configuring ATM2 IQ VC Tunnel CoS Components

Configure ATM2 IQ VC tunnel CoS components:

```
[edit interfaces]
at-1/2/0 {
  atm-options {
    vpi 0;
    linear-red-profiles red-profile-1 {
      queue-depth 35000 high-plp-threshold 75 low-plp-threshold 25;
    }
  }
  scheduler-maps map-1 {
    vc-cos-mode strict;
    forwarding-class best-effort {
```

```

        priority low;
        transmit-weight percent 25;
        linear-red-profile red-profile-1;
    }
}
}
unit 0 {
    vci 0.128;
    shaping {
        vbr peak 20m sustained 10m burst 20;
    }
    atm-scheduler-map map-1;
    family inet {
        address 192.168.0.100/32 {
            destination 192.168.0.101;
        }
    }
}
}

```

#### SEE ALSO

[Configuring a Point-to-Point ATM1 or ATM2 IQ Connection | 132](#)

[Defining the ATM Traffic-Shaping Profile Overview | 123](#)

[atm-scheduler-map | 303](#)

[vci | 414](#)

## Configuring ATM Scheduler on Ethernet VPLS over a Bridged ATM Interface

On M7i routers, M10i routers with Enhanced III FPCs, and M320 routers with Enhanced III FPCs, you can attach scheduler maps under ATM logical interfaces configured with Ethernet VPLS over ATM (bridging) encapsulation.

The following configuration tasks are required:

- Define the **scheduler-maps** statement at the **[edit interfaces at-fpc/pic/port atm-options]** hierarchy level, as follows:

```
[edit interfaces at-fpc/pic/port atm-options]
```

```
scheduler-maps map-name {
    forwarding-class (class-name | assured-forwarding | best-effort
    expedited-forwarding | network-control);
    vc-cos-mode strict;
}
```

- Include the encapsulation **ether-vpls-over-atm-llc** statement at the **[edit interfaces at-fpc/pic/port unit logical-unit-number]** hierarchy level, as follows:

```
[edit interfaces at-fpc/pic/port unit logical-unit-number]
```

```
encapsulation ether-vpls-over-atm-llc;
```

- Include the **atm-scheduler-map** at the **[edit interfaces at-fpc/pic/port unit logical-unit-number]** hierarchy level, as follows.

```
[edit interfaces at-fpc/pic/port unit logical-unit-number]
```

```
atm-scheduler-map (map-name | default);
```

The scheduler map configured on the ATM device can be checked by using the PFE command **show atm slot number vpc** on the FPC console

## RELATED DOCUMENTATION

[encapsulation | 322](#)

[Example: Configuring ATM Scheduler Map on Ethernet VPLS over Bridged ATM Interfaces | 149](#)

## Example: Configuring ATM Scheduler Map on Ethernet VPLS over Bridged ATM Interfaces

This example describes sending packets between routers with ATM2 IQ interfaces using Ethernet VPLS over ATM encapsulation.

```
interfaces {
    at-1/2/3 {
        atm-options {
```



```

vpi 0;
scheduler-maps {
  cos-vpls {
    forwarding-class assured-forwarding {
      priority low;
      transmit-weight percent 10;
    }
    forwarding-class best-effort {
      priority low;
      transmit-weight percent 20;
    }
    forwarding-class expedited-forwarding {
      priority low;
      transmit-weight percent 30;
    }
    forwarding-class network-control {
      priority high;
      transmit-weight percent 40;
    }
  }
  unit 0 {
    encapsulation ether-vpls-over-atm-llc;
    vci 0.100;
    family vpls;
  }
  atm-scheduler-map cos-vpls;
}

```

For a proper routing setup, a routing-instance for the VPLS must be setup as well:

```

routing-instance {
  cos-test-v1 {
    instance-type vpls;
    interface at-1/2/3.0;
    route-distinguisher 10.10.10.1:1;
    vrf-target target:11111:1;
    protocols {
      vpls {
        site-range 10;
        site cos-test-v1-site1 {
          site-identifier 1;
        }
      }
    }
  }
}

```

```

    }
  }
}

```

## RELATED DOCUMENTATION

[encapsulation](#) | 322

[Configuring ATM Scheduler on Ethernet VPLS over a Bridged ATM Interface](#) | 148

## Configuring the ATM2 IQ EPD Threshold

### IN THIS SECTION

- [Example: Configuring the EPD Threshold for a Point-to-point ATM2 Interface](#) | 152
- [Example: Configuring the EPD Threshold for a Point-to-multipoint ATM2 Interface](#) | 153

The EPD threshold is a limit on the number of transmit cells that can be queued. Cells that exceed the limit are discarded. When a beginning of packet (BOP) cell is received, the VC's queue depth is checked against the EPD threshold. If the VC's queue depth exceeds the EPD threshold, the BOP cell and all subsequent cells in the packet are discarded. This prevents a single queue from draining all the buffers on the PIC.

By default, for UBR the EPD threshold is approximately 1 percent of the available cell buffers. If shaping is enabled, the default EPD threshold is proportional to the shaping rate according to the following formula:

$$\text{default epd-threshold} = \text{number of buffers} * \text{shaping rate} / \text{line rate}$$

By default, the software estimates how much buffer space is needed for each PVC. However, you can configure the per-VC buffer space. In general, ATM PVCs need larger buffers for data traffic and smaller buffers for time-sensitive applications. Unnecessarily deep buffers might cause excessive delays on congested PVCs. Overly shallow buffers might cause premature random early detection (RED) or tail packet drops in bursty conditions.

The minimum EPD threshold value is 48 cells. If the default EPD threshold formula results in an EPD threshold of less than 48 cells, the result will be ignored, and the minimum value of 48 cells will be used.

To set the EPD threshold of a PVC, include the **epd-threshold** statement:

```
epd-threshold cells;
```

For a list of hierarchy levels at which you can include this statement, see [epd-threshold](#).

The allowable range for EPD threshold varies by interface type, as shown in [Table 14 on page 152](#).

**Table 14: EPD Threshold Range by Interface Type**

Interface Type	EPD Range
1-port OC48	48 through 425,984 cells
1-port and 2-port OC12	48 through 425,984 cells
2-port OC3, DS3, and E3	48 through 212,992 cells
4-port DS3 and E3	48 through 106,496 cells

You should include the **epd-threshold** statement in the configuration of all the PVCs that you configure on an ATM2 IQ PIC. The **epd-threshold** statement performs two functions:

- It prevents head-of-line blocking because it limits the number of packets and therefore buffers that can be consumed by each configured PVC.
- It sets the maximum lifetime that can be sustained by packets over the PVC when traffic has oversubscribed the configured shaping contract.

If you add or change the EPD threshold on the VC, the logical interface associated with the VC is deleted and re-added.

On ATM2 IQ DS3 and E3 interfaces, you might be able to enter an EPD threshold or shaping parameter that exceeds the maximum threshold for these interfaces. If the configuration commits, the physical interface might indicate that it is up, but the logical interface fails. As a workaround, configure shaping parameters and EPD thresholds that do not exceed the bandwidth of the interface.

For information about configuring dual EPD thresholds on interfaces configured to use Layer 2 circuit trunk mode, see [“Configuring Two EPD Thresholds per Queue” on page 153](#).

### **Example: Configuring the EPD Threshold for a Point-to-point ATM2 Interface**

To configure the EPD threshold for a point-to-point ATM2 interface:

#### **On a Point-to-Point ATM2 Interface**

```
[edit interfaces at-1/0/0]
unit 0 {
  vci 0.123;
  epd-threshold 1300;
  ...
}
```

### Example: Configuring the EPD Threshold for a Point-to-multipoint ATM2 Interface

To configure the EPD threshold for a point-to-multipoint ATM2 interface:

#### On a Point-to-Multipoint ATM2 Interface

```
[edit interfaces at-1/0/1]
unit 0 {
  multipoint;
  family inet address 10.0.12.12/24 {
    multipoint-destination 10.0.12.14 vci 0.123 epd-threshold 1300;
    ...
  }
}
```

## Configuring Two EPD Thresholds per Queue

For ATM2 IQ interfaces configured to use Layer 2 circuit trunk mode, you can set two EPD thresholds that depend on the PLPs of the packets. When you set a threshold with the **epd-threshold** statement, it applies to packets that have a PLP of 0. When you set a threshold with the **plp1** statement, it applies to packets that have a PLP of 1. If you include the **plp1** statement in the configuration, you must also include the **epd-threshold** statement.

To configure two EPD thresholds, include the **epd-threshold** and **plp1** statements:

```
epd-threshold cells plp1 cells;
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* atm-options scheduler-maps *map-name* forwarding-class *class-name*]
- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The value you set with the **epd-threshold** statement (for PLP0) should be equal to or greater than the value you set with the **plp1** statement. EPD threshold ranges vary by interface type. See [Table 14 on page 152](#).

For general information about EPD thresholds, see [“Configuring the ATM2 IQ EPD Threshold” on page 151](#).

## Configuring the ATM2 IQ Transmission Weight

For ATM2 IQ interfaces configured with VPI shaping, you can control the number of cells a VCI can send each time the VCI has a turn to transmit by including the **transmit-weight** statement:

```
transmit-weight cells;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

VPI traffic shaping is not supported on point-to-multipoint interfaces.

The number of cells can be from 1 through 32,000. For a configuration example, see [“Example: Configuring ATM2 IQ Interfaces” on page 41](#).

## Configuring ATM-to-Ethernet Interworking

### IN THIS SECTION

- [ATM-to-Ethernet Interworking | 155](#)
- [Enabling ATM-to-Ethernet Interworking | 156](#)
- [Configuring the Ethernet Interface | 156](#)
- [Configuring Ethernet Encapsulation | 156](#)
- [Configuring the Outer VLAN Identifier | 156](#)
- [Configuring the Inner VLAN Identifier Range | 157](#)

- [Configuring the Physical Interface VPI | 157](#)
- [Configuring the ATM Logical Interface | 158](#)
- [Configuring the Protocol Family | 158](#)
- [Configuring the Logical Interface VPI | 158](#)
- [Configuring the Logical Interface VCI | 159](#)

## ATM-to-Ethernet Interworking

The ATM-to-Ethernet interworking feature is useful where ATM2 interfaces are used to terminate ATM DSLAM traffic. The ATM traffic can be forwarded with encapsulation type **ccc** (circuit cross-connect) to a local or remote Gigabit Ethernet IQ2 and IQ2-E or 10-Gigabit Ethernet IQ2 and IQ2-E interface or label-switched path (LSP). The ATM VPI and VCI are converted to stacked VLAN inner and outer VLAN tags.

These ATM-to-Ethernet interworking circuits can be mapped to individual logical interfaces configured on an ATM2 IQ interface and Gigabit Ethernet IQ2 and IQ2-E or 10-Gigabit Ethernet IQ2 and IQ2-E physical interface.

The ATM-to-Ethernet interworking cross-connect essentially provides Layer 2 switching, and statistics are reported at the logical interface level.

During conversion from ATM to Ethernet, the least significant 12 bits of the ATM cell VCI are copied to the Ethernet frame inner VLAN tag. Cells received on an ATM logical interface configured with encapsulation type **vlan-vci-ccc** and falling within the configured VCI range are reassembled into packets and forwarded to a designated Ethernet logical interface that is configured with encapsulation type **vlan-vci-ccc**.

During conversion from Ethernet to ATM, the Ethernet frame inner VLAN tags that fall within the configured range, are copied to the least significant 12 bits of the ATM cell VCI. The ATM logical interface uses its configured VPI when segmenting the Ethernet packets into cells.

ATM-to-Ethernet interworking is supported on M120, M320, and T Series routers.

ATM-to-Ethernet interworking is supported on MX Series routers with aggregated Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces. This feature is available on all Enhanced Queuing (EQ) DPCs and Enhanced DPCS for MX Series routers.

**NOTE:** This feature is *not* supported on MX Series routers with ATM interfaces.

For more information on MX Series ATM-to-Ethernet interworking, see the *MX Series Solutions Guide*.

The following sections discuss ATM-to-Ethernet interworking:

## Enabling ATM-to-Ethernet Interworking

To enable the ATM-to-Ethernet interworking cross-connect function, include the **vlan-vci-tagging** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]  
vlan-vci-tagging;
```

## Configuring the Ethernet Interface

Configure the Ethernet or aggregated Ethernet physical interface by including the **encapsulation** statement with the **vlan-vci-ccc** option at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]  
encapsulation vlan-vci-ccc;
```

When the encapsulation type **vlan-vci-ccc** is configured on the physical interface, all logical interfaces configured on the Ethernet interface must also have the encapsulation type set to **vlan-vci-ccc**.

## Configuring Ethernet Encapsulation

Configure the Ethernet logical interface by including the **encapsulation** statement with the **vlan-vci-ccc** option at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
encapsulation vlan-vci-ccc;
```

The chassis configuration cannot contain the **atm-l2circuit-mode** statement if any logical interfaces are configured with the **vlan-vci-ccc** encapsulation option.

## Configuring the Outer VLAN Identifier

Configure the Ethernet logical interface outer VLAN ID by including the **vlan-id** statement specifying the outer VLAN ID at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
vlan-id outer-vlan-identifier;
```

It is the administrator's responsibility to ensure that the outer VLAN tag and VPI match and the inner VLAN tags fall within the VCI range of the VPI.

The allowable VPI range is from 0 to 255. So the outer VLAN tags must not be configured for values above 255.

### Configuring the Inner VLAN Identifier Range

Configure the Ethernet logical interface inner VLAN ID range by including the **inner-vlan-id-range** statement and specifying the starting VLAN ID and ending VLAN ID at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
  inner-vlan-id-range start start-id end end-id;
```

VLAN IDs 0 and 4095 are reserved by IEEE 801.1q and must not be used for the inner or outer VLAN ID.

VCIs 0 through 31 are reserved for ATM management purposes by convention. Therefore inner VLAN IDs 1 through 31 should not be used.

VLAN ID 1 might be used by Ethernet switches for certain bridge management services, so using VLAN ID 1 for the inner or outer VLAN ID is discouraged.

### Configuring the Physical Interface VPI

Configure the ATM physical interface VPI by including the **vpi** statement at the **[edit interfaces *interface-name* atm-options]** hierarchy level:

```
[edit interfaces interface-name atm-options]  
  vpi virtual-path-identifier;
```

VPI 0 is reserved, and must not be used.

ATM F4/F5 OAM is not supported for VPIs used in ATM-to-Ethernet interworking cross-connects. Any F4/F5 OAM cells received are discarded.

Only one logical interface may be declared per virtual path specified in the **atm-options** statement hierarchy.

It is not necessary to dedicate all the VPIs of an ATM2 interface for ATM-to-Ethernet interworking cross-connects.



## Configuring the ATM Logical Interface

Configure the ATM logical interface by including the **encapsulation** statement and specifying the encapsulation type **vlan-vci-ccc** at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
encapsulation vlan-vci-ccc;
```

An ATM logical interface configured with the encapsulation type **vlan-vci-ccc** only supports the **epd-threshold**, **shaping**, **traps | no-traps**, **disable**, and **description** statements. No other configuration statements are supported. ATM interface CoS features are not supported by logical interfaces configured with the encapsulation type **vlan-vci-ccc**.

The ATM2 OC48 PIC does not support the encapsulation type **vlan-vci-ccc**.

The encapsulation type **vlan-vci-ccc** only supports the **ccc** protocol family. Attempts to configure any other interface protocol family are rejected.

## Configuring the Protocol Family

Configure the ATM logical interface protocol family by including the **family** statement and specifying the **ccc** option at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
family ccc;
```

## Configuring the Logical Interface VPI

Configure the ATM logical interface virtual path identifier by including the **vpi** statement at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
vpi virtual-path-identifier;
```

VPI 0 is reserved, and must not be used.

It is the administrator's responsibility to ensure the outer VLAN tag and VPI match and the inner VLAN tags fall within the VCI range of the VPI.

Once a VPI is used in an ATM-to-Ethernet interworking cross-connect, it cannot be used with any other logical interface, even if the **vpi.vci** value falls outside the VCI range for the cross-connect.

## Configuring the Logical Interface VCI

Configure the ATM logical interface virtual channel identifier range by including the **vci-range** statement and specifying the starting VCI and ending VCI at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
vci-range start start-vci end end-vci;
```

Do not use VCIs 0 through 31, which are reserved for ATM management purposes by convention.

### SEE ALSO

[encapsulation | 317](#)

[family | 332](#)

[inner-vlan-id-range | 351](#)

[vci-range | 415](#)

[vlan-id | 416](#)

[vlan-vci-tagging | 417](#)

[vpi \(ATM CCC Cell-Relay Promiscuous Mode\) | 418](#)

[vpi \(Logical Interface and Interworking\) | 420](#)

## Example: Configuring ATM-to-Ethernet Interworking

The following example shows the configuration of the ATM and Ethernet interfaces for an ATM-to-Ethernet interworking cross connect. In the example ATM DSLAM traffic is terminated on an ATM2 interface. The ATM traffic is forwarded using encapsulation type **vlan-vci-ccc** to a local Ethernet IQ2 and IQ2-E interface. See the topology in [Figure 5 on page 159](#).

Figure 5: ATM-to-Ethernet Interworking



In this example, the ATM traffic comes from the DSLAM to the router on ATM interface **at-4/0/0** and is forwarded out on Ethernet interface **ge-2/2/1**.

```
[edit interfaces]
ge-2/2/1 {
  vlan-vci-tagging;
  encapsulation vlan-vci-ccc;
  unit 0 {
    encapsulation vlan-vci-ccc;
    vlan-id 100;
    inner-vlan-id-range start 100 end 500;
  }
}
at-4/0/0 {
  atm-options {
    vpi 100;
  }
  unit 0 {
    encapsulation vlan-vci-ccc;
    family ccc;
    vpi 100;
    vci-range start 100 end 500;
  }
}
```

## RELATED DOCUMENTATION

| [Configuring ATM-to-Ethernet Interworking](#) | 154

## ATM-To-Ethernet Interworking on ATM MICs

ATM-to-Ethernet interworking supports transmission of ATM packets over Ethernet. It specifically provides support for exchange of Layer 2 and Layer 3 Protocol Data Units (PDUs) between ATM and Ethernet domains. On MX Series 5G Universal Routing Platforms with ATM MICs, you can exchange Ethernet frames between ATM and Ethernet domains over a MPLS pseudowire or a Layer 2 cross-connect by using translational cross connect (TCC). For more information about TCC, see *Circuit and Translational Cross-Connects Overview*.

Consider the following basic ATM-to-Ethernet Interworking topology where the provider edge router PE1 is connected to an ATM domain and the Provider Edge router PE2 is connected to an Ethernet domain

(see Figure 1). The customer edge routers CE1 and CE2 are customer-managed devices. The PE routers are connected by means of an MPLS pseudowire. The ATM traffic on the PE1–CE1 link can comprise untagged Ethernet frames over ATM format. The Ethernet traffic on PE2–CE2 link can comprise untagged, single-VLAN or double-VLAN tagged Ethernet frames depending on the configuration of the PE2 router.

For ATM-to-Ethernet Interworking, the virtual path identifier (VPI) and virtual circuit identifier (VCI) values on the ATM link are mapped to the outer and inner VLAN tag on the Ethernet link. Mapping implies that either the same value is copied or a one-to-one translation is performed. If VLAN translation is enabled, instead of copying the value, a one-to-one translation is performed on the Ethernet facing PE, using a lookup table.

ATM cells that are received on the PE1 router are reassembled into ATM Adaptation Layer 5 (AAL5) logical link control (LLC) frames. The router removes the header and footer and adds two VLAN tags (outer and inner) to the untagged Ethernet payload based on the configuration. The VLAN IDs must correspond to the VPI and VCI of the ATM cell. You must add an MPLS label before transmitting the dual-VLAN-tagged Ethernet frame over the MPLS pseudowire. You can also add other optional MPLS tags.

**NOTE:** If the AAL5 frame sent by CE1 is not encapsulated with LLC and if the untagged Ethernet payload includes the frame check sequence (FCS), PE1 rejects the AAL5 frame. Also, PE1 can transmit and receive only a dual VLAN-tagged Ethernet frame without FCS. Inclusion of FCS can result in packet drops or data corruption.

On the PE2 router, the MPLS label and optional MPLS tags are removed and the Ethernet frame is transmitted toward the CE2 router. You can modify or remove one or both VLAN tags before forwarding the frame to the CE2 router.

## Limitations

Following are the limitations of the ATM-to-Ethernet interworking feature on MX Series routers with ATM MICs:

- The ATM-to-Ethernet interworking feature is not backward compatible or does not interoperate with the ATM-Ethernet interworking feature supported on M Series and T Series Routers. The functionality is the same but the implementation is different.
- The total number of VCIs supported is 4000 for the ATM MIC. This is an existing system limit.
- If an ATM logical interface is configured with **vci-range** of *N* VCIs, then *N* VCIs are deducted from the available pool of 4000 VCIs.
- ATM quality of service (QoS) is not supported with the **vlan-vci-ccc** encapsulation. If you use the **vci-range** statement then the **vlan-vci-ccc** encapsulation supports multiple VCIs on a single logical interface. This is a hardware limitation.

## RELATED DOCUMENTATION

[Example: Configuring ATM-to-Ethernet Interworking on ATM MIC | 162](#)

# Example: Configuring ATM-to-Ethernet Interworking on ATM MIC

## IN THIS SECTION

- [Requirements | 162](#)
- [Overview | 162](#)
- [Configuration | 163](#)

This example shows how to configure the ATM and Ethernet interfaces for an ATM-to-Ethernet interworking cross-connect.

## Requirements

This example uses the following hardware and software components:

- One MX Series router with ATM MIC
- One MX Series router with Ethernet MIC
- Junos OS Release 16.1R1 or later release

## Overview

Configuring ATM-to-Ethernet Interworking enables exchange of Ethernet frames between an ATM domain and an Ethernet domain on MX Series routers with ATM MIC. The ATM domain can be connected to the Ethernet domain over an MPLS pseudowire.

## Topology

Consider a sample topology in which provider edge (PE) router (ATMRouter) is an MX Series router with an ATM MIC and PE router (EthernetRouter) is an MX Series router with an Ethernet MIC. CE1 and CE2 are the customer edge routers or customer-managed devices. ATMRouter and EthernetRouter are connected by means of an MPLS pseudowire. The ATM traffic between ATMRouter and CE1 comprises untagged Ethernet over ATM cells. The Ethernet traffic between EthernetRouter and CE2 comprises double-VLAN-tagged Ethernet frames.

When a packet is sent from CE1 to CE2 (ATM-to-Ethernet), ATMRouter accepts ATM cells from CE1 with virtual circuit identifier (VCI) in the range 10/50 to 10/100 and reassembles ATM cells into AAL5 frames. ATMRouter extracts the Ethernet frame from the AAL5 frame payload. ATMRouter adds two VLAN tags with VLAN IDs corresponding to the virtual path identifier (VPI) and VCI of the received ATM cell. The dual-tagged-Ethernet frame is then encapsulated into a MPLS packet and sent over the pseudowire to EthernetRouter.

EthernetRouter strips the MPLS encapsulation and the dual-VLAN-tagged Ethernet frame is sent to CE2. The outer VLAN ID is rewritten to 20 and the inner VLAN ID remains the same. The packet arrives at CE2.

The reverse happens when a packet is sent from CE2 to CE1.

## Configuration

### IN THIS SECTION

- [Configuring ATMRouter | 163](#)
- [Configuring EthernetRouter | 166](#)

To enable exchange of Ethernet frames between an ATM domain and an Ethernet domain according to the topology mentioned in the overview section, perform these tasks:

### Configuring ATMRouter

#### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the interfaces on ATMRouter:

1. To configure the MIC to use SONET framing, include the **framing** statement at the **[edit chassis]** hierarchy level.

```
[edit chassis]
user@host# set fpc 1 pic 0 framing sonet port 0 framing sonet speed oc3-stm1
```

2. In configuration mode, go to the **[edit interfaces]** hierarchy level. Configure the Ethernet core interface that connects ATMRouter to EthernetRouter and specify the description of the Ethernet interface for your reference.

```
[edit]
user@host# edit interfaces
user@host# edit ge-1/0/0
user@host# set description PE2Facing
```

3. Configure a logical unit for the Ethernet interface, specify the family as **inet**, and assign an IP address to the interface. Also, specify the family as **mpls** to enable ATMRouter to connect to EthernetRouter.

```
[edit interfaces ge-1/0/0]
user@host# edit unit 0
user@host# set family inet address 192.0.0.1/24
user@host # set family mpls
user@host# top
```

4. In configuration mode, at the **[edit interfaces]** hierarchy level, configure the ATM interface that connects to CE1 and specify the description of the ATM interface for your reference. Also, define the virtual path identifier for this interface by using the **vpi** statement and specify a value from 1 through 255. The value zero (0) is reserved and must not be used.

```
[edit]
user@host# edit interfaces
user@host# edit at-1/2/0
user@host# set description CE1Facing
user@host# set atm-options vpi 10
```

5. Configure a logical unit for the ATM interface. Also, configure the ATM logical interface by specifying the encapsulation and the protocol family. The encapsulation type **vlan-vci-vcc** supports only the **ccc** protocol family. Any attempts to configure any other interface protocol family is rejected.

```
[edit interfaces at-1/2/0]
user@host# edit unit 0
user@host# set encapsulation vlan-vci-vcc family ccc
```

6. Configure the VPI and VCI for the logical interface. The VPI value 0 is reserved and must not be used. VCI values from 0 through 31 are reserved for ATM management purposes by convention.

```
[edit interfaces at-1/2/0 unit 0]
user@host# set vpi 10 vci-range start 100 end 110
user@host# top
```

7. Configure the physical loopback interface at the **[edit interfaces]** hierarchy level.

```
[edit]
user@host# set interfaces lo0 unit 0 family inet address 198.51.100.1/32
```

8. Configure the route identifier that specifies the routing device's IP address. The router identifier is used by BGP and OSPF to identify the routing device from which a packet originated. The router identifier is usually the IP address of the local routing device. If you do not configure a router identifier, the IP address of the first interface to come online is used. This is usually the loopback interface. Otherwise, the first hardware interface with an IP address is used.

```
[edit]
user@host # set router-options router-id 198.51.100.1
```

9. At the **[edit protocols]** hierarchy level, configure the interface on which to configure MPLS as well as the loopback interface.

```
[edit protocols]
user@host# edit mpls
user@host# set interface ge-1/0/0.0
user@host# set interface lo0.0
user@host# top
```

10. At the **[edit protocols]** hierarchy level, configure a single-area OSPF network by specifying the area ID and associated interfaces (Ethernet interface and the loopback interface).

```
[edit protocols]
user@host# edit ospf
user@host# set area 0.0.0.0 interface ge-1/0/0.0
user@host# set area 0.0.0.0 interface lo0.0
user@host# top
```

11. Create an LDP instance on the Ethernet interface and the loopback interface at the **[edit]** hierarchy level. LDP is required as the signaling protocol for Layer 2 circuits.

```
[edit]
user@host# edit protocols ldp
user@host# set interface ge-1/0/0.0
user@host# set interface lo0.0
user@host# top
```



- Establish the Layer 2 circuit by specifying the **l2circuit** statement at the **[edit protocols]** hierarchy level. The neighbor parameter specifies the IP address of the PE neighbor. The interface name refers to the local CE-facing interface that forms the Layer 2 circuit. The VCI ID must match the ID of the PE neighbor.

```
[edit]
user@host# edit protocols l2circuit
user@host# edit neighbor 198.51.100.2 interface at-1/2/0.0
user@host# set static incoming label 1000000 outgoing label 1000000
user@host# set virtual-circuit-id 5
user@host# set no-control-word
user@host# set ignore-encapsulation-mismatch
user@host# set ignore-mtu-mismatch
```

## Configuring EthernetRouter

### Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure the interfaces on EthernetRouter:

- In configuration mode, go to the **[edit interfaces]** hierarchy level. Configure the Ethernet core interface that connects EthernetRouter to ATMRouter and specify the description of the Ethernet interface for your reference.

```
[edit]
user@host# edit interfaces
user@host# edit ge-1/0/0
user@host# set description PE1Facing
```

- Configure a logical unit for the Ethernet interface and specify the family as **inet** and assign an IP address to the Ethernet interface. Also, specify the family as **mpls** to enable EthernetRouter to connect to ATMRouter.

```
[edit interfaces ge-1/0/0]
user@host# edit unit 0
user@host# set family inet address 192.0.0.2/24
user@host# set family mpls
user@host# top
```

- At the **[edit interfaces]** hierarchy level, configure the Ethernet interface that connects to CE2 and specify the description of the interface for your reference. Also, specify **flexible-vlan-tagging** to support

transmission of 802.1Q VLAN single-tag and dual-tag frames on the same port. Specify **extended-vlan-ccc** as the encapsulation to enable tagging for translational cross-connect (TCC).

```
[edit]
user@host# edit interfaces
user@host# edit ge-1/0/1
user@host# set description CE2Facing
user@host# set flexible-vlan-tagging
user@ost# set encapsulation extended-vlan-ccc
user@host# set gigether-options ethernet-switch-profile tag-protocol-id [0x8100 0x9100 0x88a8]
```

4. Configure a logical unit for the Ethernet interface. Also, configure mixed tagging. Mixed tagging enables you to configure two logical interfaces on the same Ethernet port, one with single-tag framing and one with dual-tag framing. You can also specify the protocol family.

```
[edit interfaces ge-1/0/1]
user@host# edit unit 0
user@host# set vlan-tags outer 0x88a8.10 inner-range 0x8100.100-110
user2host# set family ccc;
```

5. Configure the physical loopback interface at the **[edit interfaces]** hierarchy level.

```
[edit]
user@host# set interfaces lo0 unit 0 family inet address 198.51.100.2/32
```

6. Configure the route identifier that specifies the routing device's IP address. The router identifier is used by BGP and OSPF to identify the routing device from which a packet originated. The router identifier is usually the IP address of the local routing device. If you do not configure a router identifier, the IP address of the first interface to come online is used. This is usually the loopback interface. Otherwise, the first hardware interface with an IP address is used.

```
[edit]
user@host # set router-options router-id 198.51.100.2
```

7. At the **[edit protocols]** hierarchy level, configure the interface on which to configure MPLS as well as the loopback interface.

```
[edit protocols]
user@host# edit mpls
user@host# set interface ge-1/0/0.0
```

```
user@host# set interface lo0.0
user@host# top
```

8. At the **[edit protocols]** hierarchy level, configure a single-area OSPF network by specifying the area ID and associated interfaces (Ethernet interface and the loopback interface).

```
[edit protocols]
user@host# edit ospf
user@host# set area 0.0.0.0 interface ge-1/0/0.0
user@host# set area 0.0.0.0 interface lo0.0
user@host# top
```

9. Create an LDP instance on the Ethernet interface and the loopback interface at the **[edit]** hierarchy level. LDP is required as the signaling protocol for Layer 2 circuits.

```
[edit]
user@host# edit protocols ldp
user@host# set interface ge-1/0/0.0
user@host# set interface lo0.0
user@host# top
```

10. Establish the Layer 2 circuit by specifying the **l2circuit** statement at the **[edit protocols]** hierarchy level. The neighbor parameter specifies the IP address of the PE neighbor. The interface name refers to the local CE-facing interface that forms the Layer 2 circuit. The VCI ID must match the ID of the PE neighbor.

```
[edit]
user@host# edit protocols l2circuit
user@host# edit neighbor 198.51.100.1 interface ge-1/0/1.0
user@host# set static incoming label 1000000 outgoing label 1000000
user@host# set virtual-circuit-id 5
user@host# set no-control-word
user@host# set ignore-encapsulation-mismatch
user@host# set ignore-mtu-mismatch
```

## RELATED DOCUMENTATION

[ATM-To-Ethernet Interworking on ATM MICs | 160](#)

[Verifying ATM-to-Ethernet Interworking Configuration on ATM MICs | 169](#)

## Verifying ATM-to-Ethernet Interworking Configuration on ATM MICs

### IN THIS SECTION

- Verifying That The ATM Interface on Router1 Is Configured Correctly | 169
- Verifying The Status of the MIC on Router1 | 170
- Verify That OSPF Configuration on Router1 Is Accurate | 170
- Verify That LDP Configuration on Router1 Is Accurate | 171
- Verify That Layer 2 Virtual Circuit Session Configuration on Router1 Is Accurate | 171
- Verifying That the Ethernet Interface on Router2 Is Configured Correctly | 172
- Verifying the Status of the MIC on Router2 | 172
- Verify That OSPF Configuration on Router2 Is Accurate | 173
- Verify That LDP Configuration on Router2 Is Accurate | 173
- Verify That Layer 2 Virtual Circuit Session Configuration on Router2 Is Accurate | 174

To verify that the ATM-to-Ethernet interworking feature is configured correctly, perform these tasks on both the routers:

### Verifying That The ATM Interface on Router1 Is Configured Correctly

#### Purpose

To verify that the ATM interface (at-1/2/0) on Router1 is configured correctly.

#### Action

From operational mode, enter the **show interfaces** command.

```
user@host> show interfaces at-1/2/0 terse
```

Interface	Admin	Link	Proto	Local	Remote
at-1/2/0	up	up			
at-1/2/0.0	up	up	ccc		
at-1/2/0.32767	up	up			

#### Meaning

The ATM interface on Router1 is operational.

### Verifying The Status of the MIC on Router1

**Purpose**

To verify the status of the MIC.

**Action**

From operational mode, enter the **show chassis fpc pic-status** command.

user@host> **show chassis fpc pic-status**

```
Slot 0 Online
  PIC 2 Online 10x 1GE(LAN) -EH SFP
  PIC 3 Online 10x 1GE(LAN) -EH SFP
Slot 1 Online
  PIC 0 Online 2xOC12/8xOC3 CC-CE
  PIC 2 Online 10x 1GE(LAN) SFP
  PIC 3 Online 10x 1GE(LAN) SFP
Slot 2 Online
  PIC 0 Online 4x 10GE(LAN) SFP+
```

**Meaning**

ATM MIC on FPC slot 1 is online and operational.

### Verify That OSPF Configuration on Router1 Is Accurate

**Purpose**

To verify that routers are adjacent and able to exchange OSPF data.

**Action**

From operational mode, enter the **show ospf neighbor** command.

user@host> **show ospf neighbor**

Address	Interface	State	ID	Pri	Dead
192.0.0.1	ge-1/0/0.0	Full	198.51.100.2	128	36

**Meaning**

The adjacent router is online and can accept OSPF data.

## Verify That LDP Configuration on Router1 Is Accurate

### Purpose

To view LDP session information.

### Action

From operational mode, enter the **show ldp session** command.

```
user@host> show ldp session
```

```
Address State Connection Hold time Adv. Mode
198.51.100.2 Operational Open 26 DU
```

### Meaning

The output indicates that the session is operational and that the connection is open. It also indicates that the session will close in 26 seconds.

## Verify That Layer 2 Virtual Circuit Session Configuration on Router1 Is Accurate

### Purpose

To view the Layer 2 virtual circuits from the local PE router (Router1) to its neighbors.

### Action

From operational mode, enter the **show l2circuit connections** command.

```
user@host> show l2circuit connections
```

```
Layer-2 Circuit Connections:
Legend for connection status (St)
EI -- encapsulation invalid NP -- interface h/w not present
MM -- mtu mismatch Dn -- down
EM -- encapsulation mismatch VC-Dn -- Virtual circuit Down
CM -- control-word mismatch Up -- operational
VM -- vlan id mismatch CF -- Call admission control failure
OL -- no outgoing label IB -- TDM incompatible bitrate
NC -- intf encaps not CCC/TCC TM -- TDM misconfiguration
BK -- Backup Connection ST -- Standby Connection
CB -- rcvd cell-bundle size bad SP -- Static Pseudowire
LD -- local site signaled down RS -- remote site standby
RD -- remote site signaled down HS -- Hot-standby Connection
XX -- unknown
Legend for interface status
```

```

Up -- operational
Dn -- down

Neighbor: 198.51.100.2
  Interface Type St Time last up # Up
trans
  at-1/0/0.0(vc 5) rmt Up May 24 22:01:44 2016
1
  Remote PE: 198.51.100.2, Negotiated control-word: No Encapsulation:
VLAN
  Incoming label: 299776, Outgoing label: 300192
  Negotiated PW status TLV: No
  Local interface: at-1/0/0.0, Status: Up, Encapsulation: VLAN Qin-Q
and VCI Interworking
  Flow Label Transmit: No, Flow Label Receive: No

```

### Meaning

The command output displays the Layer 2 virtual circuits from Router1 to its neighbors.

## Verifying That the Ethernet Interface on Router2 Is Configured Correctly

### Purpose

To verify that the Ethernet interface (ge-1/0/1) on Router2 is configured correctly.

### Action

From operational mode, enter the **show interfaces** command.

```
user@host> show interfaces ge-1/0/1 terse
```

```

Interface Admin Link Proto Local Remote
ge-1/0/1      up  up
ge-1/0/1.0    up  up  ccc
ge-1/0/1.32767 up  up  multiservice

```

### Meaning

The Ethernet interface on Router2 is operational.

## Verifying the Status of the MIC on Router2

### Purpose

To verify the status of the MIC.

### Action

From operational mode, enter the **show chassis fpc pic-status** command.

```
user@host> show chassis fpc pic-status
```

```
Slot 2 Online MPC Type 1 3D Q
  PIC 0 Online 10x 1GE(LAN) SFP
  PIC 1 Online 10x 1GE(LAN) SFP
  PIC 2 Online 2xOC12/8xOC3 CC-CE
  PIC 0 Online 4x 10GE(LAN) SFP+
```

### Meaning

MIC 2 on MPC slot 2 is online and operational.

## Verify That OSPF Configuration on Router2 Is Accurate

### Purpose

To verify that routers are adjacent and able to exchange OSPF data.

### Action

From operational mode, enter the **show ospf neighbor** command.

```
user@host> show ospf neighbor
```

Address	Interface	State	ID	Pri	Dead
192.0.0.1	ge-1/0/0.0	Full	198.51.100.0		128 32

### Meaning

The adjacent router is online and can accept OSPF data.

## Verify That LDP Configuration on Router2 Is Accurate

### Purpose

To view LDP session information.

### Action

From operational mode, enter the **show ldp session** command.

```
user@host> show ldp session
```



```
Address State Connection Hold time Adv. Mode
198.51.100.0 Operational Open 22 DU
```

### Meaning

The output indicates that the session is operational and that the connection is open. It also indicates that the session will close in 22 seconds.

## Verify That Layer 2 Virtual Circuit Session Configuration on Router2 Is Accurate

### Purpose

To view the Layer 2 virtual circuits from the local PE router (Router2) to its neighbors.

### Action

From operational mode, enter the **show l2circuit connections** command.

```
user@host> show l2circuit connections
```

```
Layer-2 Circuit Connections:
Legend for connection status (St)
EI -- encapsulation invalid NP -- interface h/w not present
MM -- mtu mismatch Dn -- down
EM -- encapsulation mismatch VC-Dn -- Virtual circuit Down
CM -- control-word mismatch Up -- operational
VM -- vlan id mismatch CF -- Call admission control failure
OL -- no outgoing label IB -- TDM incompatible bitrate
NC -- intf encaps not CCC/TCC TM -- TDM misconfiguration
BK -- Backup Connection ST -- Standby Connection
CB -- rcvd cell-bundle size bad SP -- Static Pseudowire
LD -- local site signaled down RS -- remote site standby
RD -- remote site signaled down HS -- Hot-standby Connection
XX -- unknown
Legend for interface status
Up -- operational
Dn -- down

Neighbor: 198.51.100.0
Interface Type St Time last up # Up
trans
ge-1/0/1.0(vc 5) rmt Up May 24 22:01:45 2016
1
Remote PE: 198.51.100.0, Negotiated control-word: No Encapsulation:
VLAN Qin-Q and VCI Interworking
```

```

Incoming label: 300192, Outgoing label: 299776                               Negotiated PW
status TLV: No
Local interface: ge-1/0/1.0, Status: Up, Encapsulation: VLAN
Flow Label Transmit: No, Flow Label Receive: No

```

### Meaning

The command output displays the Layer 2 virtual circuits from Router2 to its neighbors.

### RELATED DOCUMENTATION

[ATM-To-Ethernet Interworking on ATM MICs | 160](#)

[Example: Configuring ATM-to-Ethernet Interworking on ATM MIC | 162](#)

## Configuring the Junos OS to Enable ATM2 Intelligent Queuing Layer 2 Circuit Transport Mode

On ATM2 IQ PICs only, you can configure Layer 2 circuit cell relay, Layer 2 circuit ATM Adaptation Layer 5 (AAL5), or Layer 2 circuit trunk mode.

Layer 2 circuit cell relay and Layer 2 circuit AAL5 are defined in the Internet draft *draft-martini-l2circuit-encap-mpls-04.txt*, *Encapsulation Methods for Transport of Layer 2 Frames Over IP and MPLS Networks*.

Layer 2 circuit trunk mode allows you to send ATM cells over Multiprotocol Label Switching (MPLS) trunking.

The four transport modes are defined as follows:

- To tunnel IP packets over an ATM backbone, use the default standard AAL5 transport mode.
- To tunnel a stream of AAL5-encoded ATM segmentation-and-reassembly protocol data units (SAR-PDUs) over an MPLS or IP backbone, use Layer 2 circuit AAL5 transport mode.
- To tunnel a stream of ATM cells over an MPLS or IP backbone, use Layer 2 circuit cell-relay transport mode.
- To transport ATM cells over an MPLS core network that is implemented on some other vendor switches, use Layer 2 circuit trunk mode.

**NOTE:** You can transport AAL5-encoded traffic with Layer 2 circuit cell-relay transport mode, because Layer 2 circuit cell-relay transport mode ignores the encoding of the cell data presented to the ingress interface.

When you configure AAL5 mode Layer 2 circuits, the control word carries cell loss priority (CLP) information by default.

By default, ATM2 IQ PICs are in standard AAL5 transport mode. Standard AAL5 allows multiple applications to tunnel the protocol data units of their Layer 2 protocols over an ATM virtual circuit. To configure the Layer 2 circuit transport modes, include the **atm-l2circuit-mode** statement at the **[edit chassis fpc slot-number pic pic-number]** hierarchy level:

```
[edit chassis fpc slot-number pic pic-number]
atm-l2circuit-mode (cell | aal5 | trunk trunk);
```

On a TX Matrix or TX Matrix Plus router, include the **atm-l2circuit-mode** statement at the **[edit chassis lcc number fpc slot-number pic pic-number]** hierarchy level:

```
[edit chassis lcc number fpc slot-number pic pic-number]
atm-l2circuit-mode (cell | aal5 | trunk trunk);
```

**aal5** tunnels a stream of AAL5-encoded ATM cells over an IP backbone.

**cell** tunnels a stream of ATM cells over an IP backbone.

**trunk** transports ATM cells over an MPLS core network that is implemented on some other vendor switches. Trunk mode can be user-to-network interface (UNI) or network-to-network interface (NNI).

**NOTE:** To determine which vendors support Layer 2 circuit trunk mode, contact Juniper Networks customer support.

## RELATED DOCUMENTATION

[Configuring the Junos OS to Support ILMI for Cell Relay Encapsulation on an ATM2 IQ PIC | 179](#)

[Configuring the Junos OS to Enable Idle Cell Format and Payload Patterns for ATM Devices | 177](#)

[Configuring the Junos OS to Use ATM Cell-Relay Accumulation Mode on an ATM1 PIC | 178](#)

## Configuring the Junos OS to Enable Idle Cell Format and Payload Patterns for ATM Devices

ATM devices send idle cells to enable the receiving ATM interface to recognize the start of each new cell. The receiving ATM device does not act on the contents of idle cells and does not pass them up to the ATM layer in the ATM protocol stack.

By default, the idle cell format for ATM cells is (4 bytes): 0x00000000. For ATM 2 PICs and ATM MICs, you can configure the format of the idle cell header and payload bytes.

To configure the idle cell header to use the International Telecommunications Union (ITU-T) standard of 0x00000001, include the **itu-t** statement at the **[edit chassis fpc slot-number pic number idle-cell-format]** hierarchy level:

```
[edit chassis fpc slot-number pic pic-number idle-cell-format]
itu-t;
```

On a TX Matrix or TX Matrix Plus router, include the **itu-t** statement at the **[edit chassis lcc number fpc slot-number pic pic-number idle-cell-format]** hierarchy level:

```
[edit chassis lcc number fpc slot-number pic pic-number idle-cell-format]
itu-t;
```

By default, the payload pattern is cell payload (48 bytes). To configure the idle cell payload pattern, include the **payload-pattern** statement at the **[edit chassis fpc slot-number pic pic-number idle-cell-format]** hierarchy level:

```
[edit chassis fpc slot-number pic pic-number idle-cell-format]
payload-pattern payload-pattern-byte;
```

On a TX Matrix router, include the **payload-pattern** statement at the **[edit chassis lcc number fpc slot-number pic pic-number idle-cell-format]** hierarchy level:

```
[edit chassis lcc number fpc slot-number pic pic-number idle-cell-format]
payload-pattern payload-pattern-byte;
```

The payload pattern byte can range from **0x00** through **0xff**.

For information about the TX Matrix router, see *TX Matrix Router and T640 Router Configuration Overview*. For information about the TX Matrix Plus router, see *TX Matrix Plus Router Configuration Overview*.

## RELATED DOCUMENTATION

---

[Configuring the Junos OS to Use ATM Cell-Relay Accumulation Mode on an ATM1 PIC | 178](#)


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[Configuring the Junos OS to Enable ATM2 Intelligent Queuing Layer 2 Circuit Transport Mode | 175](#)


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[Configuring the Junos OS to Support ILMI for Cell Relay Encapsulation on an ATM2 IQ PIC | 179](#)


---

[Configuring Layer 2 Circuit Transport Mode on ATM MICs | 72](#)


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[Example: Configuring Layer 2 Circuit Transport Mode on ATM MICs | 73](#)

## Configuring the Junos OS to Use ATM Cell-Relay Accumulation Mode on an ATM1 PIC

You can configure an Asynchronous Transfer Mode (ATM) 1 PIC to use cell-relay accumulation mode. In this mode, the incoming cells (one to eight cells) are packaged into a single packet and forwarded to the label-switched path (LSP). At the edge router, this packet is divided into individual cells and transmitted over the ATM interface.

**NOTE:** When you configure an ATM PIC to use cell-relay accumulation, all ports on the ATM PIC use cell-relay accumulation mode.

To configure an ATM PIC to use cell-relay accumulation mode, include the **atm-cell-relay-accumulation** statement at the **[edit chassis fpc slot-number pic pic-number]** hierarchy level:

```
[edit chassis fpc slot-number pic pic-number ]
  atm-cell-relay-accumulation;
```

On a TX Matrix or TX Matrix Plus router, include the **atm-cell-relay-accumulation** statement at the **[edit chassis lcc number fpc slot-number pic pic-number]** hierarchy level:

```
[edit chassis lcc number fpc slot-number pic pic-number]
  atm-cell-relay-accumulation;
```

## RELATED DOCUMENTATION

---

[Configuring the Junos OS to Enable ATM2 Intelligent Queuing Layer 2 Circuit Transport Mode | 175](#)


---

[Configuring the Junos OS to Support ILMI for Cell Relay Encapsulation on an ATM2 IQ PIC | 179](#)

## Configuring the Junos OS to Support ILMI for Cell Relay Encapsulation on an ATM2 IQ PIC

Integrated Local Management Interface (ILMI) is supported on AAL5 interfaces, regardless of transport mode. To enable ILMI on interfaces with cell-relay encapsulation, you must configure an ATM2 IQ PIC to use Layer 2 circuit trunk transport mode.

To configure ILMI on an interface with cell-relay encapsulation, include the following statements:

```
[edit chassis fpc slot-number pic pic-number]  
atm-l2circuit-mode trunk trunk;  
[edit interfaces at-fpc/pic/port]  
encapsulation atm-ccc-cell-relay;  
atm-options {  
    ilmi;  
    pic-type atm2;  
}  
unit logical-unit-number {  
    trunk-id number;  
}
```

### RELATED DOCUMENTATION

[Configuring the Junos OS to Enable ATM2 Intelligent Queuing Layer 2 Circuit Transport Mode](#) | 175

# Configuring Passive Monitoring on ATM Interfaces

## IN THIS CHAPTER

- [Enabling Passive Monitoring on ATM Interfaces | 180](#)
- [Removing MPLS Labels from Incoming Packets | 181](#)

## Enabling Passive Monitoring on ATM Interfaces

The Monitoring Services I and Monitoring Services II PICs are designed to enable IP services. If you have a Monitoring Services PIC and an ATM PIC installed in an M Series, MX Series, or T Series router, you can monitor IPv4 and IPv6 traffic from another router.

On ATM interfaces, you enable packet flow monitoring by including the **passive-monitor-mode** statement at the **[edit interfaces at-*fpc/pic/port*]** hierarchy level:

```
[edit interfaces at-fpc/pic/port]  
passive-monitor-mode;
```

If you include the **passive-monitor-mode** statement in the configuration, the ATM interface is always up, and the interface does not receive or transmit incoming control packets, such as OAM cell and ILMI.

On monitoring services interfaces, you enable packet flow monitoring by including the **family** statement at the **[edit interfaces mo-*fpc/pic/port* unit *logical-unit-number*]** hierarchy level, specifying the **inet** option:

```
[edit interfaces mo-fpc/pic/port unit logical-unit-number]  
family inet;
```

For conformity with cflowd record structure, you must include the **receive-options-packets** and **receive-ttl-exceeded** statements at the **[edit interfaces mo-*fpc/pic/port* unit *logical-unit-number* family *inet*]** hierarchy level:

```
[edit interfaces mo-fpc/pic/port unit logical-unit-number family inet]  
receive-options-packets;
```

```
receive-ttl-exceeded;
```

## RELATED DOCUMENTATION

| *Configuring Multiservice Physical Interface Properties*

## Removing MPLS Labels from Incoming Packets

The Junos OS can forward only IPv4 packets to a Monitoring Services PIC. IPv4 packets with MPLS labels cannot be forwarded to a Monitoring Services PIC. By default, if packets with MPLS labels are forwarded to the Monitoring Services PIC, they are discarded. To monitor packets with MPLS labels, you must remove the MPLS labels as the packets arrive on the interface.

You can remove up to two MPLS labels from an incoming packet by including the **pop-all-labels** statement at the **[edit interfaces *interface-name* atm-options mpls]** hierarchy level:

```
[edit interfaces interface-name atm-options mpls]
pop-all-labels {
  required-depth number;
}
```

**NOTE:** On T Series devices, the **pop-all-labels** command can remove up to five MPLS labels from incoming packets.

By default, the **pop-all-labels** statement takes effect for incoming packets with one or two labels. You can specify the number of MPLS labels an incoming packet must have for the **pop-all-labels** statement to take effect by including the **required-depth** statement at the **[edit interfaces *interface-name* atm-options mpls pop-all-labels]** hierarchy level:

```
[edit interfaces interface-name atm-options mpls pop-all-labels]
required-depth number;
```

The required depth can be **1**, **2**, or **[ 1 2 ]**. If you include the **required-depth 1** statement, the **pop-all-labels** statement takes effect for incoming packets with one label only. If you include the **required-depth 2** statement, the **pop-all-labels** statement takes effect for incoming packets with two labels only. If you include the **required-depth [ 1 2 ]** statement, the **pop-all-labels** statement takes effect for incoming packets



with one or two labels. A required depth of [ 1 2 ] is equivalent to the default behavior of the **pop-all-labels** statement.

When you remove MPLS labels from incoming packets, note the following:

- The **pop-all-labels** statement has no effect on IP packets with three or more MPLS labels.
- When you enable MPLS label removal, you must configure all ports on a PIC with the same label popping mode and required depth.
- You use the **pop-all-labels** statement to enable passive monitoring applications, not active monitoring.
- You cannot apply MPLS filters or accounting to the MPLS labels because the labels are removed as soon as the packet arrives on the interface.
- The following ATM encapsulation types are not supported on interfaces with MPLS label removal:
  - atm-ccc-cell-relay
  - atm-ccc-vc-mux
  - atm-mlppp-llc
  - atm-tcc-snap
  - atm-tcc-vc-mux
  - ether-over-atm-llc
  - ether-vpls-over-atm-llc

## RELATED DOCUMENTATION

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[atm-options](#) | 301

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[mpls](#) | 360

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[pop-all-labels](#) | 374

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[required-depth](#) | 383

# 2

PART

## ATM-over-ADSL Interfaces

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Configuring ATM-over-ADSL Interfaces | **186**

---

# ATM-over-ADSL Interfaces Overview

## IN THIS CHAPTER

- [ATM-over-ADSL Overview | 184](#)

## ATM-over-ADSL Overview

You configure the underlying ADSL as an ATM interface with an interface name of **at-pim/0/port**. Multiple encapsulation types are supported on both the physical and logical ATM-over-ADSL interface.

You can configure Point-to-Point Protocol over Ethernet (PPPoE) over ATM to connect through DSL lines. For PPPoE on an ATM-over-ADSL interface, you must configure encapsulation on both the physical and logical interfaces. To configure encapsulation on an ATM-over-ADSL physical interface, use Ethernet over ATM encapsulation. To configure encapsulation on an ATM-over-ADSL logical interface, use the PPPoE over AAL5 LLC encapsulation. LLC encapsulation allows a single ATM virtual connection to transport multiple protocols.

**NOTE:** PPPoE encapsulation is not supported on an M120 router with ATM2 PICs.

When you configure a point-to-point encapsulation such as PPP on a physical interface, the physical interface can have only one logical interface (only one **unit** statement) associated with it.

For more information about configuring PPPoE, see *Configuring PPPoE*.

## RELATED DOCUMENTATION

---

[Configuring the ATM-over-ADSL Virtual Path Identifier | 187](#)

---

[Configuring the ATM-over-ADSL Physical Interface Operating Mode | 187](#)

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[Configuring the ATM-over-ADSL Physical Interface Encapsulation Type | 189](#)

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[Configuring the ATM-over-ADSL Logical Interface Encapsulation Type | 189](#)

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[Configuring the ATM-over-ADSL Protocol Family | 191](#)

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## Configuring ATM-over-ADSL Interfaces

### IN THIS CHAPTER

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### Configuring Physical ATM Interfaces and Logical Interface Properties for ADSL

To configure physical ATM interfaces for ADSL, include the **vpi 0** statement at the **[edit interfaces at-pim/0/port atm-options]** hierarchy level, the **operating-mode** statement at the **[edit interfaces at-pim/0/port dsl-options]** hierarchy level, and the **encapsulation** statement at the **[edit interfaces at-pim/0/port]** hierarchy level:

```
[edit interfaces at-pim/0/port]
atm-options {
    vpi 0;
}
dsl-options {
    operating-mode mode;
}
encapsulation (atm-pvc | ethernet-over-atm);
```

Configure logical interface properties by including the **encapsulation** statement, **family** statement, and **vci** statement:

```
unit logical-unit-number {
```

```

encapsulation (atm-vc-mux | atm-nlpd | atm-cisco-nlpd | atm-snap | atm-ppp-vc-mux | atm-ppp-llc |
ether-over-atm-llc | ppp-over-ether-over-atm-llc);
family inet {
    vci vpi-identifier.vci-identifier;
}
}

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

## RELATED DOCUMENTATION

[Configuring the ATM-over-ADSL Virtual Path Identifier | 187](#)

[Configuring the ATM-over-ADSL Physical Interface Operating Mode | 187](#)

[Configuring the ATM-over-ADSL Physical Interface Encapsulation Type | 189](#)

[Configuring the ATM-over-ADSL Logical Interface Encapsulation Type | 189](#)

[Configuring the ATM-over-ADSL Protocol Family | 191](#)

[Configuring the ATM-over-ADSL Virtual Channel Identifier | 191](#)

## Configuring the ATM-over-ADSL Virtual Path Identifier

Set the ATM virtual path identifier (VPI) to 0 (zero) by including the **vpi 0** statement at the [edit interfaces *at-pim/0/port atm-options*] hierarchy level:

```

[edit interfaces at-pim/0/port atm-options]
vpi 0;

```

## Configuring the ATM-over-ADSL Physical Interface Operating Mode

Configure the ADSL operating mode on the physical ATM interface by including the **operating-mode** statement at the [edit interfaces *at-pim/0/port dsl-options*] hierarchy level:

```
[edit interfaces at-pim/0/port dsl-options]
operating-mode (adsl2plus | ansi-dmt | auto | etsi | itu-annexb-non-ur2 | itu-annexb-ur2 | itu-dmt | itu-dmt-bis);
```

By default, the mode is **auto**, which means the ADSL line autonegotiates the setting to match the setting of the DSLAM located at the central office.

Table 15 on page 188 shows the Annex A PIM and Annex B PIM operational modes for ATM-over-ADSL interfaces.

**Table 15: ATM-over-ADSL Operational Modes**

Encapsulation Types	Comments
<b>Annex A PIMs</b>	
<b>adsl2plus</b>	Set the ADSL line to train in the ITU G.992.5 mode.
<b>ansi-dmt</b>	Set the ADSL line to train in the ANSI T1.413 Issue 2 mode.
<b>auto</b>	Set the ADSL line to autonegotiate the setting to match the setting of the DSLAM located at the central office.  The ADSL line trains in the ANSI T1.413 Issue 2 ( <b>ansi-dmt</b> ) or ITU G.992.1 ( <b>itu-dmt</b> ) mode.
<b>itu-dmt</b>	Set the ADSL line to train in the ITU G.992.1 mode.
<b>itu-dmt-bis</b>	Set the ADSL line to train in the ITU G.992.3 mode.
<b>itu-lite</b>	Set the ADSL line to train in the G.992.2 mode.
<b>itu-lite-bis</b>	Set the ADSL line to train in the G.992.4 mode.
<b>Annex B PIMs</b>	
<b>adsl2plus</b>	Set the ADSL line to train in the ITU G.992.5 mode.
<b>auto</b>	Set the ADSL line after autonegotiating the setting to match the setting of the DSLAM located at the central office.
<b>etsi</b>	Set the ADSL line to train in the ETSI TS 101 388 V1.3.1 mode.

Table 15: ATM-over-ADSL Operational Modes (*continued*)

Encapsulation Types	Comments
itu-dmt	Set the ADSL line to train in the ITU G.992.1 mode.
itu-dmt-bis	Set the ADSL line to train in the ITU G.992.3 mode.
itu-annexb-ur2	Set the ADSL line to train in the ITU G.992.1 Deutsche Telekom UR-2 mode.
itu-annexb-non-ur2	Set the ADSL line to train in the ITU G.992.1 non-UR-2 mode.
itu-dmt	Set the ADSL line to train in the ITU G.992.1 mode.

## Configuring the ATM-over-ADSL Physical Interface Encapsulation Type

Configure the physical interface encapsulation type by including the **encapsulation** statement at the **[edit interfaces at-pim/0/port]** hierarchy level:

```
[edit interfaces at-pim/0/port]
encapsulation type;
```

Table 16 on page 190 shows the physical interface encapsulation types for ATM-over-ADSL interfaces.

## Configuring the ATM-over-ADSL Logical Interface Encapsulation Type

Configure the logical interface encapsulation type by including the **encapsulation** statement:

```
[edit interfaces at-pim/0/port unit logical-unit-number]
encapsulation type;
```

You can include this statement at the following hierarchy levels:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

Table 16 on page 190 shows the logical interface encapsulation types for ATM-over-ADSL interfaces.



Table 16: ATM-over-ADSL Encapsulation Types

Encapsulation Types	Comments
<b>Physical Interface</b>	
<b>ether-over-atm</b>	<p>Ethernet over ATM encapsulation.</p> <p>Use this type of encapsulation for interfaces that carry IPv4 traffic.</p>
<b>atm-pvc</b>	ATM permanent virtual circuits (PVCs).
<b>Logical Interface</b>	
<b>atm-vc-mux</b>	<p>Use ATM VC multiplex encapsulation.</p> <p>You can only configure the <b>inet</b> family when you use this type of encapsulation.</p>
<b>atm-nlpd</b>	<p>Use ATM network layer protocol ID (NLPD) encapsulation.</p> <p>You can only configure the <b>inet</b> family when you use this type of encapsulation.</p>
<b>atm-cisco-nlpd</b>	<p>Use Cisco NLPD encapsulation.</p> <p>You can only configure the <b>inet</b> family when you use this type of encapsulation.</p>
<b>atm-snap</b>	Use ATM subnetwork attachment point (SNAP) encapsulation.
<b>atm-ppp-vc-mux</b>	Use PPP over ATM AAL5 multiplex encapsulation.
<b>atm-ppp-llc</b>	Use ATM PPP over AAL5 logical link control (LLC) encapsulation.
<b>ether-over-atm-llc</b>	<p>Use Ethernet over LLC encapsulation for interfaces that carry IPv4 traffic.</p> <p>You cannot configure multipoint interfaces if you use this type of encapsulation.</p>

Table 16: ATM-over-ADSL Encapsulation Types (*continued*)

Encapsulation Types	Comments
<b>ppp-over-ether-over-atm-llc</b>	<p>Use PPP over Ethernet over ATM LLC encapsulation.</p> <p>You cannot configure the interface address when you use this encapsulation type. Instead, you configure the interface address on the PPP interface.</p>

## Configuring the ATM-over-ADSL Protocol Family

Configure the protocol family type by including the **family** statement:

```
[edit interfaces at-pim/0/port unit logical-unit-number]
family family;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

## Configuring the ATM-over-ADSL Virtual Channel Identifier

Configure the virtual channel identifier (VCI) type and value by including the **vci** statement:

```
[edit interfaces at-pim/0/port unit logical-unit-number]
vci vpi-identifier.vci-identifier;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

# 3

PART

## ATM-over-SHDSL Interfaces

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Configuring ATM-over-SHDSL Interfaces | **193**

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# Configuring ATM-over-SHDSL Interfaces

## IN THIS CHAPTER

- Configuring ATM Mode for SHDSL Overview | 193
- Configuring ATM Mode on the PIM | 195
- Configuring SHDSL Operating Mode on an ATM Physical Interface | 196
- Configuring Encapsulation on the ATM Physical Interface | 197
- Configuring Logical Interface Properties | 197
- Example: Configuring an ATM-over-SHDSL Interface | 199
- Verifying an ATM-over-SHDSL Interface Configuration | 200

## Configuring ATM Mode for SHDSL Overview

To configure the ATM mode for SHDSL, include the **pic-mode** statement at the **[edit chassis fpc fpc-number pic 0 shdsl]** hierarchy level:

```
[edit chassis]
fpc fpc-number {
  pic 0 {
    shdsl {
      pic-mode (1-port-atm | 2-port-atm);
    }
  }
}
```

For more information about configuring the ATM mode, see the *Junos OS Administration Library* and the *Junos OS Interfaces and Routing Configuration Guide*.

To configure SHDSL operating mode on the physical ATM interface and set the encapsulation, include the **shdsl-options** statement and the **encapsulation** statement at the **[edit interfaces at-pim/0/port]** hierarchy level:

```
[edit interfaces at-pim/0/port]
shdsl-options {
  annex (annex-a | annex-b);
  line-rate line-rate;
  loopback (local remote);
  snr-margin {
    snext margin;
  }
  encapsulation (atm-pvc | ethernet-over-atm)
}
```

To configure ATM virtual path identifier (VPI) options for the interface, include the **vpi** statement at the **[edit interfaces *interface-name* atm-options]** hierarchy level:

```
[edit interfaces interface-name]
atm-options {
  vpi vpi-identifier {
    maximum-vcs maximum-vcs;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
  }
}
```

For more information about configuring ATM VPI options, see [“Configuring the Maximum Number of ATM1 VCs on a VP” on page 51](#).

To configure logical interface properties, include the **encapsulation** statement, **family** statement, and **vci** statement:

```
unit logical-unit-number {
  encapsulation type;
  family inet {
    vci vpi-identifier.vci-identifier;
  }
}
```

You can include these statements at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number*]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]**

## RELATED DOCUMENTATION

<a href="#">Configuring ATM Mode on the PIM   195</a>
<a href="#">Configuring SHDSL Operating Mode on an ATM Physical Interface   196</a>
<a href="#">Configuring Encapsulation on the ATM Physical Interface   197</a>
<a href="#">Configuring Logical Interface Properties   197</a>
<a href="#">Example: Configuring an ATM-over-SHDSL Interface   199</a>
<a href="#">Verifying an ATM-over-SHDSL Interface Configuration   200</a>

## Configuring ATM Mode on the PIM

You can configure only one mode on each 2-port SHDSL PIM.

The two-wire mode supports autodetection of the line rate or fixed line rate and network speeds from 192 Kbps to 2.3 Kbps in 64-Kbps increments.

For information about configuring Annex A or Annex B, see [“Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 196](#).

To configure the ATM mode for SHDSL, include the **pic-mode** statement at the **[edit chassis fpc fpc-number pic 0 shdsl]** hierarchy level:

```
[edit chassis]
fpc fpc-number {
  pic 0 {
    shdsl {
      pic-mode (1-port-atm | 2-port-atm);
    }
  }
}
```

The default is 2-wire (two-port ATM) mode. To set the default explicitly, specify the **2-port-atm** option. For 4-wire (single-port ATM) mode, specify the **1-port-atm** option.

For more information about configuring the **pic-mode** statement, see the *Junos OS Administration Library*. For information about configuring the ATM mode, see the *Junos OS Interfaces and Routing Configuration Guide*.

## Configuring SHDSL Operating Mode on an ATM Physical Interface

To configure the SHDSL operating mode on the physical ATM interface, include the **shdsl-options** statement at the **[edit interfaces at-pim/0/port]** hierarchy level:

```
[edit interfaces at-pim/0/port]
shdsl-options {
  annex (annex-a | annex-b);
  line-rate line-rate;
  loopback (local | remote);
  snr-margin {
    snext margin;
  }
}
```

Configure the following SHDSL options:

- **annex**—The type of annex:
  - **annex-a**—Use for North American SHDSL network implementations.
  - **annex-b**—Use for European SHDSL network implementations.
- **line-rate**—The SHDSL line rate. The default for 2-wire mode is auto. The default for 4-wire mode is 4608 Kbps.
- **loopback**—A loopback connection, **local** or **remote**.
  - **local**—Use to troubleshoot physical PIC errors. A local loopback loops packets, including both data and timing information, back on the local router's PIM.
  - **remote**—Use to troubleshoot physical circuit problems between the local router and the remote router. A remote loopback loops packets, including both data and timing information, back on the remote router's PIC.
- **snr-margin**— The SHDSL signal-to-noise ratio (SNR) margin, **current** or **snext**. The SNR margin is the difference between the desired SNR and the actual SNR.
  - **current**—Current SNR is the difference between desired SNR and the actual SNR. When configured, the line trains at higher than current noise margin plus SNR threshold.
  - **snext**—Self-near-end crosstalk (SNEXT) SNR margin line trains the line at higher than SNEXT threshold.

## Configuring Encapsulation on the ATM Physical Interface

To configure the type of encapsulation for the physical ATM interface, include the **encapsulation** statement at the **[edit interfaces at-pim /0/port]** hierarchy level:

```
[edit interfaces at-pim/0/port]
encapsulation (atm-pvc | ether-over-atm);
```

Configure one of the following:

- **atm-pvc**—ATM permanent virtual circuits (PVCs), used for PPP over ATM over SHDSL interfaces. This is the default encapsulation.
- **ether-over-atm**—Ethernet over ATM encapsulation. For interfaces that carry IPv4 traffic, use this type of encapsulation.

### RELATED DOCUMENTATION

[Configuring ATM Interface Encapsulation | 56](#)

*Example: Combining Layer 2 and Layer 3 Classification on the Same ATM Physical Interface*

## Configuring Logical Interface Properties

To configure logical interface properties, include the **encapsulation** statement, **family** statement, and **vci** statement:

```
unit logical-unit-number {
  encapsulation type;
  family inet {
    vci vpi-identifier.vci-identifier;
  }
}
```

You can include these statements at the following hierarchy levels:

- **[edit interfaces interface-name unit logical-unit-number]**
- **[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]**

To configure the logical link-layer encapsulation type, include the **encapsulation** statement.



ATM-over-SHDSL interfaces that use **inet** (IP) protocols support the following encapsulations on the logical interface:

- **atm-vc-mux**—Use ATM VC multiplex encapsulation. You can only configure the **inet** family when you use this type of encapsulation.
- **atm-nlpd**—Use ATM network layer protocol ID (NLPD) encapsulation. You can only configure the **inet** family when you use this type of encapsulation.
- **atm-cisco-nlpd**—Use Cisco NLPD encapsulation. You can only configure the **inet** family when you use this type of encapsulation.

ATM-over-SHDSL for PPP over ATM interfaces support the following encapsulations on the logical interface:

- **atm-ppp-llc**—Use ATM PPP over AAL5 logical link control (LLC) encapsulation.
- **atm-ppp-vc-mux**—Use PPP over ATM AAL5 multiplex encapsulation.

ATM-over-SHDSL interfaces also support the following encapsulations on the logical interface:

- **atm-snap**—Use ATM subnetwork attachment point (SNAP) encapsulation.
- **atm-mlppp-llc**—For ATM2 IQ interfaces only, use Multilink PPP (MLPPP) over AAL5 LLC. For this encapsulation type, your router must be equipped with a Link Services or Voice Services PIC. MLPPP over ATM encapsulation is not supported on ATM2 IQ OC48 interfaces.
- **ppp-over-ether-over-atm-llc**—Use PPP over Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, you configure the interface address on the PPP interface.
- **family**—The family protocol type.
- **vci**—The virtual channel identifier (VCI) type and value.
- **vci-identifier**—ATM virtual circuit identifier. Unless you configure the interface to use promiscuous mode, this value cannot exceed the largest numbered VC configured for the interface with the **maximum-vcs** option of the **vpi** statement. Specify a VCI identifier from 0 through 4089 or 0 through 65,535 with promiscuous mode. VCIs from 0 through 31 are reserved.
- **vpi-identifier**—ATM virtual path identifier. Specify a VPI from 0 through 255. The default is 0.

## RELATED DOCUMENTATION

[unit | 398](#)

[encapsulation | 317](#)

[family | 332](#)

[vci | 414](#)

## Example: Configuring an ATM-over-SHDSL Interface

The following example illustrates an ATM-over-SHDSL interface configuration.

### Configuration for the ATM Mode on the PIM

```
[edit chassis]
fpc 6 {
  pic 0 {
    shdsl {
      pic-mode 2-port-atm;
    }
  }
}
```

### Configuration for the SHDSL Operating Mode on the Physical ATM Interface

```
[edit interfaces at-6/0/0/0]
shdsl-options {
  annex annex-b;
  line-rate 192;
  loopback local;
  snr-margin {
    current 1;
    snext 2;
  }
}
```

### Configuration for the Encapsulation on the Physical ATM Interface

```
[edit interfaces at-6/0/0/0]
encapsulation ethernet-over-atm;
```

### Configuration for the Logical Interface

```
[edit interfaces at-6/0/0/0 unit 3]
encapsulation atm-nlpid;
family inet {
  vci 25;
}
```

#### RELATED DOCUMENTATION

[Configuring ATM Mode for SHDSL Overview | 193](#)

[Verifying an ATM-over-SHDSL Interface Configuration | 200](#)

## Verifying an ATM-over-SHDSL Interface Configuration

To verify an ATM-over-SHDSL interface configuration, you can issue the following operational mode command:

```
user@host> show interfaces at-pim/0/port extensive
```

#### RELATED DOCUMENTATION

[Configuring ATM Mode for SHDSL Overview | 193](#)

[Example: Configuring an ATM-over-SHDSL Interface | 199](#)

# 4

PART

## Troubleshooting Information

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Monitoring and Troubleshooting ATM Interfaces | **202**

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# Monitoring and Troubleshooting ATM Interfaces

## IN THIS CHAPTER

- Determining ATM Interface Type | 202
- Monitoring ATM Interfaces | 218
- Configuring Interface Diagnostics Tools to Test the Physical Layer Connections | 249
- Investigating Interface Steps and Commands for ATM Interfaces | 257
- Using Loopback Testing for ATM Interfaces | 257
- Locating ATM Alarms and Errors | 278

## Determining ATM Interface Type

### IN THIS SECTION

- Checklist for Determining ATM Interface Type | 202
- Determining the ATM Interface Type and Configuration | 204
- Determining the ATM Interface Type | 205
- Identifying the ATM Interface Type | 206
- Verifying the ATM Configuration | 208
- Examples of Incorrect Configurations of ATM Options | 212

### Checklist for Determining ATM Interface Type

#### Purpose

To determine the type of Asynchronous Transfer Mode (ATM) interface on your router.

#### Action

[Table 17 on page 203](#) provides the links and commands for determining the type of ATM interface on your router.

Table 17: Checklist for Determining ATM Interface Type

Tasks	Command or Action
<b>“Determining the ATM Interface Type and Configuration” on page 204</b>	
1. <a href="#">Determining the ATM Interface Type on page 205</a>	show chassis hardware  NOTE: For ATM1 and ATM2 interfaces.
2. <a href="#">Identifying the ATM Interface Type on page 206</a>	show chassis hardware  NOTE: For ATM MIC interfaces.
3. <a href="#">Verifying the ATM Configuration on page 208</a>	
a. <a href="#">Verifying the Configuration of an ATM1 Interface on page 208</a>	show configuration interfaces at- <i>fpc/pic/port</i>
b. <a href="#">Verifying the Configuration of an ATM2 IQ Interface on page 209</a>	show configuration interfaces at- <i>fpc/pic/port</i>
c. <a href="#">Verifying the Configuration of an ATM MIC Interface on page 210</a>	show configuration interfaces at- <i>fpc/pic/port</i>
<b>“Examples of Incorrect Configurations of ATM Options” on page 212</b>	
1. <a href="#">Verifying the Configuration of the VCI on an ATM1 Interface on page 212</a>	show configuration interfaces at- <i>fpc/pic/port</i> show interfaces terse at- <i>fpc/pic/port</i> edit edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> maximum-vcs <i>maximum-vcs</i> show commit show configuration interfaces at- <i>fpc/pic/port</i> run show interfaces terse at- <i>fpc/pic/port</i>
2. <a href="#">Verifying the Configuration of the VCI on an ATM2 IQ Interface on page 214</a>	show configuration interfaces at- <i>fpc/pic/port</i> show interfaces terse at- <i>fpc/pic/port</i> edit edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> delete maximum-vcs show commit show configuration interfaces at- <i>fpc/pic/port</i> run show interfaces terse at- <i>fpc/pic/port</i>

Table 17: Checklist for Determining ATM Interface Type (*continued*)

Tasks	Command or Action
3. <a href="#">Verifying the Configuration of Promiscuous Mode on an ATM2 IQ Interface on page 216</a>	<pre>show configuration interfaces at-<i>fpc/pic/port</i> show interfaces terse at-<i>fpc/pic/port</i> edit set interfaces <i>interface-name</i> atm-options pic-type atm 2 show commit show configuration interfaces at-<i>fpc/pic/port</i> run show interfaces terse at-<i>fpc/pic/port</i></pre>

SEE ALSO

<a href="#">Determining the ATM Interface Type and Configuration   204</a>
<a href="#">Determining the ATM Interface Type   205</a>
<a href="#">Verifying the ATM Configuration   208</a>
<a href="#">Examples of Incorrect Configurations of ATM Options   212</a>

### Determining the ATM Interface Type and Configuration

#### Purpose

When you know the type of ATM interface on your router, you can configure it with the correct configuration options.

For ATM1, ATM2 intelligent queuing (IQ) interfaces, and ATM MIC interfaces, the Junos OS does not determine from the interface name **at-*fpc/pic/port*** whether your routing platform has an ATM1, ATM2 IQ Physical Interface Card (PIC), or ATM Modular Interface Card (MIC) installed.

#### Action

To determine the type of ATM interface on your router and to check your ATM interface configuration, follow these steps:

1. [Determining the ATM Interface Type on page 205](#)
2. [Verifying the ATM Configuration on page 208](#)

SEE ALSO

---

[Checklist for Determining ATM Interface Type | 202](#)


---

[Determining the ATM Interface Type | 205](#)


---

[Verifying the ATM Configuration | 208](#)


---

[Examples of Incorrect Configurations of ATM Options | 212](#)


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## Determining the ATM Interface Type

### Purpose

To determine the type of ATM interface on your router, use the following Junos OS command-line interface (CLI) operational mode command:

### Action

```
user@host> show chassis hardware
```

### Sample Output

```
user@host> show chassis hardware
```

```
Hardware inventory:
Item Version Part number Serial number Description
Chassis 50992 M10
Midplane REV 03 710-001950 HB2090
Power Supply B Rev 04 740-002497 LJ23082 AC
Display REV 04 710-001995 HC5151
Routing Engine 9700000792694801 RE-2.0
FEB REV 06 710-003310 HH0211 E-FEB
FPC 0 E-FPC
PIC 0 REV 06 750-002992 HP2711 4x F/E, 100 BASE-TX
PIC 1 REV 02 750-005718 BE6774 1x OC-12 ATM-II IQ, MM
PIC 3 REV 04 750-002971 HC8106 4x OC-3 SONET, MM
FPC 1 E-FPC
PIC 1 REV 03 750-000612 AA7399 2x OC-3 ATM, MM
PIC 3 REV 02 750-000618 AE2070 4x T3
```

### Meaning

The sample output shows the hardware inventory. The ATM2 IQ interface is in Flexible PIC Concentrator (FPC) slot 0, and PIC slot 1, which translates to **at-fpc/pic/port** or **at-0/1/0**. The ATM1 interface name is **at-1/1/0**.



## SEE ALSO

[Checklist for Determining ATM Interface Type | 202](#)
[Determining the ATM Interface Type and Configuration | 204](#)
[Verifying the ATM Configuration | 208](#)
[Examples of Incorrect Configurations of ATM Options | 212](#)

## Identifying the ATM Interface Type

### Purpose

Display information about the type of ATM interface.

### Action

To determine the type of ATM interface on your router:

```
host1#show chassis hardware
```

Hardware inventory:

Item	Version	Part number	Serial number	Description
Chassis			JN115736EAFc	MX240
Midplane	REV 07	760-021404	ABAA5038	MX240 Backplane
FPM Board	REV 03	760-021392	ABBA2758	Front Panel Display
PEM 0	Rev 01	740-022697	QCS0937C07K	PS 1.2-1.7kW; 100-240V
AC in				
PEM 1	Rev 01	740-022697	QCS0939C04X	PS 1.2-1.7kW; 100-240V
AC in				
PEM 2	Rev 01	740-022697	QCS0937C06B	PS 1.2-1.7kW; 100-240V
AC in				
PEM 3	Rev 01	740-022697	QCS0937C07U	PS 1.2-1.7kW; 100-240V
AC in				
Routing Engine 0	REV 12	740-013063	9009042291	RE-S-2000
Routing Engine 1	REV 12	740-013063	9009042266	RE-S-2000
CB 0	REV 06	710-021523	ABBC1435	MX SCB
CB 1	REV 06	710-021523	ABBC1497	MX SCB
FPC 2	REV 14	750-031088	YH8446	MPC Type 2 3D Q
CPU	REV 06	711-030884	YH9612	MPC PMB 2G
MIC 0				
MIC 1	REV 10	750-036132	ZP7062	2xOC12/8xOC3 CC-CE
PIC 2		BUILTIN	BUILTIN	2xOC12/8xOC3 CC-CE
Xcvr 0	NON-JNPR	23393-00492		UNKNOWN
Xcvr 1	NON-JNPR	23393-00500		UNKNOWN

Xcvr 2		NON-JNPR	23393-00912	UNKNOWN
Xcvr 3	REV 01	740-015638	22216-00575	Load SFP
Xcvr 4	REV 01	740-015638	24145-00110	Load SFP
Xcvr 5	REV 01	740-015638	24145-00016	Load SFP
Xcvr 6	REV 01	740-015638	24145-00175	Load SFP
Xcvr 7		NON-JNPR	23393-00627	UNKNOWN
QXM 0	REV 05	711-028408	YF4681	MPC QXM
QXM 1	REV 05	711-028408	YF4817	MPC QXM
Fan Tray 0	REV 01	710-021113	XL3645	MX240 Fan Tray

### Meaning

On an MX Series router with an ATM MIC with SFP, the ATM interface is in FPC slot 2 and PIC slot 2, which translates to **at-fpc/pic/port** or **at-2/2/0**.

Table 18 on page 207 lists the **show chassis hardware** command output fields.

**Table 18: show chassis hardware Output Fields**

Field Name	Field Description
Item	Information about the backplane, routing engine, power entry modules (PEM), and fan trays. Also displays information about the FPCs and associated PICs and MPCs and associated MICs or DPCs.
Version	Revision level of the chassis component.
Part Number	Part number of the chassis component.
Serial Number	Serial number of the chassis component. The serial number of the backplane is also the serial number of the router or switch chassis. Use this serial number when you need to contact Juniper Networks Customer Support about the router or switch chassis.
Description	Brief description of the hardware component.

### SEE ALSO

[Verifying the Configuration of an ATM MIC Interface](#) | 210

---

[Monitoring ATM MIC Interfaces | 240](#)


---

[Monitoring Traffic and Error Statistics for an ATM MIC Interface | 247](#)


---

[show chassis hardware](#)


---

## Verifying the ATM Configuration

The supported set of configuration options varies between the ATM1 and ATM2 IQ interfaces. If you configure an ATM1 interface using ATM2 IQ configuration options, the configuration does not commit. The same occurs if you configure an ATM2 IQ interface with ATM1 options. See the *Junos Network Interfaces Configuration Guide* for more information on the options supported for ATM1 and ATM2 IQ interfaces.

1. [Verifying the Configuration of an ATM1 Interface | 208](#)
2. [Verifying the Configuration of an ATM2 IQ Interface | 209](#)
3. [Verifying the Configuration of an ATM MIC Interface | 210](#)

### Verifying the Configuration of an ATM1 Interface

#### Purpose

The Junos OS assumes an ATM1 interface configuration if you include the **maximum-vcs** statement without the **pic-type** statement at the [edit interfaces at-*fpc/pic/port* atm-options] hierarchy level,

#### Action

To check the configuration of an ATM1 interface, use the following Junos OS CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

#### Sample Output 1

```
user@host> show configuration interfaces at-0/1/0
```

```
atm-options {
  vpi 1 {
    maximum-vcs 1024;
  }
}
unit 100 {
  vci 1.100;
  family inet {
    address 25.25.25.2/30;
  }
}
```

## Sample Output 2

```
user@host> show configuration interfaces at-1/0/0
```

```
atm-options {
  pic-type atm1;
  vpi 0 maximum-vcs 256;
  vpi 1 maximum-vcs 512;
}
```

## Meaning

The sample output shows the correct configuration of an ATM1 interface. Sample output 1 shows the **maximum-vcs** statement configured on an ATM interface. Because the **pic-type** statement is not included in the configuration, this interface is assumed to be an ATM1 interface. Use the **show chassis hardware** command to verify that the interface is an ATM1. Otherwise this could be the incorrect configuration of an ATM2 IQ interface. Sample output 2 shows the correct configuration of an ATM1 interface with the **pic-type** statement and the **maximum-vcs** statement.

## SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

## Verifying the Configuration of an ATM2 IQ Interface

### Purpose

ATM2 IQ interfaces must *not* have the **maximum-vcs** statement included in the configuration.

### Action

To check the configuration on an ATM2 IQ interface, use the following CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

## Sample Output 1

```
user@host> show configuration interfaces at-0/1/0
```

```
atm-options {
  vpi 1;
}
unit 100 {
  vci 1.100;
  family inet {
```

```

        address 25.25.25.1/30;
    }
}

```

## Sample Output 2

user@host> show configuration interfaces at-2/2/0

```

atm-options {
    pic-type atm2 ;
    vpi 1;
}
unit 100 {
    encapsulation ether-over-atm-llc;
    vci 1.100;
    shaping {
        vbr peak 66k sustained 66k burst 40;
    }
    family inet {
        address 192.168.5.1/24;
    }
}
[...Output truncated...]

```

## Meaning

The sample output shows the correct configuration of an ATM2 IQ interface. The first example shows that the interface **at-0/1/0** has ATM options configured and the logical interface **at-0/1/0.100**. Sample output 2 shows another interface **at-2/2/0** with the PIC type configured.

**NOTE:** The ATM2 IQ interface does *not* have the **maximum-vcs** statement included in the configuration.

## SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

## Verifying the Configuration of an ATM MIC Interface

### Purpose

Verify that the ATM MIC interface is configured correctly. ATM MIC interfaces do *not* have the **maximum-cvs** and **pic-type** statements included in the configuration.

### Action

To check the configuration of the ATM MIC interface:

```
user@host>show configuration interfaces at-2/2/0
```

```
atm-options {  
    vpi 7;  
}  
unit 100 {  
    encapsulation atm-vc-mux;  
    vci 7.100  
    family inet {  
        address 10.10.10.1/32;{  
        destination 10.10.20.1  
    }  
}  
}
```

### Meaning

The sample output shows the correct configuration of an ATM MIC interface. The sample output shows that the interface **at-2/2/0** has ATM options configured.

**NOTE:** The ATM MIC interface does *not* have the **maximum-cvs** statement or the **pic-type** statement included in the configuration.

### SEE ALSO

---

[Checklist for Determining ATM Interface Type | 202](#)

---

[Determining the ATM Interface Type and Configuration | 204](#)

---

[Examples of Incorrect Configurations of ATM Options | 212](#)

---

[Identifying the ATM Interface Type | 206](#)

---

[Monitoring ATM MIC Interfaces | 240](#)

## Examples of Incorrect Configurations of ATM Options

Even though ATM1 and ATM2 IQ interfaces may be configured with the incorrect options, the configuration may commit but the logical interface may not come up. Here are some examples of incorrectly configured options:

1. [Verifying the Configuration of the VCI on an ATM1 Interface | 212](#)
2. [Verifying the Configuration of the VCI on an ATM2 IQ Interface | 214](#)
3. [Verifying the Configuration of Promiscuous Mode on an ATM2 IQ Interface | 216](#)

### Verifying the Configuration of the VCI on an ATM1 Interface

#### Purpose

If your configuration of the virtual channel identifier (VCI) is incorrect, the logical interface is not created.

#### Action

To verify that VCI is configured correctly on your ATM1 interface, follow these steps:

1. Verify the configuration with the following Junos OS CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

For example, the following output shows an *incorrectly* configured ATM1 interface:

```
user@host> show configuration interfaces at-1/2/0
```

```
atm-options {
  vpi 1;
} <<< the maximum-vcs statement is missing
unit 100 {
  vci 1.100;
  family inet {
    address 25.25.25.2/30;
  }
}
```

2. Check if the logical interface unit 100 is created with the following command:

```
user@host> show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is not created:

```
user@host> show interfaces terse at-1/2/0
```

```

Interface          Admin Link Proto Local          Remote
at-1/2/0           up    up
<<< missing logical interface at-1/2/0.100

```

3. Include the **maximum-vcs** statement in the configuration:

```

user@host> edit
user@host# edit interfaces interface-name atm-options vpi vpi-identifier maximum-vcs maximum-vcs
user@host# show
user@host# commit

```

For example, the following output shows a *correctly* configured ATM1 interface:

```
user@host> show configuration interfaces at-0/1/0
```

```

atm-options {
    vpi 1 {
        maximum-vcs 1024;
    }
}
unit 100 {
    vci 1.100;
    family inet {
        address 25.25.25.2/30;
    }
}

```

1. Check that the logical interface is created with the following command:

```
user@host> run show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is created:

```
user@host# run show interfaces terse at-1/2/0
```

```

Interface          Admin Link Proto Local          Remote
at-1/2/0           up    up
at-1/2/0.100      up  up  inet 25.25.25.2/30

```

## Meaning



The steps above show that initially the logical interface **at-1/2/0.100** is not created because the **maximum-vcs** statement is not included in the ATM1 configuration. When that statement is included, the logical interface is created.

## SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

### Verifying the Configuration of the VCI on an ATM2 IQ Interface

#### Purpose

If your configuration of the VCI is incorrect, the logical interface is not created.

#### Action

To check that VCI is configured correctly on your ATM2 IQ interface, follow these steps:

1. Check the configuration with the following Junos OS CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

For example, the following output shows an *incorrectly* configured ATM2 IQ interface:

```
user@host> show configuration interfaces at-0/1/0
```

```
atm-options {
  vpi 1 {
    maximum-vcs 200; <<< incorrectly included
  }
}
unit 100 {
  vci 1.100;
  family inet {
    address 25.25.25.1/30;
  }
}
```

2. Check if the logical interface unit 100 is created with the following command:

```
user@host> show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is not created:

```
user@host> show interfaces terse at-0/1/0
```

```

Interface          Admin Link Proto Local          Remote
at-0/1/0           up    up
<<< missing logical interface at-0/1/0.100

```

3. Delete the incorrect **maximum-vcs** statement from the configuration:

```

user@host> edit
user@host# edit interfaces interface-name atm-options vpi vpi-identifier
user@host# delete maximum-vcs
user@host# show
user@host# commit

```

For example, the following output shows a *correctly* configured ATM2 IQ interface:

```
user@host> show configuration interfaces at-0/1/0
```

```

atm-options {
    vpi 1 {
    }
}
unit 100 {
    vci 1.100;
    family inet {
        address 25.25.25.1/30;
    }
}

```

4. Check that the logical interface is created with the following command:

```
user@host> show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is created:

```
user@host> show interfaces terse at-0/1/0
```

```

Interface          Admin Link Proto Local          Remote
at-0/1/0           up    up
at-0/1/0.100       up  up  inet 25.25.25.1/30

```

## Meaning

The steps above show that initially the logical interface **at-0/1/0.100** is not created because the **maximum-vcs** statement is included in the ATM2 IQ configuration. When that statement is deleted, the logical interface is created.

## SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

### **Verifying the Configuration of Promiscuous Mode on an ATM2 IQ Interface**

#### **Purpose**

If your configuration of promiscuous mode is incorrect, the logical interface is not created. ATM2 IQ interfaces must have the **pic-type atm2** statement included if you are including the **promiscuous-mode** statement in the configuration.

#### **Action**

To check that promiscuous mode is configured correctly on your ATM2 IQ interface, follow these steps:

1. Check the configuration with the following Junos OS CLI operational mode command:

```
user@host> show configuration interfaces at-fpc/pic/port
```

For example, the following output shows promiscuous mode *incorrectly* configured on an ATM2 IQ interface:

```
user@host> show configuration interfaces at-1/2/0
```

```
encapsulation atm-ccc-cell-relay;
atm-options {
    promiscuous-mode { <<< the pic-type statement is missing
        vpi 1;
    }
}
unit 1 {
    vpi 1;
}
```

2. Check if the logical interface unit 1 is created with the following command:

```
user@host> run show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is not created:

```
user@host# run show interfaces terse at-0/1/0
```

```
Interface          Admin Link Proto Local          Remote
at-0/1/0           up    up
<<< missing logical interface at-0/1/0.1
```

3. Include the **pic-type** statement in the configuration:

```
user@host> edit
user@host# set interfaces interface-name atm-options pic-type atm2
user@host# show
user@host# commit
```

For example, the following output shows promiscuous mode correctly configured on an ATM2 IQ interface:

```
user@host> show configuration interfaces at-0/1/0
```

```
encapsulation atm-ccc-cell-relay;
atm-options {
    pic-type atm2;
    promiscuous-mode {
        vpi 1;
    }
}
unit 1 {
    vpi 1;
}
```

4. Check that the logical interface is created with the following command:

```
user@host> run show interfaces terse at-fpc/pic/port
```

For example, the following output shows that the link is created:

```
user@host# run show interfaces terse at-0/1/0
```

```
Interface          Admin Link Proto Local          Remote
at-0/1/0           up    up
at-0/1/0.1         up  up  ccc
```

## Meaning

The steps above show that initially the logical interface **at-0/1/0.1** is not created because the **pic-type** statement is not included with the **promiscuous-mode** statement in the ATM2 IQ configuration. When that statement is included, the logical interface is created.

#### SEE ALSO

*ATM Interfaces User Guide for Routing Devices*

#### SEE ALSO

[Checklist for Determining ATM Interface Type | 202](#)

[Determining the ATM Interface Type and Configuration | 204](#)

[Verifying the ATM Configuration | 208](#)

*ATM Interfaces User Guide for Routing Devices*

#### RELATED DOCUMENTATION

*Investigating Interface Steps and Commands*

[Monitoring ATM Interfaces | 218](#)

[Using Loopback Testing for ATM Interfaces | 257](#)

[Locating ATM Alarms and Errors | 278](#)

## Monitoring ATM Interfaces

#### IN THIS SECTION

- [Checklist for Monitoring ATM Interfaces | 219](#)
- [Monitoring ATM Interfaces | 220](#)
- [Monitoring ATM1 Interfaces | 221](#)
- [Monitoring ATM2 IQ Interfaces | 227](#)
- [Monitoring ATM MIC Interfaces | 240](#)

## Checklist for Monitoring ATM Interfaces

### Purpose

To monitor Asynchronous Transfer Mode (ATM) interfaces and begin the process of isolating ATM interface problems when they occur.

### Action

Table 19 on page 219 provides the links and commands for monitoring ATM interfaces.

Table 19: Checklist for Monitoring ATM Interfaces

Tasks	Command or Action
<a href="#">“Monitoring ATM Interfaces” on page 220</a>	<code>show interfaces terse at*</code>
<a href="#">“Monitoring ATM1 Interfaces” on page 221</a>	
1. <a href="#">Displaying the Status of a Specific ATM1 Interface on page 221</a>	<code>show interfaces at-fpc/pic/port</code>
2. <a href="#">Displaying Extensive Status Information for a Specific ATM1 Interface on page 222</a>	<code>show interfaces at-fpc/pic/port extensive</code>
3. <a href="#">“Monitoring Statistics for an ATM1 Interface” on page 225</a>	<code>monitor interface at-fpc/pic/port</code>
<a href="#">“Monitoring ATM2 IQ Interfaces” on page 227</a>	
1. <a href="#">Displaying the Status of a Specific ATM2 IQ Interface on page 227</a>	<code>show interfaces terse at-fpc/pic/port</code> <code>show interfaces at-fpc/pic/port</code>
2. <a href="#">Displaying Extensive Information for a Specific ATM2 Interface on page 231</a>	<code>show interfaces at-fpc/pic/port extensive</code>
3. <a href="#">Monitoring Statistics for an ATM2 Interface on page 238</a>	<code>monitor interface at-fpc/pic/port</code>
<a href="#">“Monitoring ATM MIC Interfaces” on page 240</a>	
1. <a href="#">Displaying the Status of a Specific ATM MIC Interface on page 240</a>	<code>show interfaces terse at-fpc/pic/port</code> <code>show interfaces at-fpc/pic/port</code>
2. <a href="#">Displaying Extensive Information for a Specific ATM MIC Interface on page 242</a>	<code>show interfaces at-fpc/pic/port extensive</code>
3. <a href="#">Monitoring Traffic and Error Statistics for an ATM MIC Interface on page 247</a>	<code>monitor interface at-fpc/pic/port</code>

SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

Monitoring ATM Interfaces

Purpose

By monitoring ATM interfaces, you begin the process of isolating ATM interface problems when they occur. The following command provides the status of all ATM interfaces on the router. See [“Checklist for Determining ATM Interface Type” on page 202](#) for information on how to determine the ATM interface type.

Action

To display the status of all ATM interfaces, use the following Junos OS command-line interface (CLI) operational mode command:

```
user@host> show interfaces terse at*
```

Sample Output

The following sample output is for an ATM1 interface:

```
user@host> show interfaces terse at*
Interface           Admin Link Proto Local           Remote
at-2/0/0             up   up
at-2/2/0.100         up   up   inet  10.16.5.1/24
at-2/2/0.101         up   up   inet  10.16.250.253/30
at-2/2/0.200         up   up   inet  20.20.20.1/30
at-2/2/0.300         up   up   inet  30.30.30.1/30
at-2/2/0.400         up   up   inet  40.40.40.1/30
at-2/2/0.32767       up   up
at-2/0/1             up   down
at-2/0/1.10          up   down inet  10.10.100.1/30
```

Meaning

The sample output lists only the ATM interfaces and shows the status of both the physical and logical interfaces. See [Table 20 on page 221](#) for a description of what the output means. You cannot determine from this output whether the interfaces are ATM1 or ATM2 intelligent queuing (IQ). See [“Checklist for Determining ATM Interface Type” on page 202](#) for information on how to determine the ATM interface type.

Table 20: Status of ATM Interfaces

Physical Interface	Logical Interface	Status Description
<b>at-2/0/0</b> <b>Admin Up</b> <b>Link Up</b>	<b>at-2/0/0.100</b> <b>Admin Up</b> <b>Link Up</b>	Both the physical and logical links are up and running on this interface. By default on an ATM interface, if the physical link is up, the logical link is also up. However, for ATM 1 or ATM2 IQ interfaces with an ATM encapsulation and OAM configured for the VC, even if the physical interface is up, the logical link for a VC can be down due to a VC misconfiguration.
<b>at-2/0/1</b> <b>Admin Up</b> <b>Link Down</b>	<b>at-2/0/1.10</b> <b>Admin Up</b> <b>Link Down</b>	The physical link is down on this interface and therefore the logical interface is down also.

SEE ALSO

*ATM Interfaces User Guide for Routing Devices*

## Monitoring ATM1 Interfaces

To monitor an ATM1 interface, follow these steps:

1. [Displaying the Status of a Specific ATM1 Interface | 221](#)
2. [Displaying Extensive Status Information for a Specific ATM1 Interface | 222](#)
3. [Monitoring Statistics for an ATM1 Interface | 225](#)

### *Displaying the Status of a Specific ATM1 Interface*

#### Purpose

To display the status of a specific ATM interface, use the following Junos OS CLI operational mode command:

#### Action

```
user@host> show interfaces at-fpc/pic/port
```

#### Meaning



The first line of the sample output shows that the physical link is down and therefore the logical link is down also. This means that the interface cannot pass packets.

Further down the sample output, look for active alarms and defects. If there are any, and to further diagnose the problem, see [“Displaying Extensive Status Information for a Specific ATM1 Interface” on page 222](#) to display more extensive information about the ATM interface and the physical interface that is down.

## SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

### **Displaying Extensive Status Information for a Specific ATM1 Interface**

#### **Purpose**

To display extensive status information about a specific interface, use the following Junos OS CLI operational mode command:

#### **Action**

```
user@host> show interfaces at-fpc/pic/port extensive
```

#### **Sample Output**

```
user@host> show interfaces at-2/0/1 extensive
```

```
Physical interface: at-2/0/1, Enabled, Physical link is Down
  Interface index: 23, SNMP ifIndex: 43, Generation: 22
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC3 , Loopback: None, Payload scrambler: Enabled
  Device flags   : Present Running Down
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Statistics last cleared: 2002-07-29 14:28:14 EDT (00:18:00 ago)
  Traffic statistics:
    Input  bytes :                0                0 bps
    Output bytes :                0                0 bps
    Input  packets:                0                0 pps
    Output packets:                0                0 pps
Input errors:
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0
Output errors:
```

```

Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
SONET alarms      : LOL, LOS
SONET defects     : LOL, LOF, LOS, SEF, AIS-L, AIS-P, RDI-P, PLM-P
SONET PHY:
    Seconds      Count  State
    PLL Lock      0      0  OK
    PHY Light    1079      0  Light Missing
SONET section:
    BIP-B1          0      0
    SEF            1079      0  Defect Active
    LOS            1079      0  Defect Active
    LOF            1079      0  Defect Active
    ES-S           1079
    SES-S           1079
    SEFS-S          1079
SONET line:
    BIP-B2          0      0
    REI-L           0      0
    RDI-L           0      0  OK
    AIS-L           1079      0  Defect Active
    BERR-SF         0      0  OK
    BERR-SD         0      0  OK
    ES-L            1079
    SES-L            1079
    UAS-L            1079
    ES-LFE          0
    SES-LFE          0
    UAS-LFE          0
SONET path:
    BIP-B3          0      0
    REI-P           0      0
    LOP-P           0      0  OK
    AIS-P           1079      0  Defect Active
    RDI-P           1079      0  Defect Active
    UNEQ-P          0      0  OK
    PLM-P           1079      0  Defect Active
    ES-P            1079
    SES-P            1079
    UAS-P            1079
    ES-PFE           1079
    SES-PFE           1079
    UAS-PFE           1079
Received SONET overhead:
    F1      : 0x00, J0      : 0x00, K1      : 0xff, K2      : 0xff
    S1      : 0x00, C2      : 0xff, C2(cmp) : 0x13, F2      : 0x00

```

```

Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00, V5      : 0x00
V5(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
Z4      : 0x00, V5      : 0x00
ATM status:
HCS state:      Hunt
LOC      :      OK
ATM Statistics:
Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns:
0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 381110991,
Output idle cell count: 18446744069795695321,
Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input
timeouts: 0, Input invalid VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0
PFE configuration:
Destination slot: 2
CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                        %      bps      %      bytes
0 best-effort            0      0      0      0      low      none
1 expedited-forwarding   0      0      0      0      low      none
2 assured-forwarding     0      0      0      0      low      none
3 network-control        0      0      0      0      low      none
Logical interface at-2/0/1.10 (Index 30) (SNMP ifIndex 65) (Generation 29)
Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
Input bytes :      0
Output bytes :      0
Input packets:      0
Output packets:      0
Local statistics:
Input bytes :      0
Output bytes :      0
Input packets:      0
Output packets:      0
Transit statistics:
Input bytes :      0      0 bps
Output bytes :      0      0 bps
Input packets:      0      0 pps
Output packets:      0      0 pps
Protocol inet, MTU: 4470, Flags: None, Generation: 32 Route table: 0
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary

```

```

        Destination: 192.168.100.0/30, Local: 192.168.100.1, Broadcast: Unspecified,
Generation: 61
VCI 2.100
Flags: Active
Total down time: 0 sec, Last down: Never
ATM per-VC transmit statistics:
  Tail queue packet drops: 0
Traffic statistics:
  Input  bytes   :                0
  Output bytes   :                0
  Input  packets :                0
  Output packets :                0

```

### Meaning

The sample output is for an OC3 ATM interface and shows the statistics for the SONET media, as well as the **Input** and **Output** ATM errors. Error details include input and output errors, active alarms and defects, and media-specific errors.

If the physical link is down, look at the active alarms and defects for the ATM interface and check the ATM media accordingly. See [“List of Common ATM Alarms and Error” on page 278](#) for an explanation of ATM alarms.

### SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

### Monitoring Statistics for an ATM1 Interface

#### Purpose

To monitor statistics for an ATM1 interface, use the following Junos OS CLI operational mode command:

#### Action

```
user@host> monitor interface at-fpc/pic/port
```



**CAUTION:** We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

## Sample Output

```
user@host> monitor interface at-2/0/0
```

```

host                               Seconds: 68                        Time: 13:52:33
                                   Delay: 0/0/2

Interface: at-2/0/0, Enabled, Link is Up
Encapsulation: ATM-PVC, Speed: OC3

Traffic statistics:                                Current delta
    Input bytes:                1528168 (2142968 bps)      [1528000]
    Output bytes:               1540192 (2165880 bps)      [1540000]
    Input packets:              1002 (175 pps)             [1000]
    Output packets:            1002 (175 pps)             [1000]

Error statistics:
    Input errors:               0                          [0]
    Input drops:               0                          [0]
    Input framing errors:       0                          [0]
    Policed discards:          0                          [0]
    L3 incompletes:            0                          [0]
    L2 channel errors:         0                          [0]
    L2 mismatch timeouts:      0                          [0]
    Carrier transitions:        0                          [0]
    Output errors:             0                          [0]
    Output drops:              0                          [0]
    Aged packets:              0                          [0]

ATM statistics:
    Input cell count           33049                      [33034]
    Input invalid vc           0                          [0]
    Output cell count          89231368868                 [23664462]
    Output idle cell count     18446744072746574220         [23631438]

Active alarms : None
Active defects: None

SONET error counts/seconds:
    LOS count                  0                          [0]
    LOF count                  0                          [0]
    SEF count                   0                          [0]
    ES-S                        0                          [0]
    SES-S                       0                          [0]

SONET statistics:
    BIP-B1                     0                          [0]
    BIP-B2                     0                          [0]
    REI-L                      0                          [0]
    BIP-B3                     0                          [0]
    REI-P                      0                          [0]

```

```
Received SONET overhead:  F1      : 0x00  J0      : 0x00Z
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

### Meaning

The sample output checks for and displays common interface failures and any increases in framing errors. Information from this command can help you narrow down possible causes of an interface problem.

**NOTE:** If you are accessing the router from the console connection, make sure you set the CLI terminal type using the **set cli terminal** command.

### SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

### SEE ALSO

| *ATM Interfaces User Guide for Routing Devices*

## Monitoring ATM2 IQ Interfaces

To monitor an ATM2 interface, follow these steps:

1. [Displaying the Status of a Specific ATM2 IQ Interface | 227](#)
2. [Displaying Extensive Information for a Specific ATM2 Interface | 231](#)
3. [Monitoring Statistics for an ATM2 Interface | 238](#)

### *Displaying the Status of a Specific ATM2 IQ Interface*

#### Purpose

To display the status of a specific ATM2 IQ interface, use the following Junos OS CLI operational mode commands:

#### Action

```
user@host> show interfaces terse at-fpc/pic/port
user@host> show interfaces at-fpc/pic/port
```

## Sample Output 1

```
user@host> show interfaces terse at-2/2/0
```

Interface	Admin	Link	Proto	Local	Remote
at-2/2/0	up	up			
at-2/2/0.100	up	up	inet	10.16.5.1/24	
at-2/2/0.101	up	up	inet	10.16.250.253/30	
at-2/2/0.200	up	up	inet	20.20.20.1/30	
at-2/2/0.300	up	up	inet	30.30.30.1/30	
at-2/2/0.400	up	up	inet	40.40.40.1/30	
at-2/2/0.32767	up	up			

## Sample Output 2

```
user@host> show interfaces at-2/2/0
```

```
Physical interface: at-2/2/0, Enabled, Physical link is Up
  Interface index: 138, SNMP ifIndex: 26
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed: OC12,
  Loopback: None,
  Payload scrambler: Enabled
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 4 supported
  Current address: 00:90:69:d6:d5:3a
  Last flapped   : 2004-05-03 14:32:52 UTC (02:41:35 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  SONET alarms   : None
  SONET defects  : None
  VPI 1
    Flags: Active
    Total down time: 0 sec, Last down: Never
  Traffic statistics:
    Input  packets:                0
    Output packets:               18
Logical interface at-2/2/0.100 (Index 67) (SNMP ifIndex 36)
  Flags: Point-To-Multipoint SNMP-Traps Encapsulation: Ether-over-ATM-LLC
  Input packets : 0
  Output packets: 7
  Protocol inet, MTU: 1500
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
```

```

    Destination: 172.16.5/24, Local: 172.16.5.1, Broadcast: 172.16.5.255
VCI 1.100
  Flags: Active, Shaping, Multicast
  VBR, Peak: 66kbps, Sustained: 66kbps, Burst size: 40
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
  Input packets : 0
  Output packets: 14
Logical interface at-2/2/0.101 (Index 68) (SNMP ifIndex 37)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Input packets : 0
Output packets: 2
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 172.16.250.252/30, Local: 172.16.250.253, Broadcast:
172.16.250.255
  VCI 1.101
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
  Input packets : 0
  Output packets: 2
Logical interface at-2/2/0.200 (Index 69) (SNMP ifIndex 8280)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Input packets : 0
Output packets: 0
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 20.20.20.0/30, Local: 20.20.20.1, Broadcast: 20.20.20.3
VCI 1.200
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
  Input packets : 0
  Output packets: 0
Logical interface at-2/2/0.300 (Index 70) (SNMP ifIndex 8281)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Input packets : 0
Output packets: 0
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary

```



```

    Destination: 30.30.30.0/30, Local: 30.30.30.1, Broadcast: 30.30.30.3
VCI 1.300
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
  Input packets : 0
  Output packets: 0
Logical interface at-2/2/0.400 (Index 72) (SNMP ifIndex 8282)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Input packets : 0
Output packets: 0
  Protocol inet, MTU: 4470
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 40.40.40.0/30, Local: 40.40.40.1, Broadcast: 40.40.40.3
VCI 1.400
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
  Input packets : 0
  Output packets: 0
Logical interface at-2/2/0.32767 (Index 71) (SNMP ifIndex 27)
  Flags: Point-To-Multipoint No-Multicast SNMP-Traps Encapsulation: ATM-VCMUX
Input packets : 0
Output packets: 0
VCI 1.4
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
  Input packets : 0
  Output packets: 0

```

### Meaning

The first line of the sample output shows that the physical link and all logical links are up. This means that the interface can pass packets.

Further down the sample output, look for active alarms and defects. If there are any, and to further diagnose the problem, see [“Displaying Extensive Information for a Specific ATM2 Interface” on page 231](#) to display more extensive information about the ATM interface and the physical interface that is down.

SEE ALSO

[Displaying Extensive Information for a Specific ATM2 Interface | 231](#)

[Monitoring Statistics for an ATM2 Interface | 238](#)

[Monitoring ATM2 IQ Interfaces | 227](#)

### **Displaying Extensive Information for a Specific ATM2 Interface**

#### **Purpose**

To display extensive status information about a specific ATM2 interface, use the following Junos OS CLI operational mode command:

#### **Action**

```
user@host> show interfaces at-fpc/pic/port extensive
```

#### **Sample Output**

```
user@host> show interfaces at-2/2/0 extensive
```

```
Physical interface: at-2/2/0, Enabled, Physical link is Up
  Interface index: 138, SNMP ifIndex: 26, Generation: 21
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed: OC12,
  Loopback: None,
  Payload scrambler: Enabled
  Device flags      : Present Running
  Link flags        : None
  CoS queues        : 4 supported
  Hold-times        : Up 0 ms, Down 0 ms
  Current address: 00:90:69:d6:d5:3a
  Last flapped      : 2004-05-03 14:32:52 UTC (02:42:30 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes      :                0                0 bps
    Output bytes     :             1600                0 bps
    Input packets    :                0                0 pps
    Output packets   :             18                0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
  L3 incompletes: 0,
    L2 channel errors: 0, L2 mismatch timeouts: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  Queue counters:
    Queued packets  Transmitted packets  Dropped packets
    0 assured-forw   18                18                0
    1 expedited-fo   0                 0                 0
    2 best-effort    0                 0                 0
```

```

3 network-cont                0                0                0
SONET alarms   : None
SONET defects  : None
SONET PHY:           Seconds      Count  State
  PLL Lock        0              0  OK
  PHY Light        0              0  OK
SONET section:
  BIP-B1           1             13
  SEF               0              0  OK
  LOS               0              0  OK
  LOF               0              0  OK
  ES-S              1
  SES-S             0
  SEFS-S            0
SONET line:
  BIP-B2            1             196
  REI-L             1             291
  RDI-L             0              0  OK
  AIS-L             0              0  OK
  BERR-SF           0              0  OK
  BERR-SD           0              0  OK
  ES-L              1
  SES-L             0
  UAS-L             0
  ES-LFE            1
  SES-LFE           0
  UAS-LFE           0
SONET path:
  BIP-B3            1             36
  REI-P             1             211
  LOP-P             0              0  OK
  AIS-P             0              0  OK
  RDI-P             0              0  OK
  UNEQ-P            0              0  OK
  PLM-P             0              0  OK
  ES-P              1
  SES-P             0
  UAS-P             0
  ES-PFE            1
  SES-PFE           0
  UAS-PFE           0
Received SONET overhead:
  F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
  S1      : 0x00, C2      : 0x13, C2(cmp) : 0x13, F2      : 0x00

```

```

    Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
    F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
    S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
    Z4      : 0x00
ATM status:
    HCS state:      Sync
    LOC      :      OK
ATM Statistics:
    Uncorrectable HCS errors: 177, Correctable HCS errors: 3, Tx cell FIFO overruns:
0,
    Rx cell FIFO overruns: 0, Rx cell FIFO underruns: 0, Input cell count: 4,
    Output cell count: 13785683517, Output idle cell count: 0, Output VC queue
drops: 0,
    Input no buffers: 0, Input length errors: 0, Input timeouts: 0, Input invalid
VCs: 2,
    Input bad CRCs: 0, Input OAM cell no buffers: 0
Packet Forwarding Engine configuration:
    Destination slot: 2
    VPI 1
    Flags: Active
    Total down time: 0 sec, Last down: Never
    Traffic statistics:
        Input  bytes :                0
        Output bytes :             1600
        Input  packets:                0
        Output packets:             18
Logical interface at-2/2/0.100 (Index 67) (SNMP ifIndex 36) (Generation 11)
    Flags: Point-To-Multipoint SNMP-Traps Encapsulation: Ether-over-ATM-LLC
    Traffic statistics:
        Input  bytes :                0
        Output bytes :             896
        Input  packets:                0
        Output packets:                7
    Local statistics:
        Input  bytes :                0
        Output bytes :             896
        Input  packets:                0
        Output packets:                7
    Transit statistics:
        Input  bytes :                0                0 bps
        Output bytes :                0                0 bps
        Input  packets:                0                0 pps
        Output packets:                0                0 pps

```

```

Protocol inet, MTU: 1500, Generation: 17, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 172.16.5/24, Local: 172.16.5.1, Broadcast: 172.16.5.255,
Generation: 16
  VCI 1.100
    Flags: Active, Shaping, Multicast
    VBR, Peak: 66kbps, Sustained: 66kbps, Burst size: 40
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0
    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input  bytes   :                0
      Output bytes   :             1512
      Input  packets:                0
      Output packets:             14
Logical interface at-2/2/0.101 (Index 68) (SNMP ifIndex 37) (Generation 12)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
  Traffic statistics:
    Input  bytes   :                0
    Output bytes   :             200
    Input  packets:                0
    Output packets:             2
  Local statistics:
    Input  bytes   :                0
    Output bytes   :             200
    Input  packets:                0
    Output packets:             2
  Transit statistics:
    Input  bytes   :                0                0 bps
    Output bytes   :                0                0 bps
    Input  packets:                0                0 pps
    Output packets:                0                0 pps
Protocol inet, MTU: 4470, Generation: 18, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 172.16.250.252/30, Local: 172.16.250.253, Broadcast:
172.16.250.255,
    Generation: 18
  VCI 1.101
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0

```

```

    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input  bytes   :                0
      Output bytes   :               184
      Input  packets :                0
      Output packets :                2
Logical interface at-2/2/0.200 (Index 69) (SNMP ifIndex 8280) (Generation 13)
    Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
    Traffic statistics:
      Input  bytes   :                0
      Output bytes   :                0
      Input  packets :                0
      Output packets :                0
    Local statistics:
      Input  bytes   :                0
      Output bytes   :                0
      Input  packets :                0
      Output packets :                0
    Transit statistics:
      Input  bytes   :                0                0 bps
      Output bytes   :                0                0 bps
      Input  packets :                0                0 pps
      Output packets :                0                0 pps
    Protocol inet, MTU: 4470, Generation: 19, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 20.20.20.0/30, Local: 20.20.20.1, Broadcast: 20.20.20.3,
    Generation: 20
    VCI 1.200
      Flags: Active
      Total down time: 0 sec, Last down: Never
      EPD threshold: 0, Transmit weight cells: 0
      ATM per-VC transmit statistics:
        Tail queue packet drops: 0
      Traffic statistics:
        Input  bytes   :                0
        Output bytes   :                0
        Input  packets :                0
        Output packets :                0
Logical interface at-2/2/0.300 (Index 70) (SNMP ifIndex 8281) (Generation 14)
    Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
    Traffic statistics:
      Input  bytes   :                0

```

```

Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Protocol inet, MTU: 4470, Generation: 20, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 30.30.30.0/30, Local: 30.30.30.1, Broadcast: 30.30.30.3,
Generation: 22
VCI 1.300
Flags: Active
Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
ATM per-VC transmit statistics:
Tail queue packet drops: 0
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Logical interface at-2/2/0.400 (Index 72) (SNMP ifIndex 8282) (Generation 15)
Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps

```

```

Input  packets:                0                0 pps
Output packets:                0                0 pps
Protocol inet, MTU: 4470, Generation: 21, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 40.40.40.0/30, Local: 40.40.40.1, Broadcast: 40.40.40.3,
Generation: 24
  VCI 1.400
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0
    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input  bytes   :                0
      Output bytes   :                0
      Input  packets:                0
      Output packets:                0
Logical interface at-2/2/0.32767 (Index 71) (SNMP ifIndex 27) (Generation 9)
  Flags: Point-To-Multipoint No-Multicast SNMP-Traps Encapsulation: ATM-VCMUX
  Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets:                0
    Output packets:                0
  Local statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets:                0
    Output packets:                0
  VCI 1.4
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0
    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input  bytes   :                0
      Output bytes   :                0
      Input  packets:                0
      Output packets:                0

```

## Meaning



The sample output is for an OC12 ATM interface and shows the statistics for the SONET media, as well as the **Input** and **Output** ATM errors. Error details include input and output errors, active alarms and defects, and media-specific errors.

If the physical link is down, look at the active alarms and defects for the ATM interface and check the ATM media accordingly. See [“List of Common ATM Alarms and Error” on page 278](#) for an explanation of ATM alarms.

SEE ALSO

- [Displaying the Status of a Specific ATM2 IQ Interface | 227](#)
- [Monitoring Statistics for an ATM2 Interface | 238](#)
- [Monitoring ATM2 IQ Interfaces | 227](#)


*Monitoring Statistics for an ATM2 Interface*

**Purpose**

To monitor statistics for an ATM2 interface, use the following Junos OS CLI operational mode command:

**Action**

```
user@host> monitor interface at-fpc/pic/port
```



**CAUTION:** We recommend that you use this command only for diagnostic purposes. Do not leave it on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

**Sample Output**

```
user@host> monitor interface at-2/2/0
```


```
host                               Seconds: 5                               Time: 17:16:49
                                   Delay: 3/0/3

Interface: at-2/2/0, Enabled, Link is Up
Encapsulation: ATM-PVC, Speed: OC12
Traffic statistics:                               Current delta
Input bytes:                                0 (0 bps)                                [0]
Output bytes:                             1600 (0 bps)                             [0]
Input packets:                             0 (0 pps)                             [0]
Output packets:                           18 (0 pps)                             [0]
Error statistics:
```

```
Input errors:                                0                                [0]
Input drops:                                0                                [0]
Input framing errors:                        0                                [0]
Policed discards:                           0                                [0]
L3 incompletes:                             0                                [0]
L2 channel errors:                          0                                [0]
L2 mismatch timeouts:                       0                                [0]
Carrier transitions:                         1                                [0]
Output errors:                              0                                [0]
Output drops:                              0                                [0]
Aged packets:                              0                                [0]
ATM statistics:
  Input cell count                           4                                [0]
  Input invalid vc                           2                                [0]
  Output cell count                          13908633088                    [8484369]
  Output idle cell count                     0                                [0]
Active alarms : NoneActive defects: NoneSONET error countsZ [0]
```

Meaning

The sample output checks for and displays common interface failures and any increases in framing errors. Information from this command can help you narrow down possible causes of an interface problem.

**NOTE:** If you are accessing the router from the console connection, make sure you set the CLI terminal type using the **set cli terminal** command.

SEE ALSO

- [Displaying the Status of a Specific ATM2 IQ Interface | 227](#)
- [Displaying Extensive Information for a Specific ATM2 Interface | 231](#)
- [Monitoring ATM2 IQ Interfaces | 227](#)

SEE ALSO

- [Checklist for Monitoring ATM Interfaces | 219](#)
- [Monitoring ATM Interfaces | 220](#)
- [Monitoring ATM1 Interfaces | 221](#)

## Monitoring ATM MIC Interfaces

### IN THIS SECTION

- [Displaying the Status of a Specific ATM MIC Interface | 240](#)
- [Displaying Extensive Information for a Specific ATM MIC Interface | 242](#)
- [Monitoring Traffic and Error Statistics for an ATM MIC Interface | 247](#)

To monitor the status of ATM MIC interfaces, perform the following tasks:

### *Displaying the Status of a Specific ATM MIC Interface*

#### Purpose

Display the status of a specific ATM MIC interface.

#### Action

To display the summary information about a specific ATM MIC interface:

```
user@host> show interfaces terse at-2/2/0
```

Interface	Admin	Link	Proto	Local	Remote
at-2/2/0		up	up		
at-2/2/0.100		up	up	inet 10.10.10.1	--> 10.10.20.1
at-2/2/0.32767		up	up		

To display the status of a specific ATM MIC interface:

```
user@host> show interfaces at-2/2/0
```

### Sample Output

```
Physical interface: at-2/2/0, Enabled, Physical link is Up
Interface index: 146, SNMP ifIndex: 510
Link-level type: ATM-PVC, MTU: 9192, Clocking: Internal, SONET mode,
Speed: OC3, Loopback: None, Payload scrambler: Enabled
Device flags    : Present Running
Link flags      : None
```

```

CoS queues      : 8 supported, 8 maximum usable queues
Schedulers     : 0
Current address: 00:26:88:da:a6:74
Last flapped    : 2012-03-07 11:02:11 PST (5w4d 15:45 ago)
Input rate      : 0 bps (0 pps)
Output rate     : 0 bps (0 pps)
SONET alarms    : None
SONET defects   : None
  VPI 7
    Flags: Active
    Total down time: 0 sec, Last down: Never
Traffic statistics:
  Input  packets:                0
  Output packets:                0

Logical interface at-2/2/0.100 (Index 347) (SNMP ifIndex 518)
  Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: ATM-VCMUX
  Input packets : 0
  Output packets: 0
  Protocol inet, MTU: 2040
    Flags: Sendbroadcast-pkt-to-re
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.10.20.1, Local: 10.10.10.1
  VCI 7.100
    Flags: Active
    Total down time: 0 sec, Last down: Never
      Input packets : 0
      Output packets: 0

Logical interface at-2/2/0.32767 (Index 348) (SNMP ifIndex 519)
  Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x4000
  Encapsulation: ATM-VCMUX
  Input packets : 0
  Output packets: 0
  VCI 7.4
    Flags: Active
    Total down time: 0 sec, Last down: Never
      Input packets : 0
      Output packets: 0

```

### Meaning

The first line of the sample output shows that the physical link and all logical links are up. This means that the interface can pass packets.

Further down the sample output, look for active alarms and defects. If there are any, and to further diagnose the problem, see [“Displaying Extensive Information for a Specific ATM MIC Interface” on page 242](#) to display more extensive information about the ATM interface and the physical interface that is down.

[Table 21 on page 242](#) lists the **show interfaces terse** command output fields.

**Table 21: show interfaces terse Output Fields**

Field Name	Field Description
Interface	Interface name.
Admin	The administrative status of the interface. Possible values: up or down.
Link	Status of the link. Possible values: up or down.
Proto	Protocol family configured on the logical interface.
Local	Local IP address of the logical interface.
Remote	Remote IP address of the logical interface.

For information about the output fields of the **show interfaces** command, see [show interfaces \(ATM\)](#).

### ***Displaying Extensive Information for a Specific ATM MIC Interface***

#### **Purpose**

Display extensive information for a specific ATM MIC interface.

#### **Action**

To display extensive status information about a specific ATM MIC interface:

```
user@host>show interfaces at-2/2/0 extensive
```

```
Physical interface: at-2/2/0, Enabled, Physical link is Up
Interface index: 146, SNMP ifIndex: 510, Generation: 421
Link-level type: ATM-PVC, MTU: 9192, Clocking: Internal, SONET mode,
Speed: OC3, Loopback: None, Payload scrambler: Enabled
Device flags    : Present Running
Link flags      : None
CoS queues      : 8 supported, 8 maximum usable queues
Schedulers     : 0
Hold-times      : Up 0 ms, Down 0 ms
```

```

Current address: 00:26:88:da:a6:74
Last flapped   : 2012-03-07 11:02:11 PST (5w4d 15:58 ago)
Statistics last cleared: Never

Traffic statistics:
  Input bytes   :                0                0 bps
  Output bytes  :                0                0 bps
  Input packets :                0                0 pps
  Output packets:                0                0 pps

IPv6 transit statistics:
  Input bytes   :                0
  Output bytes  :                0
  Input packets :                0
  Output packets:                0

Input errors:
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  Resource errors: 0

Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
  Resource errors: 0

Egress queues: 8 supported, 4 in use

Queue counters:      Queued packets  Transmitted packets      Dropped packets
  0 best-effort             0                0                0
  1 expedited-fo           0                0                0
  2 assured-forw           0                0                0
  3 network-cont           0                0                0

Queue number:      Mapped forwarding classes
  0                best-effort
  1                expedited-forwarding
  2                assured-forwarding
  3                network-control

SONET alarms   : None
SONET defects  : None

SONET PHY:      Seconds      Count  State
  PLL Lock      0            0  OK
  PHY Light     0            0  OK

SONET section:
  BIP-B1        1            29
  SEF           0            0  OK
  LOS           0            0  OK
  LOF           0            0  OK
  ES-S          1
  SES-S         0
  SEFS-S        0

```

## SONET line:

BIP-B2	1	75	
REI-L	1	36	
RDI-L	0	0	OK
AIS-L	0	0	OK
BERR-SF	0	0	OK
BERR-SD	0	0	OK
ES-L	1		
SES-L	0		
UAS-L	0		
ES-LFE	1		
SES-LFE	0		
UAS-LFE	0		

## SONET path:

BIP-B3	1	23	
REI-P	1	34	
LOP-P	0	0	OK
AIS-P	0	0	OK
RDI-P	0	0	OK
UNEQ-P	0	0	OK
PLM-P	0	0	OK
ES-P	1		
SES-P	0		
UAS-P	0		
ES-PFE	1		
SES-PFE	0		
UAS-PFE	0		

## Payload pointer:

Current pointer	: 0
Pointer increment count	: 0
Pointer decrement count	: 0
New pointer NDF count	: 1

## Received SONET overhead:

F1	: 0x00, J0	: 0x00, K1	: 0x00, K2	: 0x00
S1	: 0x00, C2	: 0x13, C2(cmp)	: 0x13, F2	: 0x00
Z3	: 0x00, Z4	: 0x00, S1(cmp)	: 0x00	

## Transmitted SONET overhead:

F1	: 0x00, J0	: 0x01, K1	: 0x00, K2	: 0x00
S1	: 0x00, C2	: 0x13, F2	: 0x00, Z3	: 0x00
Z4	: 0x00			

## ATM status:

HCS state:	Sync
LOC	: OK

## ATM Statistics:

```

Uncorrectable HCS errors: 7, Correctable HCS errors: 0,
Tx cell FIFO overruns: 0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 0,
Output idle cell count: 1210483921034, Output VC queue drops: 0,
Input no buffers: 0, Input length errors: 0, Input timeouts: 0,
Input invalid VCs: 0, Input bad CRCs: 0, Input OAM cell no buffers: 0
Packet Forwarding Engine configuration:
  Destination slot: 2
  VPI 7
    Flags: Active
    Total down time: 0 sec, Last down: Never
    Traffic statistics:
      Input  bytes   :                0
      Output bytes   :                0
      Input  packets :                0
      Output packets :                0

Logical interface at-2/2/0.100 (Index 347) (SNMP ifIndex 518)
(Generation 660)
  Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: ATM-VCMUX
  Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0
  Local statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0
  Transit statistics:
    Input  bytes   :                0                0 bps
    Output bytes   :                0                0 bps
    Input  packets :                0                0 pps
    Output packets :                0                0 pps
  Protocol inet, MTU: 2040, Generation: 457, Route table: 0
    Flags: Sendbroadcast-pkt-to-re
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.10.20.1, Local: 10.10.10.1, Broadcast: Unspecified,
      Generation: 621
  VCI 7.100
    Flags: Active
    Total down time: 0 sec, Last down: Never
    ATM per-VC transmit statistics:

```



```

    Tail queue packet drops: 0
Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0

Logical interface at-2/2/0.32767 (Index 348) (SNMP ifIndex 519)
(Generation 661)
Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x4000
Encapsulation: ATM-VCMUX
Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0
Local statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0
Transit statistics:
    Input  bytes   :                0                0 bps
    Output bytes   :                0                0 bps
    Input  packets :                0                0 pps
    Output packets :                0                0 pps
VCI 7.4
Flags: Active
Total down time: 0 sec, Last down: Never
ATM per-VC transmit statistics:
    Tail queue packet drops: 0
Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0

```

### Meaning

The sample output is for an OC3 ATM interface and shows the statistics for the SONET media, as well as the **Input** and **Output** ATM errors. Error details include input and output errors, active alarms and defects, and media-specific errors.

If the physical link is down, look at the active alarms and defects for the ATM interface and check the ATM media accordingly. See [“List of Common ATM Alarms and Error” on page 278](#) for an explanation of ATM alarms.

For information about the output fields of the **show interfaces extensive** command, see [show interfaces \(ATM\)](#).

### **Monitoring Traffic and Error Statistics for an ATM MIC Interface**

#### **Purpose**

Monitor traffic and error statistics for an ATM MIC interface.

#### **Action**

To display real-time statistics, updated every second, for an ATM MIC interface:



**CAUTION:** We recommend that you use this command only for diagnostic purposes. If you use this command during normal router operations, additional CPU and memory resources are consumed.

```
user@host> monitor interface at-2/2/0
```

```
host                               Seconds: 5                               Time: 04:02:22
                                   Delay: 0/0/3

Interface: at-2/2/0, Enabled, Link is Up
Encapsulation: ATM-PVC, Speed: OC3
Traffic statistics:
  Input bytes:                      0 (0 bps)
  Output bytes:                     0 (0 bps)
  Input packets:                    0 (0 pps)
  Output packets:                   0 (0 pps)
Error statistics:
  Input errors:                     0
  Input drops:                      0
  Input framing errors:             0
  Policed discards:                 0
  L3 incompletes:                   0
  L2 channel errors:                0
  L2 mismatch timeouts:             0 Carrier transitiz
```

```

host                               Seconds: 5                               Time: 04:02:22
                                   Delay: 1/1/1

Interface: at-2/2/1, Enabled, Link is Up
Encapsulation: ATM-PVC, Speed: OC3

Traffic statistics:                                     Current delta
  Input bytes:                0 (0 bps)                [0]
  Output bytes:               0 (0 bps)                [0]
  Input packets:              0 (0 pps)                [0]
  Output packets:             0 (0 pps)                [0]

Error statistics:
  Input errors:                0                        [0]
  Input drops:                 0                        [0]
  Input framing errors:        0                        [0]
  Policed discards:            0                        [0]
  L3 incompletes:              0                        [0]
  L2 channel errors:           0                        [0]
  L2 mismatch timeouts:        0 Carrier transitiz     [0]

```

### Meaning

The sample output displays common interface failures and any increase in framing errors. Information from this command can help you narrow down possible causes of an interface problem.

**NOTE:** If you are accessing the router from the console connection, make sure you set the CLI terminal type using the **set cli terminal** command.

For information about the output fields of the **monitor interfaces (ATM)** command, see *monitor interface*.

### SEE ALSO

[Verifying the Configuration of an ATM MIC Interface | 210](#)

[Identifying the ATM Interface Type | 206](#)

### RELATED DOCUMENTATION

[Investigating Interface Steps and Commands](#)

[Determining ATM Interface Type | 202](#)

## Configuring Interface Diagnostics Tools to Test the Physical Layer Connections

### IN THIS SECTION

- [Configuring Loopback Testing | 249](#)
- [Configuring BERT Testing | 251](#)
- [Starting and Stopping a BERT Test | 255](#)

### Configuring Loopback Testing

Loopback testing allows you to verify the connectivity of a circuit. You can configure any of the following interfaces to execute a loopback test: aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, E1, E3, NxDSO, serial, SONET/SDH, T1, and T3.

The physical path of a network data circuit usually consists of segments interconnected by devices that repeat and regenerate the transmission signal. The transmit path on one device connects to the receive path on the next device. If a circuit fault occurs in the form of a line break or a signal corruption, you can isolate the problem by using a loopback test. Loopback tests allow you to isolate segments of the circuit and test them separately.

To do this, configure a *line loopback* on one of the routers. Instead of transmitting the signal toward the far-end device, the line loopback sends the signal back to the originating router. If the originating router receives back its own Data Link Layer packets, you have verified that the problem is beyond the originating router. Next, configure a line loopback farther away from the local router. If this originating router does not receive its own Data Link Layer packets, you can assume that the problem is on one of the segments between the local router and the remote router's interface card. In this case, the next troubleshooting step is to configure a line loopback closer to the local router to find the source of the problem.

The following types of loopback testing are supported by Junos OS:

- DCE local—Loops packets back on the local data circuit-terminating equipment (DCE).
- DCE remote—Loops packets back on the remote DCE.

- **Local**—Useful for troubleshooting physical PIC errors. Configuring local loopback on an interface allows transmission of packets to the channel service unit (CSU) and then to the circuit toward the far-end device. The interface receives its own transmission, which includes data and timing information, on the local router's PIC. The data received from the CSU is ignored. To test a local loopback, issue the **show interfaces interface-name** command. If PPP keepalives transmitted on the interface are received by the PIC, the **Device Flags** field contains the output **Loop-Detected**.
- **Payload**—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A payload loopback loops data only (without clocking information) on the remote router's PIC. With payload loopback, overhead is recalculated.
- **Remote**—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A remote loopback loops packets, including both data and timing information, back on the remote router's interface card. A router at one end of the circuit initiates a remote loopback toward its remote partner. When you configure a remote loopback, the packets received from the physical circuit and CSU are received by the interface. Those packets are then retransmitted by the PIC back toward the CSU and the circuit. This loopback tests all the intermediate transmission segments.

Table 22 on page 250 shows the loopback modes supported on the various interface types.

**Table 22: Loopback Modes by Interface Type**

Interface	Loopback Modes	Usage Guidelines
Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet	Local	<i>Configuring Ethernet Loopback Capability</i>
Circuit Emulation E1	Local and remote	<i>Configuring E1 Loopback Capability</i>
Circuit Emulation T1	Local and remote	<i>Configuring T1 Loopback Capability</i>
E1 and E3	Local and remote	<i>Configuring E1 Loopback Capability and Configuring E3 Loopback Capability</i>
NxDS0	Payload	<i>Configuring NxDS0 IQ and IQE Interfaces, Configuring T1 and NxDS0 Interfaces, Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode), Configuring Fractional E1 IQ and IQE Interfaces, and Configuring Channelized T3 IQ Interfaces</i>
Serial (V.35 and X.21)	Local and remote	<i>Configuring Serial Loopback Capability</i>

Table 22: Loopback Modes by Interface Type (*continued*)

Interface	Loopback Modes	Usage Guidelines
Serial (EIA-530)	DCE local, DCE remote, local, and remote	<i>Configuring Serial Loopback Capability</i>
SONET/SDH	Local and remote	<i>Configuring SONET/SDH Loopback Capability to Identify a Problem as Internal or External</i>
T1 and T3	Local, payload, and remote	<i>Configuring T1 Loopback Capability and Configuring T3 Loopback Capability</i>  <i>See also Configuring the T1 Remote Loopback Response</i>

To configure loopback testing, include the **loopback** statement:

```
user@host# loopback mode;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* aggregated-ether-options]
- [edit interfaces *interface-name* ds0-options]
- [edit interfaces *interface-name* e1-options]
- [edit interfaces *interface-name* e3-options]
- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]
- [edit interfaces *interface-name* serial-options]
- [edit interfaces *interface-name* sonet-options]
- [edit interfaces *interface-name* t1-options]
- [edit interfaces *interface-name* t3-options]

## Configuring BERT Testing

To configure BERT:

- Configure the duration of the test.

```
[edit interfaces interface-name interface-type-options]
user@host#bert-period seconds;
```

You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs. By default, the BERT period is 10 seconds.

- Configure the error rate to monitor when the inbound pattern is received.

```
[edit interfaces interface-name interface-type-options]
user@host#bert-error-rate rate;
```

*rate* is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from  $10^{-0}$  (1 error per bit) to  $10^{-7}$  (1 error per 10 million bits).

- Configure the bit pattern to send on the transmit path.

```
[edit interfaces interface-name interface-type-options]
user@host#bert-algorithm algorithm;
```

*algorithm* is the pattern to send in the bit stream. For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t1-0/0/0 t1-options]
```

```
user@host# set bert-algorithm ?
```

```
Possible completions:
```

```
pseudo-2e11-o152      Pattern is 2^11 -1 (per 0.152 standard)
pseudo-2e15-o151      Pattern is 2^15 - 1 (per 0.152 standard)
pseudo-2e20-o151      Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153      Pattern is 2^20 - 1 (per 0.153 standard)
...

```

For specific hierarchy information, see the individual interface types.

**NOTE:** The four-port E1 PIC supports only the following algorithms:

pseudo-2e11-o152	Pattern is $2^{11} - 1$ (per 0.152 standard)
pseudo-2e15-o151	Pattern is $2^{15} - 1$ (per 0.151 standard)
pseudo-2e20-o151	Pattern is $2^{20} - 1$ (per 0.151 standard)
pseudo-2e23-o151	Pattern is $2^{23}$ (per 0.151 standard)

When you issue the **help** command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.

**NOTE:** The 12-port T1/E1 Circuit Emulation (CE) PIC supports only the following algorithms:

all-ones-repeating	Repeating one bits
all-zeros-repeating	Repeating zero bits
alternating-double-ones-zeros	Alternating pairs of ones and zeros
alternating-ones-zeros	Alternating ones and zeros
pseudo-2e11-o152	Pattern is $2^{11} - 1$ (per 0.152 standard)
pseudo-2e15-o151	Pattern is $2^{15} - 1$ (per 0.151 standard)
pseudo-2e20-o151	Pattern is $2^{20} - 1$ (per 0.151 standard)
pseudo-2e7	Pattern is $2^7 - 1$
pseudo-2e9-o153	Pattern is $2^9 - 1$ (per 0.153 standard)
repeating-1-in-4	1 bit in 4 is set
repeating-1-in-8	1 bit in 8 is set
repeating-3-in-24	3 bits in 24 are set

When you issue the **help** command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



**NOTE:** The IQE PICs support only the following algorithms:

```
all-ones-repeating    Repeating one bits
all-zeros-repeating   Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e9-o153      Pattern is 2^9 -1 (per 0.153 (511 type) standard)
pseudo-2e11-o152     Pattern is 2^11 -1 (per 0.152 and 0.153 (2047 type)
standards)
pseudo-2e15-o151     Pattern is 2^15 -1 (per 0.151 standard)
pseudo-2e20-o151     Pattern is 2^20 -1 (per 0.151 standard)
pseudo-2e20-o153     Pattern is 2^20 -1 (per 0.153 standard)
pseudo-2e23-o151     Pattern is 2^23 -1 (per 0.151 standard)
repeating-1-in-4      1 bit in 4 is set
repeating-1-in-8      1 bit in 8 is set
repeating-3-in-24     3 bits in 24 are set
```

When you issue the **help** command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.

**NOTE:** BERT is supported on the PDH interfaces of the Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP and the DS3/E3 MIC. The following BERT algorithms are supported:

```
all-ones-repeating    Repeating one bits
all-zeros-repeating   Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
repeating-1-in-4      1 bit in 4 is set
repeating-1-in-8      1 bit in 8 is set
repeating-3-in-24     3 bits in 24 are set
pseudo-2e9-o153      Pattern is 2^9 - 1 (per 0.153 standard)
pseudo-2e11-o152     Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151     Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151     Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153     Pattern is 2^20 - 1 (per 0.153 standard)
pseudo-2e23-o151     Pattern is 2^23 (per 0.151 standard)
```

Table 23 on page 255 shows the BERT capabilities for various interface types.

**Table 23: BERT Capabilities by Interface Type**

Interface	T1 BERT	T3 BERT	Comments
12-port T1/E1 Circuit Emulation	Yes (ports 0–11)	—	<ul style="list-style-type: none"> <li>Limited algorithms</li> </ul>
4-port Channelized OC3/STM1 Circuit Emulation	Yes (port 0–3)	—	<ul style="list-style-type: none"> <li>Limited algorithms</li> </ul>
E1 or T1	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> <li>Single port at a time</li> <li>Limited algorithms</li> </ul>
E3 or T3	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> <li>Single port at a time</li> </ul>
Channelized OC12	—	Yes (channel 0–11)	<ul style="list-style-type: none"> <li>Single channel at a time</li> <li>Limited algorithms</li> <li>No bit count</li> </ul>
Channelized STM1	Yes (channel 0–62)	—	<ul style="list-style-type: none"> <li>Multiple channels</li> <li>Only one algorithm</li> <li>No error insert</li> <li>No bit count</li> </ul>
Channelized T3 and Multichannel T3	Yes (channel 0–27)	Yes (port 0–3 on channel 0)	<ul style="list-style-type: none"> <li>Multiple ports and channels</li> <li>Limited algorithms for T1</li> <li>No error insert for T1</li> <li>No bit count for T1</li> </ul>

These limitations do not apply to channelized IQ interfaces. For information about BERT capabilities on channelized IQ interfaces, see *Channelized IQ and IQE Interfaces Properties*.

## Starting and Stopping a BERT Test

Before you can start the BERT test, you must disable the interface. To do this, include the **disable** statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
```

```
disable;
```

After you configure the BERT properties and commit the configuration, begin the test by issuing the **test interface *interface-name* *interface-type*-bert-start** operational mode command:

```
user@host> test interface interface-name interface-type-bert-start
```

The test runs for the duration you specify with the **bert-period** statement. If you want to terminate the test sooner, issue the **test interface *interface-name* *interface-type*-bert-stop** command:

```
user@host> test interface interface-name interface-type-bert-stop
```

For example:

```
user@host> test interface t3-1/2/0 t3-bert-start
user@host> test interface t3-1/2/0 t3-bert-stop
```

To view the results of the BERT test, issue the **show interfaces extensive | find BERT** command:

```
user@host> show interfaces interface-name extensive | find BERT
```

For more information about running and evaluating the results of the BERT procedure, see the [CLI Explorer](#).

**NOTE:** To exchange BERT patterns between a local router and a remote router, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local router, issue the **test interface** command.

## RELATED DOCUMENTATION

*show interfaces diagnostics optics* (Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, 100-Gigabit Ethernet, and Virtual Chassis Port)

## Investigating Interface Steps and Commands for ATM Interfaces

This section includes the following information to assist you when troubleshooting ATM interfaces:

The “[Monitoring ATM Interfaces](#)” on page 218 section helps you determine the nature of the interface problem. The “[Using Loopback Testing for ATM Interfaces](#)” on page 257 section provides information to help you isolate the source of the problem. The “[Locating ATM Alarms and Errors](#)” on page 278 section explains some of the alarms and errors for the media.

### RELATED DOCUMENTATION

[Monitoring ATM Interfaces](#) | 218

[Using Loopback Testing for ATM Interfaces](#) | 257

[Locating ATM Alarms and Errors](#) | 278

## Using Loopback Testing for ATM Interfaces

### IN THIS SECTION

- [Checklist for Using Loopback Testing for ATM Interfaces](#) | 257
- [Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface](#) | 259
- [Creating a Loopback](#) | 260
- [Setting Clocking to Internal](#) | 263
- [Verifying That the ATM Interface Is Up](#) | 264
- [Clearing ATM Interface Statistics](#) | 268
- [Pinging the ATM Interface](#) | 269
- [Checking for ATM Interface Error Statistics](#) | 270
- [Diagnosing a Suspected Circuit Problem](#) | 276

### Checklist for Using Loopback Testing for ATM Interfaces

#### Purpose

To use loopback testing for ATM interfaces.

## Action

Table 24 on page 258 provides links and commands for using loopback testing for ATM interfaces.

**Table 24: Checklist for Using Loopback Testing for ATM Interfaces**

Tasks	Command or Action
<b>“Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface” on page 259</b>	
1. <a href="#">Creating a Loopback on page 260</a>	
a. <a href="#">Creating a Physical Loopback on page 260</a>	Connect the transmit port to the receive port.
b. <a href="#">Configuring a Local Loopback on page 260</a>	[edit interfaces <i>interface-name</i> (sonet-options   t3-options)] set loopback local show commit
2. <a href="#">Setting Clocking to Internal on page 263</a>	[edit interfaces <i>interface-name</i> ] set clocking internal show commit
3. <a href="#">Verifying That the ATM Interface Is Up on page 264</a>	show interfaces at- <i>fpc/port/pic</i>
4. <a href="#">Clearing ATM Interface Statistics on page 268</a>	clear interfaces statistics at- <i>fpc/port/pic</i>
5. <a href="#">Pinging the ATM Interface on page 269</a>	ping interface at- <i>fpc/port/pic</i> local-IP-address bypass-routing count 1000 rapid
6. <a href="#">Checking for ATM Interface Error Statistics on page 270</a>	show interfaces at- <i>fpc/port/pic</i> extensive
<b>“Diagnosing a Suspected Circuit Problem” on page 276</b>	
1. <a href="#">Creating a Loop from the Router to the Network on page 276</a>	[edit interfaces <i>interface-name</i> (sonet-options   t3-options)] set loopback remote show commit
2. <a href="#">Creating a Loop to the Router from Various Points in the Network on page 277</a>	Perform Steps 2 through 6 from “Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface” on page 259.

## SEE ALSO

Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface	259
Creating a Loopback	260
Setting Clocking to Internal	263
Verifying That the ATM Interface Is Up	264
Clearing ATM Interface Statistics	268
Pinging the ATM Interface	269
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**Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface****Problem**

**Description:** When you suspect a hardware problem, perform the following steps to verify if there is a hardware problem.

**Solution**

To diagnose a suspected hardware problem with an ATM1 or ATM2 IQ interface, follow these steps:

1. [Creating a Loopback on page 260](#)
2. [Setting Clocking to Internal on page 263](#)
3. [Verifying That the ATM Interface Is Up on page 264](#)
4. [Clearing ATM Interface Statistics on page 268](#)
5. [Pinging the ATM Interface on page 269](#)
6. [Checking for ATM Interface Error Statistics on page 270](#)

## SEE ALSO

Checklist for Using Loopback Testing for ATM Interfaces	257
Creating a Loopback	260
Setting Clocking to Internal	263
Verifying That the ATM Interface Is Up	264
Clearing ATM Interface Statistics	268
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## Creating a Loopback

### IN THIS SECTION

- [Creating a Physical Loopback | 260](#)
- [Configuring a Local Loopback | 260](#)

You can create a physical loopback or configure a local loopback to help diagnose a suspected hardware problem. Creating a physical loopback is recommended because it allows you to test and verify the transmit and receive ports.

If a field engineer is not available to create the physical loopback, you can configure a local loopback for the interface. The local loopback creates a loopback internally in the Physical Interface Card (PIC).

### ***Creating a Physical Loopback***

Create a physical loopback from the transmit port to the receive port.

**NOTE:** Make sure you use single-mode fiber for a single-mode port and multimode fiber for a multimode port for SONET media.

1. To create a physical loopback at the port, connect the transmit port to the receive port using a known good cable.

When you create and test a physical loopback, you are testing the transmit and receive ports of the PIC. This action is recommended if a field engineer is available to create the physical loop as it provides a more complete test of the PIC.

### SEE ALSO

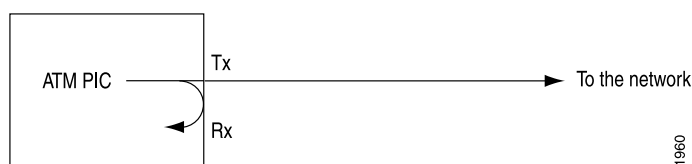
| *ATM Interfaces User Guide for Routing Devices*

### ***Configuring a Local Loopback***

#### **Purpose**

Because ATM interfaces can be either SONET or T3, you use the **sonet-options** or **t3-options** statements to configure a local loopback. [Figure 6 on page 261](#) illustrates a local loopback configured for an ATM interface.

**Figure 6: Local Loopback**



### Action

To configure a local loopback without physically connecting the transmit port to the receive port, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name (sonet-options | t3-options)
```

2. Configure the loopback:

```
[edit interfaces interface-name (sonet-options | t3-options)]
user@host# set loopback local
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces (t3-1/0/0 t3-options)]
user@host# show
loopback local;
```



#### 4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
user@host# commit
commit complete
```

#### Meaning

When you create a local loopback, you create an internal loop on the interface being tested. A local loopback loops the traffic internally on that PIC. A local loopback tests the interconnection of the PIC but does not test the transmit and receive ports.

**NOTE:** Remember to delete the loopback statement after completing the test.

#### SEE ALSO

*ATM Interfaces User Guide for Routing Devices*

#### SEE ALSO

[Checklist for Using Loopback Testing for ATM Interfaces | 257](#)

[Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface | 259](#)

[Setting Clocking to Internal | 263](#)

[Verifying That the ATM Interface Is Up | 264](#)

[Clearing ATM Interface Statistics | 268](#)

[Pinging the ATM Interface | 269](#)

[Checking for ATM Interface Error Statistics | 270](#)

[Diagnosing a Suspected Circuit Problem | 276](#)

## Setting Clocking to Internal

### Purpose

Clocking is set to internal because there is no external clock source in a loopback connection.

### Action

To configure clocking to internal, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]  
user@host# edit interfaces interface-name
```

2. Configure the clocking to internal:

```
user@host# set clocking internal
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0]  
user@host# show  
clocking internal;
```

4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0]
```

```
user@host# commit
commit complete
```

## Meaning

The clock source for the interface is set to the internal Stratum 3 clock.

## SEE ALSO

[Checklist for Using Loopback Testing for ATM Interfaces | 257](#)

[Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface | 259](#)

[Creating a Loopback | 260](#)

[Verifying That the ATM Interface Is Up | 264](#)

[Clearing ATM Interface Statistics | 268](#)

[Pinging the ATM Interface | 269](#)

[Checking for ATM Interface Error Statistics | 270](#)

[Diagnosing a Suspected Circuit Problem | 276](#)

## Verifying That the ATM Interface Is Up

### Purpose

Displaying the status of the ATM interface provides the information you need to determine whether the physical link is up or down.

### Action

To verify that the status of the ATM interface is up, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces at-fpc/pic/port
```

### Sample Output 1

The following sample output is for an OC3 ATM interface:

```

user@host> show interfaces at-2/0/0
Physical interface: at-2/0/0, Enabled, Physical link is Up
  Interface index: 22, SNMP ifIndex: 42
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC3 , Loopback: Local, Payload scrambler: Enabled
Device flags : Present Running
  Link flags      : None
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)
SONET alarms : None
SONET defects : None
Logical interface at-2/0/0.0 (Index 29) (SNMP ifIndex 49)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
  Input packets : 0
  Output packets: 0
  Protocol inet, MTU: 4470, Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 192.168.1.0/30, Local: 192.168.1.1
  VCI 1.100
    Flags: Active
    Total down time: 0 sec, Last down: Never
Traffic statistics:
  Input  packets:                0
  Output packets:                0

```

## Sample Output 2

The following sample output is for a T3 ATM interface:

```

user@host> show interfaces at-0/1/0
Physical interface: at-0/1/0, Enabled, Physical link is Up
  Interface index: 90, SNMP ifIndex: 18
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, Speed: T3 , Loopback:
None, Payload scrambler: Enabled,
  Mode: C/Bit parity, Line buildout: 10, ATM Encapsulation: PLCP
Device flags : Present Running
  Link flags      : None
  Current address: 00:90:69:0c:c0:1f
  Last flapped   : 2002-08-14 16:25:07 UTC (00:00:42 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)

```

Active alarms : None

Active defects : None

### Sample Output 3

The following sample output is for an OC3 ATM interface:

```
user@host> show interfaces at-2/0/1
Physical interface: at-2/0/1, Enabled, Physical link is Down
  Interface index: 23, SNMP ifIndex: 43
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed: OC3
, Loopback: None, Payload scrambler: Enabled
  Device flags : Present Running Down
  Link flags      : None
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)
  SONET alarms   : LOL, LOS
  SONET defects  : LOL, LOF, LOS, SEF, AIS-L, AIS-P, RDI-P, PLM-P
  Logical interface at-2/0/1.10 (Index 30) (SNMP ifIndex 65)
    Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 4470, Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 192.168.100.0/30, Local: 192.168.100.1
    VCI 2.100
      Flags: Active
      Total down time: 0 sec, Last down: Never
  Traffic statistics:
    Input  packets:                0
    Output packets:                0
```

### Sample Output 4

The following sample output is for a T3 ATM interface:

```
user@host> show interfaces at-0/1/0
Physical interface: at-0/1/0, Enabled, Physical link is Down
  Interface index: 90, SNMP ifIndex: 18
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, Speed: T3 , Loopback:
None, Payload scrambler: Enabled,
```

```
Mode: C/Bit parity, Line buildout: 10, ATM Encapsulation: PLCP
```

**Device flags : Present Running Down**

```
Link flags      : None
```

```
Current address: 00:90:69:0c:c0:1f
```

```
Last flapped   : 2002-08-09 11:36:15 UTC (5d 04:14 ago)
```

```
Input rate     : 0 bps (0 pps)
```

```
Output rate    : 0 bps (0 pps)
```

**Active alarms : PLL, LOF, LOS**

**Active defects : PLL, LOF, LOS**

### Meaning

Sample output 1 shows that the physical link is up and there are no SONET alarms or defects.

Sample output 2 shows that the physical link is up and there are no active alarms or defects.

Sample output 3 shows that the physical link, the device flags, and interface flags are down, and that there are SONET alarms and defects. When you see that the physical link is down, there may be a problem with the port.

Sample output 4 shows that the physical link, the device flags, and interface flags are down, and that there are active alarms and defects. When you see that the physical link is down, there may be a problem with the port.

For more information about problem situations and actions to take for a physical link that is down, see [Table 25 on page 267](#).

**Table 25: Problems and Solutions for a Physical Link That Is Down**

Problem	Actions
Cable mismatch	Verify that the cable connection is correct.
Damaged fiber or coax cable or dirty fiber cable	Verify that the cable can successfully loop a known good port of the same type.
Too much or too little optical attenuation (for an OC3 or OC12 ATM interface)	Verify that the attenuation is correct per the PIC optical specification.
The transmit port is not transmitting within the dBm optical range per the specifications (for an OC3 or OC12 ATM interface)	Verify that the Tx power of the optics is within range of the PIC optical specification.

## SEE ALSO

[Checklist for Using Loopback Testing for ATM Interfaces | 257](#)[Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface | 259](#)[Creating a Loopback | 260](#)[Setting Clocking to Internal | 263](#)[Clearing ATM Interface Statistics | 268](#)[Pinging the ATM Interface | 269](#)[Checking for ATM Interface Error Statistics | 270](#)[Diagnosing a Suspected Circuit Problem | 276](#)

## Clearing ATM Interface Statistics

### Purpose

You must reset ATM interface statistics before you initiate the ping test. Resetting the statistics provides a clean start so that previous input or output errors and packet statistics do not interfere with the current investigation.

### Action

To clear all statistics for the interface, use the following Junos OS CLI operational mode command:

```
user@host> clear interfaces statistics at-fpc/pic/port
```

### Sample Output

```
user@host> clear interfaces statistics at-4/0/2
user@host>
```

### Meaning

[illegible]



```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 192.168.1.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.423/0.740/26.822/0.829 ms
```

## Meaning

This command sends 1000 ping packets out of the interface to the local IP address. The ping should complete successfully with no packet loss. If there is any persistent packet loss, open a case with the Juniper Networks Technical Assistance Center (JTAC) at [support@juniper.net](mailto:support@juniper.net), or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

## SEE ALSO

[Checklist for Using Loopback Testing for ATM Interfaces | 257](#)

[Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface | 259](#)

[Creating a Loopback | 260](#)

[Setting Clocking to Internal | 263](#)

[Verifying That the ATM Interface Is Up | 264](#)

[Clearing ATM Interface Statistics | 268](#)

[Checking for ATM Interface Error Statistics | 270](#)

[Diagnosing a Suspected Circuit Problem | 276](#)

## Checking for ATM Interface Error Statistics

### Purpose

Persistent interface error statistics indicate that you need to open a case with JTAC.

### Action

To check the local interface for error statistics, use the following Junos OS CLI operational mode command:

```
user@host> show interfaces at-fpc/pic/port extensive
```

## Sample Output

The following sample output is for an OC3 ATM interface:

```

user@host> show interfaces at-2/0/0 extensive

Physical interface: at-2/0/0, Enabled, Physical link is Up
  Interface index: 22, SNMP ifIndex: 42, Generation: 21
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed:
OC3 , Loopback: None, Payload scrambler: Enabled
  Device flags      : Present Running
  Link flags        : None
  Hold-times        : Up 0 ms, Down 0 ms
  Statistics last cleared: 2002-07-29 14:28:14 EDT (00:00:26 ago)
  Traffic statistics:
    Input  bytes :                0                0 bps
    Output bytes :                0                0 bps
    Input  packets:                0                0 pps
    Output packets:                0                0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0,
    L2 mismatch timeouts: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  SONET alarms      : None
  SONET defects      : None
  SONET PHY:
    Seconds          Count  State
    PLL Lock         0      0  OK
    PHY Light        0      0  OK
  SONET section:
    BIP-B1           0      0
    SEF              0      0  OK
    LOS              0      0  OK
    LOF              0      0  OK
    ES-S             0
    SES-S            0
    SEFS-S           0
  SONET line:
    BIP-B2           0      0
    REI-L            0      0
    RDI-L            0      0  OK
    AIS-L            0      0  OK
    BERR-SF          0      0  OK
    BERR-SD          0      0  OK
    ES-L             0

```

```

SES-L          0
UAS-L          0
ES-LFE        0
SES-LFE        0
UAS-LFE        0

```

#### SONET path:

```

BIP-B3          0          0
REI-P           0          0
LOP-P           0          0 OK
AIS-P           0          0 OK
RDI-P           0          0 OK
UNEQ-P          0          0 OK
PLM-P           0          0 OK
ES-P            0
SES-P           0
UAS-P           0
ES-PFE          0
SES-PFE         0
UAS-PFE         0

```

#### Received SONET overhead:

```

F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, C2(cmp) : 0x13, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00, V5      : 0x00
V5(cmp) : 0x00

```

#### Transmitted SONET overhead:

```

F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
Z4      : 0x00, V5      : 0x00

```

#### ATM status:

```

HCS state:      Sync
LOC           :      OK

```

#### ATM Statistics:

```

Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns:
0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 8830024,
Output idle cell count: 8830026,
Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input
timeouts: 0, Input invalid VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0

```

#### PFE configuration:

```

Destination slot: 2

```

CoS transmit queue	Bandwidth		Buffer		Priority	Limit
	%	bps	%	bytes		
0 best-effort	0	0	0	0	low	none

```

 1 expedited-forwarding      0          0  0          0      low  none
 2 assured-forwarding        0          0  0          0      low  none
 3 network-control           0          0  0          0      low  none
Logical interface at-2/0/0.0 (Index 29) (SNMP ifIndex 49) (Generation 28)
Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
  Input  bytes   :                0
  Output bytes   :                0
  Input  packets:                0
  Output packets:                0
Local statistics:
  Input  bytes   :                0
  Output bytes   :                0
  Input  packets:                0
  Output packets:                0
Transit statistics:
  Input  bytes   :                0                0 bps
  Output bytes   :                0                0 bps
  Input  packets:                0                0 pps
  Output packets:                0                0 pps
Protocol inet, MTU: 4470, Flags: None, Generation: 31 Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 192.168.1.0/30, Local: 192.168.1.1, Broadcast: Unspecified,
Generation: 59
  VCI 1.100
    Flags: Active
    Total down time: 0 sec, Last down: Never
    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input  bytes   :                0
      Output bytes   :                0
      Input  packets:                0
      Output packets:                0

```

## Sample Output

The following sample output is for a T3 ATM interface:

```

user@host> show interfaces at-0/1/0 extensive
Physical interface: at-0/1/0, Enabled, Physical link is Up
  Interface index: 90, SNMP ifIndex: 18, Generation: 89
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, Speed:  T3 , Loopback:

```

```

None, Payload scrambler: Enabled,
Mode: C/Bit parity, Line buildout: 10, ATM Encapsulation: PLCP
Device flags      : Present Running
Link flags        : None
Hold-times        : Up 0 ms, Down 0 ms
Current address: 00:90:69:0c:c0:1f
Last flapped      : 2002-08-14 16:25:07 UTC (00:00:21 ago)
Statistics last cleared: 2002-08-14 16:25:26 UTC (00:00:02 ago)
Traffic statistics:
  Input bytes      :                      0          0 bps
  Output bytes     :                      0          0 bps
  Input packets    :                      0          0 pps
  Output packets   :                      0          0 pps
Input errors:
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
Active alarms      : None
Active defects     : None
DS3 media:
  Seconds          Count  State
  PLL Lock         0      0 OK
  Reframing        0      0 OK
  AIS              0      0 OK
  LOF              0      0 OK
  LOS              0      0 OK
  YELLOW           0      0 OK
  EXZ              0      0
  LCV              0      0
  PCV              0      0
  FERR             0      0
  LES              0
  PES              0
  PSES             0
  SEFS             0
  UAS              0
PLCP defects:
  Seconds          Count  State
  LOF              0      0
  YELLOW           0      0
ATM defects:
  Seconds          Count  State
  LCD              0      0
ATM status:
  HCS state:      Sync

```

```

LOC      :      OK
PLCP statistics (errored seconds):
  Framing errors           : 0(0)
  Bit interleaved parity errors: 0(0)
  Far end block errors     : 0(0)
ATM Statistics:
  Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns:
0, Rx cell FIFO overruns: 0,
  Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 96041,
Output idle cell count: 96040,
  Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input
timeouts: 0, Input invalid VCs: 0,
  Input bad CRCs: 0, Input OAM cell no buffers: 0
Packet Forwarding Engine configuration:
  Destination slot: 0
  CoS transmit queue      Bandwidth      Buffer Priority  Limit
                           %             bps      %         bytes
  0 best-effort           95          42499200  95          0         low     none
  3 network-control       5           2236800   5          0         low     none

```

### Meaning

Check for any error statistics that may appear in the output. There should not be any input or output errors. If there are any persistent input or output errors, open a case with the JTAC at [support@juniper.net](mailto:support@juniper.net), or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

### SEE ALSO

[Checklist for Using Loopback Testing for ATM Interfaces | 257](#)

[Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface | 259](#)

[Creating a Loopback | 260](#)

[Setting Clocking to Internal | 263](#)

[Verifying That the ATM Interface Is Up | 264](#)

[Clearing ATM Interface Statistics | 268](#)

[Pinging the ATM Interface | 269](#)

[Diagnosing a Suspected Circuit Problem | 276](#)

## Diagnosing a Suspected Circuit Problem

When you suspect a circuit problem, it is important to work with the transport-layer engineer to resolve the problem. The transport-layer engineer may ask you to create a loop from the router to the network, or the engineer may create a loop to the router from various points in the network.

To diagnose a suspected circuit problem, follow these steps:

1. [Creating a Loop from the Router to the Network | 276](#)
2. [Creating a Loop to the Router from Various Points in the Network | 277](#)

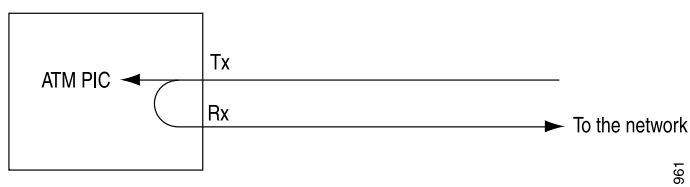
### *Creating a Loop from the Router to the Network*

#### Purpose

Creating a loop from the router to the network allows the transport-layer engineer to test the router from various points in the network. This helps the engineer isolate where the problem might be located.

[Figure 7 on page 276](#) illustrates a loop from a router to the network.

**Figure 7: Loop from the Router to the Network**



#### Action

To create a loop from the router to the network, follow these steps:

1. In configuration mode, go to the following hierarchy level:

```
[edit]
user@host# edit interfaces interface-name (sonet-options | t3-options)
```

2. Configure the remote loopback:

```
[edit interfaces interface-name (sonet-options | t3-options)]
user@host# set loopback remote
```

3. Verify the configuration:

```
user@host# show
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
user@host# show
loopback remote;
```

#### 4. Commit the change:

```
user@host# commit
```

For example:

```
[edit interfaces t3-1/0/0 t3-options]
user@host# commit
commit complete
```

## SEE ALSO

| [Creating a Loop to the Router from Various Points in the Network](#) | 277

### ***Creating a Loop to the Router from Various Points in the Network***

#### **Purpose**

The transport-layer engineer creates a loop to the router from various points in the network. You can then perform tests to verify the connection from the router to that loopback in the network.

#### **Action**

After the transport-layer engineer has created the loop to the router from the network, you must verify the connection from the router to the loopback in the network. Follow Steps 2 through 6 in [“Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface”](#) on page 259. Keep in mind that any problems encountered in the test indicate a problem with the connection from the router to the loopback in the network.

By performing tests to loopbacks at various points in the network, you can isolate the source of the problem.



## SEE ALSO

[Creating a Loop from the Router to the Network | 276](#)

## SEE ALSO

[Checklist for Using Loopback Testing for ATM Interfaces | 257](#)

[Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface | 259](#)

[Creating a Loopback | 260](#)

[Setting Clocking to Internal | 263](#)

[Verifying That the ATM Interface Is Up | 264](#)

[Clearing ATM Interface Statistics | 268](#)

[Pinging the ATM Interface | 269](#)

[Checking for ATM Interface Error Statistics | 270](#)

## RELATED DOCUMENTATION

*Investigating Interface Steps and Commands*

[Determining ATM Interface Type | 202](#)

[Monitoring ATM Interfaces | 218](#)

[Locating ATM Alarms and Errors | 278](#)

## Locating ATM Alarms and Errors

### IN THIS SECTION

- [List of Common ATM Alarms and Error | 278](#)
- [Displaying ATM1 and ATM2 Alarms and Errors | 279](#)

### List of Common ATM Alarms and Error

#### Purpose

To check Asynchronous Transfer Mode (ATM) alarms and errors on both ATM1 and ATM2 IQ interfaces.

Action

[Table 26 on page 279](#) provides links and commands for checking ATM alarms and errors.

Table 26: List of Common ATM Alarms and Error

Tasks	Command or Action
<a href="#">“Displaying ATM1 and ATM2 Alarms and Errors” on page 279</a>	<b>show interfaces at-fpc/pic/port extensive</b>  See <i>List of Common SONET Alarms and Errors</i> .  See <i>Checklist of Common T3 Alarms and Errors</i> .

SEE ALSO

| [Displaying ATM1 and ATM2 Alarms and Errors | 279](#)

Displaying ATM1 and ATM2 Alarms and Errors

Purpose

The alarms and errors that appear on an ATM1 or an ATM2 IQ interface are identical. ATM alarms and errors are dependent on the ATM interface media. If the ATM interface is an OC3 or OC12 interface media, the media statistics are SONET statistics. If the ATM interface is a T3 interface media, the media statistics are T3 statistics.

For information on determining the type of ATM interface on your router, see [“Checklist for Determining ATM Interface Type” on page 202](#).

Action

To display ATM alarms and errors, use the following Junos OS command-line interface (CLI) operational mode command:

```
user@host>show interfaces at-fpc/pic/port extensive
```

Sample Output 1

user@host> show interfaces at-2/0/0 extensive

```
Physical interface: at-2/0/0, Enabled, Physical link is Up
  Interface index: 22, SNMP ifIndex: 42, Generation: 21
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode, Speed: OC3
, Loopback: None, Payload scrambler: Enabled
  Device flags      : Present Running
```

```

Link flags      : None
Hold-times      : Up 0 ms, Down 0 ms
Statistics last cleared: 2002-07-29 14:28:14 EDT (00:00:26 ago)
Traffic statistics:
  Input bytes   :                0                0 bps
  Output bytes  :                0                0 bps
  Input packets :                0                0 pps
  Output packets:                0                0 pps
Input errors:
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
SONET alarms    : None
SONET defects   : None
SONET PHY:
      Seconds      Count  State
  PLL Lock        0        0  OK
  PHY Light       0        0  OK
SONET section:
      Seconds      Count
  BIP-B1          0        0
  SEF             0        0  OK
  LOS             0        0  OK
  LOF             0        0  OK
  ES-S           0
  SES-S          0
  SEFS-S         0
SONET line:
      Seconds      Count
  BIP-B2          0        0
  REI-L           0        0
  RDI-L           0        0  OK
  AIS-L           0        0  OK
  BERR-SF         0        0  OK
  BERR-SD         0        0  OK
  ES-L           0
  SES-L           0
  UAS-L           0
  ES-LFE         0
  SES-LFE        0
  UAS-LFE        0
SONET path:
      Seconds      Count
  BIP-B3          0        0
  REI-P           0        0
  LOP-P           0        0  OK

```

```

AIS-P          0          0 OK
RDI-P          0          0 OK
UNEQ-P         0          0 OK
PLM-P          0          0 OK
ES-P           0
SES-P          0
UAS-P          0
ES-PFE         0
SES-PFE        0
UAS-PFE        0

Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, C2(cmp) : 0x13, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00, V5      : 0x00
V5(cmp) : 0x00

Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
Z4      : 0x00, V5      : 0x00

ATM status:
HCS state:      Sync
LOC           :      OK

ATM Statistics:
Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns:
0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 8830024,
Output idle cell count: 8830026,
Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input
timeouts: 0, Input invalid VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0

PFE configuration:
Destination slot: 2

CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                        %          bps      %          bytes
0 best-effort           0          0      0          0          low      none
1 expedited-forwarding  0          0      0          0          low      none
2 assured-forwarding    0          0      0          0          low      none
3 network-control       0          0      0          0          low      none

Logical interface at-2/0/0.0 (Index 29) (SNMP ifIndex 49) (Generation 28)
Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
Traffic statistics:
Input  bytes :          0
Output bytes :          0
Input  packets:          0

```

```

        Output packets:                0
Local statistics:
    Input  bytes   :                   0
    Output bytes   :                   0
    Input  packets :                   0
    Output packets :                   0
Transit statistics:
    Input  bytes   :                   0          0 bps
    Output bytes   :                   0          0 bps
    Input  packets :                   0          0 pps
    Output packets :                   0          0 pps
Protocol inet, MTU: 4470, Flags: None, Generation: 31 Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 192.168.1.0/30, Local: 192.168.1.1, Broadcast: Unspecified,
Generation: 59
  VCI 1.100
    Flags: Active
    Total down time: 0 sec, Last down: Never
    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input  bytes   :                   0
      Output bytes   :                   0
      Input  packets :                   0
      Output packets :                   0

```

## Meaning

Sample output 1 shows the error statistics for an OC3 ATM interface. SONET alarms and errors fall into three different areas of the output: section, line, and path. See *List of Common SONET Alarms and Errors* for information on SONET alarms.

## Sample Output 2

user@host> **show interfaces at-3/1/0 extensive**

```

Physical interface: at-3/1/0, Enabled, Physical link is Up
  Interface index: 57, SNMP ifIndex: 66, Generation: 56
  Description: customer
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, Speed: T3 , Loopback:
None,
  Payload scrambler: Disabled, Mode: C/Bit parity, Line build-out: 10, ATM
Encapsulation: PLCP
  Device flags      : Present Running

```

```

Link flags      : None
Hold-times     : Up 0 ms, Down 0 ms
Statistics last cleared: 2002-07-30 15:36:58 UTC (00:00:02 ago)
Traffic statistics:
  Input bytes   :          270798          1067704 bps
  Output bytes  :          2260295          8911952 bps
  Input packets:          2001           986 pps
  Output packets:         2506          1235 pps
Input errors:
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0,
  L2 channel errors: 0, L2 mismatch timeouts: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
Active alarms : None
Active defects : None
DS3 media :
      Seconds      Count  State
  PLL Lock         0        0  OK
  Reframing        0        0  OK
  AIS              0        0  OK
  LOF              0        0  OK
  LOS              0        0  OK
  YELLOW           0        0  OK
  EXZ              0        0
  LCV              0        0
  PCV              0        0
  FERR             0        0
  LES             0
  PES             0
  PSES            0
  SEFS            0
  UAS             0
PLCP defects:
      Seconds      Count  State
  LOF              0        0
  YELLOW           0        0
ATM defects:
      Seconds      Count  State
  LCD              0        0
ATM status:
  HCS state:      Hunt
  LOC           :      OK
PLCP statistics (errored seconds):
  Framing errors          : 0(0)
  Bit interleaved parity errors: 0(0)
  Far end block errors    : 0(0)

```

## ATM Statistics:

Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns: 0,

Rx cell FIFO overruns: 0, Rx cell FIFO underruns: 0, Input cell count: 7716, Output cell count: 191980, Output idle cell count: 144302, Output VC queue

drops: 0,

Input no buffers: 0, Input length errors: 0, Input timeouts: 0, Input invalid VCs: 0,

Input bad CRCs: 0, Input OAM cell no buffers: 0

## PFE configuration:

Destination slot: 3

CoS transmit queue	Bandwidth		Buffer		Priority	Limit
	%	bps	%	bytes		
0 best-effort	0	0	0	0	low	none
1 expedited-forwarding	0	0	0	0	low	none
2 assured-forwarding	0	0	0	0	low	none
3 network-control	0	0	0	0	low	none

Logical interface at-3/1/0.0 (Index 25) (SNMP ifIndex 85) (Generation 44)

Flags: Point-To-Point Inverse-ARP SNMP-Traps Encapsulation: ATM-SNAP

## Traffic statistics:

Input bytes : 270798  
 Output bytes : 2260295  
 Input packets: 2001  
 Output packets: 2506

## Local statistics:

Input bytes : 0  
 Output bytes : 0  
 Input packets: 0  
 Output packets: 0

## Transit statistics:

Input bytes : 270798 1067704 bps  
 Output bytes : 2260295 8911952 bps  
 Input packets: 2001 986 pps  
 Output packets: 2506 1235 pps

Protocol inet, MTU: 4470, Flags: None, Generation: 51 Route table: 0

Addresses, Flags: Is-Preferred Is-Primary

Destination: 10.10.65.176/30, Local: 10.10.65.177, Broadcast: Unspecified, Generation: 88

## VCI 0.5

Flags: Active, Inverse-ARP

Total down time: 0 sec, Last down: Never

## ATM per-VC transmit statistics:

Tail queue packet drops: 0

## Traffic statistics:

```

Input  bytes :           270798
Output bytes :          2260295
Input  packets:           2001
Output packets:          2506

```

## Meaning

Sample output 2 shows the error statistics for a T3 ATM interface. See *Checklist of Common T3 Alarms and Errors* for information on T3 alarms.

[Table 27 on page 285](#) describes the input and output errors that appear in the extensive output for an ATM interface.

**Table 27: ATM Interface Input and Output Errors**

Error	Description	Reason for Error
<b>Input Errors</b>		
<b>Errors</b>	Sum of the incoming frame aborts and frame check sequence (FCS) errors.	
<b>Drops</b>	Number of packets dropped by the output queue of the I/O Manager ASIC.	If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's random early detection (RED) mechanism.
<b>Invalid VCs</b>	Number of cells that arrived for a nonexistent virtual circuit (VC).	
<b>Framing errors</b>	Sum of ATM Adaptation Layer (AAL5) packets that have FCS errors, AAL5 packets that have reassembly timeout errors, and AAL5 packets that have length errors.	
<b>Policed discards</b>	Frames that the incoming packet match code discarded because they were not recognized or of interest.	Usually, this field reports protocols that the Junos OS does not handle.
<b>L3 incompletes</b>	Number of packets discarded due to the packets failing Layer 3 header checks.	Increments when the incoming packet fails Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header would be discarded and this counter would increment.



Table 27: ATM Interface Input and Output Errors *(continued)*

Error	Description	Reason for Error
<b>L2 channel errors</b>	Errors that occurred when the software could not find a valid logical interface for an incoming frame.	This counter increments when the software cannot find a valid logical interface for an incoming frame.
<b>L2 mismatch timeouts</b>	Count of malformed or short packets.	Count of malformed or short packets that cause the incoming packet handler to discard the frame as unreadable.
<b>Output Errors</b>		
<b>Carrier transitions</b>	Number of times the interface went from down to up.	This number should not increment quickly and should increase only when the cable is unplugged, the far-end system is powered down and up, or a similar problem occurs. If it increments quickly (perhaps once every 10 seconds), then the cable, the far-end system, or the Physical Interface Card (PIC) is broken.
<b>Errors</b>	Sum of the outgoing frame aborts and FCS errors.	
<b>Drops</b>	Number of packets dropped by the output queue of the I/O Manager ASIC.	If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism.
<b>Aged packets</b>	Number of packets that remained in shared packet SDRAM for so long that the system automatically purged them.	The value in this field should never increment. If it does, it is most likely a software bug or possibly broken hardware.

Table 28 on page 286 lists ATM media-specific alarms and defects that can render the interface unable to pass packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router or trigger the red or yellow alarm LED on the craft interface. For complete explanations of most of these alarms and defects, see Chapter 6 in GR-253, *Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria*.

Table 28: ATM Active Alarms and Defects

Alarm	Description
<b>AIS</b>	Alarm indication signal
<b>AIS-L</b>	Alarm indication signal (line)

Table 28: ATM Active Alarms and Defects (*continued*)

Alarm	Description
<b>AIS-P</b>	Alarm indication signal (path)
<b>BERR</b>	Bit error rate
<b>BERR-SD</b>	Bit error rate defect-signal degrade
<b>BERR-SF</b>	Bit error rate fault-signal fail
<b>EXZ</b>	Excessive zeros
<b>FERF</b>	Far end receive failures
<b>IDLE</b>	Idle code detected
<b>LCD</b>	Loss of cell delineation
<b>LCV</b>	Line code violation
<b>LOC</b>	Loss of cell delineation
<b>LOF</b>	Loss of frame
<b>LOL</b>	Loss of light
<b>LOP</b>	Loss of pointer
<b>LOS</b>	Loss of signal
<b>PLL</b>	Phase-locked loop out of lock
<b>PLCP_LOF</b>	Loss of PLCP frame alarm
<b>PLCP_YLW PLCP</b>	Alarm at the remote end
<b>PLM-P</b>	Payload label mismatch
<b>RDI</b>	Remote defect indication
<b>RDI-L</b>	Remote defect indication (line)

Table 28: ATM Active Alarms and Defects (*continued*)

Alarm	Description
<b>RDI-P</b>	Remote defect indication (path)
<b>REI</b>	Remote error indication
<b>SEF</b>	Severely errored frame
<b>UNEQ</b>	Unequipped
<b>YLW</b>	Remote defect indication (yellow alarm)

SEE ALSO

[List of Common ATM Alarms and Error | 278](#)

#### RELATED DOCUMENTATION

*Investigating Interface Steps and Commands*

[Determining ATM Interface Type | 202](#)

[Monitoring ATM Interfaces | 218](#)

[Using Loopback Testing for ATM Interfaces | 257](#)

# 5

PART

## Configuration Statements and Operational Commands

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# Configuration Statements

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## advertise-interval

### Syntax

```
advertise-interval milliseconds;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Modify the Automatic Protection Switching (APS) interval at which the protect and working routers send packets to their neighbors to advertise that they are operational. A router considers its neighbor to be operational for a period, called the hold time, that is, by default, three times the advertisement interval.

### Options

***milliseconds***—Interval between advertisement packets.

**Range:** 1 through 65,534 milliseconds

**Default:** 1000 milliseconds

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

| [Configuring APS Timers](#)



## allow-any-vci

### Syntax

```
allow-any-vci;
```

### Hierarchy Level

```
[edit interfaces interface-name unit 0],  
[edit logical-systems logical-system-name interfaces interface-name unit 0]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro routers.

### Description

Dedicate entire ATM device to ATM cell relay circuit.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

| [Configuring an ATM1 Cell-Relay Circuit Overview](#) | 91

## annex

### Syntax

```
annex (annex-a | annex-b);
```

### Hierarchy Level

```
[edit interfaces interface-name shdsl-options],  
[edit interfaces interface-name sonet-options aps],  
[edit logical-systems logical-system-name interfaces interface-name shdsl-options]
```

### Release Information

Statement introduced in Junos OS Release 7.4.

### Description

For M320 and M120 routers only, for Multiplex Section Protection (MSP) switching on SDH interfaces, set **annex-b**. You must also configure the **working protection circuit** under the **[edit interfaces so-fpc/pic/port sonet-options aps]** hierarchy level.

### Default

**annex-b**

### Options

**annex-a**—Use for North American SHDSL network implementations.

**annex-b**—Use for European SHDSL network implementations.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## aps

### Syntax

```
aps {
  advertise-interval milliseconds;
  annex-b
  authentication-key key;
  (break-before-make | no-break-before-make);
  fast-aps-switch;
  force;
  hold-time milliseconds;
  lockout;
  neighbor address;
  paired-group group-name;
  preserve-interface;
  protect-circuit group-name;
  request;
  revert-time seconds;
  switching-mode (bidirectional | unidirectional);
  working-circuit group-name;
}
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure Automatic Protection Switching (APS) on the router.

For DS3 channels on a channelized OC12 interface, configure APS on channel 0 only. If you configure APS on channels 1 through 11, it is ignored.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

## atm-cell-relay-accumulation

### Syntax

```
atm-cell-relay-accumulation;
```

### Hierarchy Level

```
[edit chassis fpc slot-number pic pic-number],  
[edit chassis lcc number fpc slot-number pic pic-number] (Routing Matrix)
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure an Asynchronous Transfer Mode (ATM) Physical Interface Card (PIC) in cell-relay accumulation mode.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Configuring the Junos OS to Use ATM Cell-Relay Accumulation Mode on an ATM1 PIC](#) | 178

## atm-encapsulation

### Syntax

```
atm-encapsulation (direct | plcp);
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port e3-options],  
[edit interfaces at-fpc/pic/port t3-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure encapsulation for E3 and T3 traffic over ATM interfaces.

### Default

Physical Layer Convergence Protocol (PLCP) encapsulation is the default for T3 traffic and for E3 traffic using G.751 framing.

### Options

**direct**—Use direct encapsulation. G.832 framing on E3 interfaces requires direct encapsulation.

**plcp**—Use PLCP encapsulation.

### Required Privilege Level

**interface**—To view this statement in the configuration.

**interface-control**—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring E3 and T3 Parameters on ATM Interfaces | 54](#)  
[encapsulation | 322](#)

## atm-l2circuit-mode

### Syntax

```
atm-l2circuit-mode (cell | aal5 | trunk trunk);
```

### Hierarchy Level

```
[edit chassis fpc slot-number pic pic-number],  
[edit chassis lcc number fpc slot-number pic pic-number] (Routing Matrix)
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure the ATM2 intelligent queuing (IQ) Layer 2 circuit transport mode.

### Default

**aal5**

### Options

**aal5**—Tunnel a stream of ATM cells encoded with ATM Adaptation Layer (AAL5) over an IP Multiprotocol Label Switching (MPLS) backbone.

**cell**—Tunnel a stream of ATM cells over an IP MPLS backbone.

**trunk *trunk***—Transport ATM cells over an MPLS core network that is implemented on some other vendor switches. Trunk mode can be **UNI** or **NNI**.

**NOTE:** To determine which vendors support Layer 2 circuit trunk mode, contact Juniper Networks Customer Support.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION



## atm-options

### Syntax

```

atm-options {
  cell-bundle-size cells;
  ilmi;
  linear-red-profiles profile-name {
    high-plp-max-threshold percent;
    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
  }
  mpls {
    pop-all-labels {
      required-depth number;
    }
  }
  pic-type (atm1 | atm2);
  plp-to-clp;
  promiscuous-mode {
    vpi vpi-identifier;
  }
  scheduler-maps map-name {
    forwarding-class class-name {
      epd-threshold cells plp1 cells;
      linear-red-profile profile-name;
      priority (high | low);
      transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
  }
  use-null-cw;
  vpi vpi-identifier {
    maximum-vcs maximum-vcs;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
    shaping {
      (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
      queue-length number;
    }
  }
}

```



**Hierarchy Level**

```
[edit interfaces interface-name]
```


**Release Information**

Statement introduced before Junos OS Release 7.4.  
Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro Routers.

**Description**

Configure ATM-specific physical interface properties.

The remaining statements are explained separately. Search for a statement in [CLI Explorer](#) or click a linked statement in the Syntax section for details.

 **NOTE:** Certain options apply only to specific platforms.

**Required Privilege Level**

interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**RELATED DOCUMENTATION**

<i>Interface Encapsulations Overview</i>
<a href="#">multipoint-destination</a>   <b>362</b>
<a href="#">shaping</a>   <b>389</b>
<a href="#">vci</a>   <b>414</b>

## atm-scheduler-map

### Syntax

```
atm-scheduler-map (map-name | default);
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Associate a scheduler map with a virtual circuit on a logical interface.

### Options

**map-name**—Name of scheduler map that you define at the [edit interfaces *interface-name* **atm-options scheduler-maps**] hierarchy level.

**default**—The default scheduler mapping.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview | 134](#)

[scheduler-maps \(For ATM2 IQ Interfaces\) | 388](#)

## authentication-key

### Syntax

```
authentication-key key;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure the Automatic Protection Switching (APS) authentication key (password).

### Options

**key**—Authentication password. It can be 1 through 8 characters long. Configure the same key for both the working and protect routers.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

### *Configuring Basic Automatic Protect Switching*

For information about the **authentication-key** statement at the **[edit interfaces *interface-name* unit *unit-number* family inet address *address* (vrrp-group | vrrp-inet6-group) *group-number*]** or **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number*]** hierarchy level, see the *High Availability User Guide*.

## buildout (E3 or T3 over ATM Interfaces)

### Syntax

```
buildout feet;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port e3-options],  
[edit interfaces at-fpc/pic/port t3-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For E3 and T3 traffic over ATM interfaces, set the buildout value.

### Options

***feet***—The buildout value in feet.

**Range:** 0 through 450 feet (137 meters)

**Default:** 10 feet (3 meters)

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Configuring E3 and T3 Parameters on ATM Interfaces](#) | 54

## bytes

### Syntax

```
bytes {
  c2 value;
  e1-quiet value;
  f1 value;
  f2 value;
  s1 value;
  z3 value;
  z4 value;
}
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Set values in some SONET/SDH header bytes.

### Options

**c2 *value***—Path signal label SONET/SDH overhead byte. SONET/SDH frames use the C2 byte to indicate the contents of the payload inside the frame. SONET/SDH interfaces use the C2 byte to indicate whether the payload is scrambled.

**Range:** 0 through 255

**Default:** 0xCF

**e1-quiet *value***—Default idle byte sent on the orderwire SONET/SDH overhead bytes. The router does not support the orderwire channel, and hence sends this byte continuously.

**Range:** 0 through 255

**Default:** 0x7F

**f1 *value*, f2 *value*, z3 *value*, z4 *value***—SONET/SDH overhead bytes.

**Range:** 0 through 255

**Default:** 0x00

**s1 *value***—Synchronization message SONET overhead byte. This byte is normally controlled as a side effect of the system reference clock configuration and the state of the external clock coming from an interface if the system reference clocks have been configured to use an external reference.

**Range:** 0 through 255

**Default:** 0xCC

**Required Privilege Level**

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

**RELATED DOCUMENTATION**

*Configuring SONET/SDH Header Byte Values to Identify Error Conditions*

---

*no-concatenate*

## cbit-parity

### Syntax

```
(cbit-parity | no-cbit-parity);
```

### Hierarchy Level

```
[edit interfaces interface-name t3-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For T3 interfaces only, enable or disable C-bit parity mode, which controls the type of framing that is present on the transmitted T3 signal. When C-bit parity mode is enabled, the C-bit positions are used for the far-end block error (FEBE), far-end alarm and control (FEAC), terminal data link, path parity, and mode indicator bits, as defined in ANSI T1.107a-1989. For ATM and ATM2 IQ2 and IQ2-E interfaces, M23 framing is used when the **no-cbit-parity** statement is included. For all other interfaces, M13 framing is used when the **no-cbit-parity** statement is included.

### Default

C-bit parity mode is enabled.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring E3 and T3 Parameters on ATM Interfaces](#) | 54

[Disabling T3 C-Bit Parity Mode](#)

## cbr

### Syntax

```
cbr rate;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options vpi vpi-identifier shaping],
[edit interfaces at-fpc/pic/port unit logical-unit-number address address family family
multipoint-destination address shaping],
[edit interfaces at-fpc/pic/port unit logical-unit-number shaping],
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number address address family
family multipoint-destination address shaping],
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number shaping]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM encapsulation only, define a constant bit rate bandwidth utilization in the traffic-shaping profile.

### Default

Unspecified bit rate (UBR); that is, bandwidth utilization is unlimited.

### Options

**rate**—Peak rate, in bits per second (bps) or cells per second (cps). You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation **c**; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps.

For ATM1 and ATM2 OC3 interfaces, the maximum available rate is 100 percent of **line-rate**, or 135,600,000 bps. For ATM1 OC12 interfaces, the maximum available rate is 50 percent of **line-rate**, or 271,263,396 bps. For ATM2 IQ interfaces, the maximum available rate is 542,526,792 bps.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION



Defining the ATM Traffic-Shaping Profile Overview | 123

---

rtvbr | 386

---

shaping | 389

---

vbr | 411

## cell-bundle-size

### Syntax

```
cell-bundle-size cells;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options],
[edit interfaces at-fpc/pic/port unit logical-unit-number],
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces using ATM Layer 2 circuit cell-relay transport mode only, configure the maximum number of ATM cells per frame.

**NOTE:** For MIC-3D-8OC3-2OC12-ATM on MX104 routers, ensure that the configured **cell-bundle-size** is less than 30 for an ATM interface that is configured with **atm-ccc-cell-relay** encapsulation. If the configured **cell-bundle-size** is greater than or equal to 30 and the traffic is passing through the interface at line rate, it might lead to AFEB crash.

### Options

**cells**—Maximum number of cells.

**Default:** 1 cell

**Range:** 1 through 176 cells

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Configuring the Layer 2 Circuit Cell-Relay Cell Maximum Overview](#) | 85

## cell-bundle-timeout

### Syntax

```
cell-bundle-timeout microseconds;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options],  
[edit interfaces at-fpc/pic/port unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces using ATM Layer 2 circuit cell-relay transport mode only, configure the period for which the ATM cells are aggregated and bundled before they are transmitted in a single frame on a pseudowire connection. When the router detects that the allotted time interval has expired, the router forwards the MPLS packet even if it contains fewer than the specified maximum number of aggregated cells per packet.

### Options

***microseconds***—Number of microseconds for which the ATM cells are accumulated in a single packet before they are transmitted over a pseudowire.

**Default:** 125 microseconds

**Range:** 1 through 125 microseconds

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring the Timeout for Bundling of Layer 2 Circuit Cell-Relay Cells](#) | 90

## down-count

### Syntax

```
down-count cells;
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier oam-liveness],
[edit interfaces interface-name unit logical-unit-number oam-liveness],
[edit interfaces interface-name unit logical-unit-number family family address address multipoint-destination address
oam-liveness],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number oam-liveness],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address
address multipoint-destination address oam-liveness]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM encapsulation only, configure Operation, Administration, and Maintenance (OAM) F5 loopback cell count thresholds. This feature is not supported on ATM-over-SHDSL interfaces.

For ATM2 IQ PICs only, configure OAM F4 loopback cell count thresholds at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level.

### Options

**cells**—Minimum number of consecutive OAM F4 or F5 loopback cells lost before a VC is declared down.

**Range:** 1 through 255

**Default:** 5 cells

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

Configuring the ATM OAM F5 Loopback Cell Threshold | 98

## dsl-options

### Syntax

```
dsl-options {  
  loopback local;  
  operating-mode mode;  
}
```

### Hierarchy Level

[edit interfaces at-*fpc/pic/port*]

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For J Series Services Routers only, modify the properties of the digital subscriber line for an ATM interface.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM-over-ADSL Overview | 184](#)

*Junos OS Interfaces and Routing Configuration Guide*

## e3-options

### Syntax

```
e3-options {
  atm-encapsulation (direct | plcp);
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  buildout feet;
  compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
  fcs (16 | 32);
  framing (g.751 | g.832);
  idle-cycle-flag value;
  invert-data;
  loopback (local | remote);
  (payload-scrambler | no-payload-scrambler);
  start-end-flag value;
  (unframed | no-unframed);
}
```

### Hierarchy Level

```
[edit interfaces interface-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure E3-specific physical interface properties.

For ATM1 interfaces, you can configure a subset of E3 options statements.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[E3 Interfaces Overview](#)

[T3 Interfaces Overview](#)



## encapsulation (Logical Interface)

### Syntax

```
encapsulation (atm-ccc-cell-relay | atm-ccc-vc-mux | atm-cisco-nlpid | atm-mlppp-llc | atm-nlpid | atm-ppp-llc |
atm-ppp-vc-mux | atm-snap | atm-tcc-snap | atm-tcc-vc-mux | atm-vc-mux | ether-over-atm-llc |
ether-vpls-over-atm-llc | ether-vpls-over-fr | ether-vpls-over-ppp | ethernet | ethernet-ccc | ethernet-vpls |
ethernet-vpls-fr | frame-relay-ccc | frame-relay-ether-type | frame-relay-ether-type-tcc | frame-relay-ppp |
frame-relay-tcc | gre-fragmentation | multilink-frame-relay-end-to-end | multilink-ppp | ppp-over-ether |
ppp-over-ether-over-atm-llc | vlan-bridge | vlan-ccc | vlan-vci-ccc | vlan-tcc | vlan-vpls | vxlan);
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],
[edit interfaces rlsq number unit logical-unit-number]
[edit protocols evpn]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers

(**ethernet**, **vlan-ccc**, and **vlan-tcc** options only).

Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro Routers. Only the **atm-ccc-cell-relay** and **atm-ccc-vc-mux** options are supported on ACX Series routers.

Statement introduced in Junos OS Release 17.3R1 for QFX10000 Series switches (**ethernet-ccc** and **vlan-ccc** options only).

### Description

Configure a logical link-layer encapsulation type. Not all encapsulation types are supported on the switches. See the switch CLI.

Starting in Junos OS Release 20.1R1, aggregated ethernet interfaces supports VLAN TCC (Translational cross-connect) encapsulation on MX series platforms. See *Configuring VLAN TCC Encapsulation* for more details. Non-ethernet media types, SONET and ATM interfaces are only supported. It is expected that the user will have the member links of aggregated ethernet with supported hardware for configuring VLAN TCC encapsulation and no commit check is performed externally for the aggregated ethernet (AE) interfaces.

### Options

**atm-ccc-cell-relay**—Use ATM cell-relay encapsulation.

**atm-ccc-vc-mux**—Use ATM virtual circuit (VC) multiplex encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.



**atm-cisco-nlpid**—Use Cisco ATM network layer protocol identifier (NLPID) encapsulation. When you use this encapsulation type, you can configure the **inet** family only.

**atm-mlppp-llc**—For ATM2 IQ interfaces only, use Multilink Point-to-Point (MLPPP) over AAL5 LLC. For this encapsulation type, your router must be equipped with a Link Services or Voice Services PIC. MLPPP over ATM encapsulation is not supported on ATM2 IQ OC48 interfaces.

**atm-nlpid**—Use ATM NLPID encapsulation. When you use this encapsulation type, you can configure the **inet** family only.

**atm-ppp-llc**—(ATM2 IQ interfaces and MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP only) Use PPP over AAL5 LLC encapsulation.

**atm-ppp-vc-mux**—(ATM2 IQ interfaces and MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP only) Use PPP over ATM AAL5 multiplex encapsulation.

**atm-snap**—(All interfaces including MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP) Use ATM subnetwork attachment point (SNAP) encapsulation.

**atm-tcc-snap**—Use ATM SNAP encapsulation on translational cross-connect (TCC) circuits.

**atm-tcc-vc-mux**—Use ATM VC multiplex encapsulation on TCC circuits. When you use this encapsulation type, you can configure the **tcc** family only.

**atm-vc-mux**—(All interfaces including MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP) Use ATM VC multiplex encapsulation. When you use this encapsulation type, you can configure the **inet** family only.

**ether-over-atm-llc**—(All IP interfaces including MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP) For interfaces that carry IP traffic, use Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure multipoint interfaces.

**ether-vpls-over-atm-llc**—For ATM2 IQ interfaces only, use the Ethernet virtual private LAN service (VPLS) over ATM LLC encapsulation to bridge Ethernet interfaces and ATM interfaces over a VPLS routing instance (as described in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*). Packets from the ATM interfaces are converted to standard ENET2/802.3 encapsulated Ethernet frames with the frame check sequence (FCS) field removed.

**ether-vpls-over-fr**—For E1, T1, E3, T3, and SONET interfaces only, use the Ethernet virtual private LAN service (VPLS) over Frame Relay encapsulation to support Bridged Ethernet over Frame Relay encapsulated TDM interfaces for VPLS applications, per RFC 2427, *Multiprotocol Interconnect over Frame Relay*.

**NOTE:** The SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP, the Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP, and the DS3/E3 MIC do not support Ethernet over Frame Relay encapsulation.

**ether-vpls-over-ppp**—For E1, T1, E3, T3, and SONET interfaces only, use the Ethernet virtual private LAN service (VPLS) over Point-to-Point Protocol (PPP) encapsulation to support Bridged Ethernet over PPP-encapsulated TDM interfaces for VPLS applications.

**ethernet**—Use Ethernet II encapsulation (as described in RFC 894, *A Standard for the Transmission of IP Datagrams over Ethernet Networks*).

**ethernet-ccc**—Use Ethernet CCC encapsulation on Ethernet interfaces.

**ethernet-vpls**—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard Tag Protocol ID (TPID) values.

**NOTE:** The built-in Gigabit Ethernet PIC on an M7i router does not support extended VLAN VPLS encapsulation.

**ethernet-vpls-fr**—Use in a VPLS setup when a CE device is connected to a PE router over a time-division multiplexing (TDM) link. This encapsulation type enables the PE router to terminate the outer layer 2 Frame Relay connection, use the 802.1p bits inside the inner Ethernet header to classify the packets, look at the MAC address from the Ethernet header, and use the MAC address to forward the packet into a given VPLS instance.

**frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**frame-relay-ether-type**—Use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay. The physical interface must be configured with flexible-frame-relay encapsulation.

**frame-relay-ether-type-tcc**—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect different media. The physical interface must be configured with flexible-frame-relay encapsulation.

**frame-relay-ppp**—Use PPP over Frame Relay circuits. When you use this encapsulation type, you can configure the **ppp** family only.

**frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits for connecting different media. When you use this encapsulation type, you can configure the **tcc** family only.

**gre-fragmentation**—For adaptive services interfaces only, use GRE fragmentation encapsulation to enable fragmentation of IPv4 packets in GRE tunnels. This encapsulation clears the do not fragment (DF) bit in the packet header. If the packet's size exceeds the tunnel's maximum transmission unit (MTU) value, the packet is fragmented before encapsulation.

**multilink-frame-relay-end-to-end**—Use MLFR FRF.15 encapsulation. This encapsulation is used only on multilink, link services, and voice services interfaces and their constituent T1 or E1 interfaces, and is supported on LSQ and redundant LSQ interfaces.

**multilink-ppp**—Use MLPPP encapsulation. This encapsulation is used only on multilink, link services, and voice services interfaces and their constituent T1 or E1 interfaces.

**ppp-over-ether**—Use PPP over Ethernet encapsulation to configure an underlying Ethernet interface for a dynamic PPPoE logical interface on M120 and M320 routers with Intelligent Queuing 2 (IQ2) PICs, and on MX Series routers with MPCs.

**ppp-over-ether-over-atm-llc**—(MX Series routers with MPCs using the ATM MIC with SFP only) For underlying ATM interfaces, use PPP over Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, configure the interface address on the PPP interface.

**vlan-bridge**—Use Ethernet VLAN bridge encapsulation on Ethernet interfaces that have IEEE 802.1Q tagging, flexible-ethernet-services, and bridging enabled and that must accept packets carrying TPID 0x8100 or a user-defined TPID.

**vlan-ccc**—Use Ethernet virtual LAN (VLAN) encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**vlan-vci-ccc**—Use ATM-to-Ethernet interworking encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**vlan-tcc**—Use Ethernet VLAN encapsulation on TCC circuits. When you use this encapsulation type, you can configure the **tcc** family only.

**vlan-vpls**—Use Ethernet VLAN encapsulation on VPLS circuits.

**vxlan**—Use VXLAN data plane encapsulation for EVPN.

#### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

#### Release History Table

Release	Description
<a href="#">20.1R1</a>	Starting in Junos OS Release 20.1R1, aggregated ethernet interfaces supports VLAN TCC (Translational cross-connect) encapsulation on MX series platforms.

## RELATED DOCUMENTATION

*Configuring Layer 2 Switching Cross-Connects Using CCC*

---

*Configuring the Encapsulation for Layer 2 Switching TCCs*

---

*Configuring Interface Encapsulation on Logical Interfaces*

---

*Configuring the CCC Encapsulation for LSP Tunnel Cross-Connects*

---

*Circuit and Translational Cross-Connects Overview*

---

*Identifying the Access Concentrator*

---

[Configuring ATM Interface Encapsulation | 56](#)

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*Configuring VLAN and Extended VLAN Encapsulation*

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[Configuring ATM-to-Ethernet Interworking | 154](#)

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*Configuring Interface Encapsulation on PTX Series Packet Transport Routers*

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*Configuring CCC Encapsulation for Layer 2 VPNs*

---

*Configuring TCC Encapsulation for Layer 2 VPNs and Layer 2 Circuits*

---

*Configuring ATM for Subscriber Access*

---

[Understanding CoS on ATM IMA Pseudowire Interfaces Overview | 16](#)

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[Configuring Policing on an ATM IMA Pseudowire | 113](#)

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## encapsulation

### List of Syntax

[Syntax for Physical Interfaces: M Series, MX Series, QFX Series, T Series, PTX Series on page 322](#)

[Syntax for Physical Interfaces: SRX Series on page 322](#)

[Syntax for Logical Interfaces: SRX Series on page 322](#)

### Syntax for Physical Interfaces: M Series, MX Series, QFX Series, T Series, PTX Series

```
encapsulation (atm-ccc-cell-relay | atm-pvc | cisco-hdlc | cisco-hdlc-ccc | cisco-hdlc-tcc | ethernet-bridge | ethernet-ccc
| ethernet-over-atm | ethernet-tcc | ethernet-vpls | ethernet-vpls-fr | ether-vpls-over-atm-llc | ethernet-vpls-ppp
| extended-frame-relay-ccc | extended-frame-relay-ether-type-tcc | extended-frame-relay-tcc |
extended-vlan-bridge | extended-vlan-ccc | extended-vlan-tcc | extended-vlan-vpls | flexible-ethernet-services |
flexible-frame-relay | frame-relay | frame-relay-ccc | frame-relay-ether-type | frame-relay-ether-type-tcc |
frame-relay-port-ccc | frame-relay-tcc | generic-services | multilink-frame-relay-uni-nni | ppp | ppp-ccc | ppp-tcc
| vlan-ccc | vlan-vci-ccc | vlan-vpls);
```

### Syntax for Physical Interfaces: SRX Series

```
encapsulation (ether-vpls-ppp | ethernet-bridge | ethernet-ccc | ethernet-tcc | ethernet-vpls |
extended-frame-relay-ccc | extended-frame-relay-tcc | extended-vlan-bridge | extended-vlan-ccc |
extended-vlan-tcc | extended-vlan-vpls | flexible-ethernet-services | frame-relay-port-ccc | vlan-ccc | vlan-vpls);
```

### Syntax for Logical Interfaces: SRX Series

```
encapsulation ( dix | ether-vpls-fr | frame-relay-ppp | ppp-over-ether | vlan-bridge | vlan-ccc | vlan-tcc | vlan-vpls );
```

### Physical Interfaces: M Series, MX Series, QFX Series, T Series, PTX Series

```
[edit interfaces interface-name],
[edit interfaces rlsq number:number]
```

### Logical Interfaces

```
[edit interfaces interface-name unit logical-unit-number ]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 9.5.


Statement introduced in Junos OS Release 11.1 for EX Series switches.

Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers (**flexible-ethernet-services**, **ethernet-ccc**, and **ethernet-tcc** options only).

### Description

For M Series, MX Series, QFX Series, T Series, PTX Series, specify the physical link-layer encapsulation type.

For SRX Series, specify logical link layer encapsulation.



**NOTE:** Not all encapsulation types are supported on the switches. See the switch CLI.

### Default

**ppp**—Use serial PPP encapsulation.

## Physical Interface Options and Logical Interface Options

[Warning: element unresolved in stylesheets: <title> (in <config-options>). This is probably a new element that is not yet supported in the stylesheets.]

### Physical Interface Options and Logical Interface Options

For physical interfaces:

**NOTE:** Frame Relay, ATM, PPP, SONET, and SATSOP options are not supported on EX Series switches.

- **atm-ccc-cell-relay**—Use ATM cell-relay encapsulation.
- **atm-pvc**—Defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*. When you configure physical ATM interfaces with ATM PVC encapsulation, an RFC 2684-compliant ATM Adaptation Layer 5 (AAL5) tunnel is set up to route the ATM cells over a Multiprotocol Label Switching (MPLS) path that is typically established between two MPLS-capable routers using the Label Distribution Protocol (LDP).
- **cisco-hdlc**—Use Cisco-compatible High-Level Data Link Control (HDLC) framing. E1, E3, SONET/SDH, T1, and T3 interfaces can use Cisco HDLC encapsulation. Two related versions are supported:
  - CCC version (**cisco-hdlc-ccc**)—The logical interface does not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.
  - TCC version (**cisco-hdlc-tcc**)—Similar to CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- **cisco-hdlc-ccc**—Use Cisco-compatible HDLC framing on CCC circuits.
- **cisco-hdlc-tcc**—Use Cisco-compatible HDLC framing on TCC circuits for connecting different media.
- **ethernet-bridge**—Use Ethernet bridge encapsulation on Ethernet interfaces that have bridging enabled and that must accept all packets.
- **ethernet-over-atm**—For interfaces that carry IPv4 traffic, use Ethernet over ATM encapsulation. When you use this encapsulation type, you cannot configure multipoint interfaces. As defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*, this encapsulation type allows ATM interfaces to connect to devices that support only bridge protocol data units (BPDUs). Junos OS does not completely support bridging, but accepts BPDU packets as a default gateway. If you use the router as an edge device, then the router acts as a default gateway. It accepts Ethernet LLC/SNAP frames with IP or ARP in the payload, and drops the rest. For packets destined to the Ethernet LAN, a route lookup is done using the destination IP address. If the route lookup yields a full address match, the packet is encapsulated with an LLC/SNAP and MAC header, and the packet is forwarded to the ATM interface.
- **ethernet-tcc**—For interfaces that carry IPv4 traffic, use Ethernet TCC encapsulation on interfaces that must accept packets carrying standard TPID values. For 8-port, 12-port, and 48-port Fast Ethernet PICs, TCC is not supported.

- **ethernet-vpls**—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard TPID values. On M Series routers, except the M320 router, the 4-port Fast Ethernet TX PIC and the 1-port, 2-port, and 4-port, 4-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.
- **ethernet-vpls-fr**—Use in a VPLS setup when a CE device is connected to a PE device over a time division multiplexing (TDM) link. This encapsulation type enables the PE device to terminate the outer Layer 2 Frame Relay connection, use the 802.1p bits inside the inner Ethernet header to classify the packets, look at the MAC address from the Ethernet header, and use the MAC address to forward the packet into a given VPLS instance.
- **ethernet-vpls-ppp**—Use in a VPLS setup when a CE device is connected to a PE device over a time division multiplexing (TDM) link. This encapsulation type enables the PE device to terminate the outer Layer 2 PPP connection, use the 802.1p bits inside the inner Ethernet header to classify the packets, look at the MAC address from the Ethernet header, and use it to forward the packet into a given VPLS instance.
- **ether-vpls-over-atm-llc**—For ATM intelligent queuing (IQ) interfaces only, use the Ethernet virtual private LAN service (VPLS) over ATM LLC encapsulation to bridge Ethernet interfaces and ATM interfaces over a VPLS routing instance (as described in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*). Packets from the ATM interfaces are converted to standard ENET2/802.3 encapsulated Ethernet frames with the frame check sequence (FCS) field removed.
- **extended-frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. This encapsulation type allows you to dedicate DLCIs 1 through 1022 to CCC. When you use this encapsulation type, you can configure the **ccc** family only.
- **extended-frame-relay-ether-type-tcc**—Use extended Frame Relay ether type TCC for Cisco-compatible Frame Relay for DLCIs 1 through 1022. This encapsulation type is used for circuits with different media on either side of the connection.
- **extended-frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits to connect different media. This encapsulation type allows you to dedicate DLCIs 1 through 1022 to TCC.
- **extended-vlan-bridge**—Use extended VLAN bridge encapsulation on Ethernet interfaces that have IEEE 802.1Q VLAN tagging and bridging enabled and that must accept packets carrying TPID 0x8100 or a user-defined TPID.
- **extended-vlan-ccc**—Use extended VLAN encapsulation on CCC circuits with Gigabit Ethernet and 4-port Fast Ethernet interfaces that must accept packets carrying 802.1Q values. Extended VLAN CCC encapsulation supports TPIDs 0x8100, 0x9100, and 0x9901. When you use this encapsulation type, you can configure the **ccc** family only. For 8-port, 12-port, and 48-port Fast Ethernet PICs, extended VLAN CCC is not supported. For 4-port Gigabit Ethernet PICs, extended VLAN CCC is not supported.
- **extended-vlan-tcc**—For interfaces that carry IPv4 traffic, use extended VLAN encapsulation on TCC circuits with Gigabit Ethernet interfaces on which you want to use 802.1Q tagging. For 4-port Gigabit Ethernet PICs, extended VLAN TCC is not supported.



- **extended-vlan-vpls**—Use extended VLAN VPLS encapsulation on Ethernet interfaces that have VLAN 802.1Q tagging and VPLS enabled and that must accept packets carrying TPIDs 0x8100, 0x9100, and 0x9901. On M Series routers, except the M320 router, the 4-port Fast Ethernet TX PIC and the 1-port, 2-port, and 4-port, 4-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.

**NOTE:** The built-in Gigabit Ethernet PIC on an M7i router does not support extended VLAN VPLS encapsulation.

- **flexible-ethernet-services**—For Gigabit Ethernet IQ interfaces and Gigabit Ethernet PICs with small form-factor pluggable transceivers (SFPs) (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i router), and for Gigabit Ethernet interfaces, use flexible Ethernet services encapsulation when you want to configure multiple per-unit Ethernet encapsulations. Aggregated Ethernet bundles can use this encapsulation type. This encapsulation type allows you to configure any combination of route, TCC, CCC, Layer 2 virtual private networks (VPNs), and VPLS encapsulations on a single physical port. If you configure flexible Ethernet services encapsulation on the physical interface, VLAN IDs from 1 through 511 are no longer reserved for normal VLANs.
- **flexible-frame-relay**—For IQ interfaces only, use flexible Frame Relay encapsulation when you want to configure multiple per-unit Frame Relay encapsulations. This encapsulation type allows you to configure any combination of TCC, CCC, and standard Frame Relay encapsulations on a single physical port. Also, each logical interface can have any DLCI value from 1 through 1022.
- **frame-relay**—Use Frame Relay encapsulation is defined in RFC 1490, *Multiprotocol Interconnect over Frame Relay*. E1, E3, link services, SONET/SDH, T1, T3, and voice services interfaces can use Frame Relay encapsulation.
- **frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. This encapsulation is same as standard Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to CCC. The logical interface must also have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
- **frame-relay-ether-type**—Use Frame Relay ether type encapsulation for compatibility with the Cisco Frame Relay. IETF frame relay encapsulation identifies the payload format using NLPID and SNAP formats. Cisco-compatible Frame Relay encapsulation uses the Ethernet type to identify the type of payload.

**NOTE:** When the encapsulation type is set to Cisco-compatible Frame Relay encapsulation, ensure that the LMI type is set to ANSI or Q933-A.

- **frame-relay-ether-type-tcc**—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect different media. This encapsulation is Cisco-compatible Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to TCC.

- **frame-relay-port-ccc**—Use Frame Relay port CCC encapsulation to transparently carry all the DLCIs between two customer edge (CE) routers without explicitly configuring each DLCI on the two provider edge (PE) routers with Frame Relay transport. The connection between the two CE routers can be either user-to-network interface (UNI) or network-to-network interface (NNI); this is completely transparent to the PE routers. When you use this encapsulation type, you can configure the **ccc** family only.
- **frame-relay-tcc**—This encapsulation is similar to Frame Relay CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- **generic-services**—Use generic services encapsulation for services with a hierarchical scheduler.
- **multilink-frame-relay-uni-nni**—Use MLFR UNI NNI encapsulation. This encapsulation is used on link services, voice services interfaces functioning as FRF.16 bundles, and their constituent T1 or E1 interfaces, and is supported on LSQ and redundant LSQ interfaces.
- 
- **ppp**—Use serial PPP encapsulation. This encapsulation is defined in RFC 1661, *The Point-to-Point Protocol (PPP) for the Transmission of Multiprotocol Datagrams over Point-to-Point Links*. PPP is the default encapsulation type for physical interfaces. E1, E3, SONET/SDH, T1, and T3 interfaces can use PPP encapsulation.
- **ppp-ccc**—Use serial PPP encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.
- **ppp-tcc**—Use serial PPP encapsulation on TCC circuits for connecting different media. When you use this encapsulation type, you can configure the **tcc** family only.
- **vlan-ccc**—Use Ethernet VLAN encapsulation on CCC circuits. VLAN CCC encapsulation supports TPID 0x8100 only. When you use this encapsulation type, you can configure the **ccc** family only.
- **vlan-vci-ccc**—Use ATM-to-Ethernet interworking encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only. All logical interfaces configured on the Ethernet interface must also have the encapsulation type set to **vlan-vci-ccc**.
- **vlan-vpls**—Use VLAN VPLS encapsulation on Ethernet interfaces with VLAN tagging and VPLS enabled. Interfaces with VLAN VPLS encapsulation accept packets carrying standard TPID values only. On M Series routers, except the M320 router, the 4-port Fast Ethernet TX PIC and the 1-port, 2-port, and 4-port, 4-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.

**NOTE:**

- Label-switched interfaces (LSIs) do not support VLAN VPLS encapsulation. Therefore, you can only use VLAN VPLS encapsulation on a PE-router-to-CE-router interface and not a core-facing interface.
- Starting with Junos OS release 13.3, a commit error occurs when you configure **vlan-vpls** encapsulation on a physical interface and configure **family inet** on one of the logical units. Previously, it was possible to commit this invalid configuration.

For logical interfaces:

- **frame-relay**—Configure a Frame Relay encapsulation when the physical interface has multiple logical units, and the units are either point to point or multipoint.
- **multilink-frame-relay-uni-nni**—Link services interfaces functioning as FRF.16 bundles can use Multilink Frame Relay UNI NNI encapsulation.
- **ppp**—For normal mode (when the device is using only one ISDN B-channel per call). Point-to-Point Protocol is for communication between two computers using a serial interface.
- **ppp-over-ether**—This encapsulation is used for underlying interfaces of pp0 interfaces.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Understanding Physical Encapsulation on an Interface*

*Configuring Interface Encapsulation on Physical Interfaces*

*Configuring CCC Encapsulation for Layer 2 VPNs*

*Configuring Layer 2 Switching Cross-Connects Using CCC*

*Configuring TCC Encapsulation for Layer 2 VPNs and Layer 2 Circuits*

[Configuring ATM Interface Encapsulation | 56](#)

[Configuring ATM-to-Ethernet Interworking | 154](#)

*Configuring VLAN and Extended VLAN Encapsulation*

*Configuring VLAN and Extended VLAN Encapsulation*

*Configuring Encapsulation for Layer 2 Wholesale VLAN Interfaces*

*Configuring Interfaces for Layer 2 Circuits*

*Configuring Interface Encapsulation on PTX Series Packet Transport Routers*

*Configuring MPLS LSP Tunnel Cross-Connects Using CCC*

*Configuring TCC*

*Configuring VPLS Interface Encapsulation*

*Configuring Interfaces for VPLS Routing*

*Defining the Encapsulation for Switching Cross-Connects*

*Configuring an MPLS-Based Layer 2 VPN (CLI Procedure)*

## epd-threshold (Logical Interface)

### Syntax

```
epd-threshold cells plp1 cells;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],
[edit interfaces interface-name unit logical-unit-number address address family family multipoint-destination address],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number address address family
family multipoint-destination address]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 11.1 for the QFX Series.

### Description

For ATM2 IQ interfaces only, define the early packet discard (EPD) threshold on a VC. The EPD threshold is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are discarded. For interfaces configured in trunk mode, you can also configure dual EPD thresholds depending on the packet loss priorities (PLPs).

### Default

Approximately 1 percent of the available cell buffers. If shaping is enabled, the default EPD threshold is proportional to the shaping rate according to the following formula:

```
default epd-threshold = number of buffers * shaping rate / line rate
```

The minimum EPD threshold value is 48 cells. If the default EPD threshold formula results in an EPD threshold of less than 48 cells, the result will be ignored, and the minimum value of 48 cells will be used.

### Options

**cells**—Maximum number of cells.

**Range:** For 1-port and 2-port OC12 interfaces, 48 through 425,984 cells

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring the ATM2 IQ EPD Threshold | 151](#)

[Configuring Two EPD Thresholds per Queue | 153](#)

## epd-threshold (Physical Interface)

### Syntax

```
epd-threshold cells plp1 cells;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options scheduler-maps map-name forwarding-class class-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, define the EPD threshold on a VC. The EPD threshold is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are discarded.

### Default

If you do not include either the **epd-threshold** or the **linear-red-profile** statement in the forwarding class configuration, the Junos OS uses an EPD threshold based on the available bandwidth and other parameters.

### Options

**cells**—Maximum number of cells.

**Range:** For 1-port and 2-port OC12 interfaces, 48 through 425,984 cells. For 1-port OC48 interfaces, 48 through 425,984 cells. For 2-port OC3, DS3, and E3 interfaces, 48 through 212,992 cells. For 4-port DS3 and E3 interfaces, 48 through 106,496 cells.

The **plp1** statement is explained separately.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring an ATM Scheduler Map | 137](#)

[linear-red-profile | 352](#)

## family

### Syntax

```
family family {
    accounting {
        destination-class-usage;
        source-class-usage {
            (input | output | input output);
        }
    }
    access-concentrator name;
    address address {
        ... the address subhierarchy appears after the main [edit interfaces interface-name unit logical-unit-number family
            family-name] hierarchy ...
    }
    bundle interface-name;
    core-facing;
    demux-destination {
        destination-prefix;
    }
    demux-source {
        source-prefix;
    }
    direct-connect;
    duplicate-protection;
    dynamic-profile profile-name;
    filter {
        group filter-group-number;
        input filter-name;
        input-list [ filter-names ];
        output filter-name;
        output-list [ filter-names ];
    }
    interface-mode (access | trunk);
    ipsec-sa sa-name;
    keep-address-and-control;
    mac-validate (loose | strict);
    max-sessions number;
    max-sessions-vs-a-ignore;
    mtu bytes;
    multicast-only;
    nd6-stale-time seconds;
    negotiate-address;
    no-neighbor-learn;
```

```

no-redirects;
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
protocols [inet iso mpls];
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check {
    fail-filter filter-name
    mode loose;
}
sampling {
    input;
    output;
}
service {
    input {
        post-service-filter filter-name;
        service-set service-set-name <service-filter filter-name>;
    }
    output {
        service-set service-set-name <service-filter filter-name>;
    }
}
service-name-table table-name;
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max maximum-seconds> <filter [aci]>;
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
translate-plp-control-word-de;
unnumbered-address interface-name destination address destination-profile profile-name;
vlan-id number;
vlan-id-list [number number-number];

```



```

address address {
  arp ip-address (mac | multicast-mac) mac-address <publish>;
  broadcast address;
  destination address;
  destination-profile name;
  eui-64;
  master-only;
  multipoint-destination address dlcidlcid-identifier;
  multipoint-destination address {
    epd-threshold cells;
    inverse-arp;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
    shaping {
      (cbr rate | rtvbr burst length peak rate sustained rate | vbr burst length peak rate sustained rate);
      queue-length number;
    }
    vci vpi-identifier.vci-identifier;
  }
  preferred;
  primary;
  vrrp-groupgroup-id {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-key key;
    authentication-type authentication;
    fast-interval milliseconds;
    (preempt | no-preempt) {
      hold-time seconds;
    }
    priority number;
    track {
      interface interface-name {
        bandwidth-threshold bits-per-second priority-cost priority;
        priority-cost priority;
      }
      priority-hold-time seconds;
      route prefix routing-instance instance-name priority-cost priority;
    }
  }
  virtual-address [ addresses ];
}

```

```

    }
    virtual-link-local-address ipv6-address;
  }
}

```

### Hierarchy Level

```

[edit interfaces interface-name unit logical-unit-number],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]

```

### Release Information

Statement introduced before Junos OS Release 7.4.

Option **max-sessions-vs-a-ignore** introduced in Junos OS Release 11.4.

### Description

Configure protocol family information for the logical interface.

Starting in Junos OS Release 20.1R1, aggregated ethernet interfaces supports VLAN TCC (Translational cross-connect) encapsulation on MX series platforms. See *Configuring VLAN TCC Encapsulation* for more details.

**NOTE:** Not all subordinate statements are available to every protocol family.

## Options

**family**—Protocol family:

- **any**—Protocol-independent family used for Layer 2 packet filtering

**NOTE:** This option is not supported on T4000 Type 5 FPCs.

- **bridge**—(M Series and T Series routers only) Configure only when the physical interface is configured with **ethernet-bridge** type encapsulation or when the logical interface is configured with **vlan-bridge** type encapsulation. You can optionally configure this protocol family for the logical interface on which you configure VPLS.
- **ethernet-switching**—(M Series and T Series routers only) Configure only when the physical interface is configured with **ethernet-bridge** type encapsulation or when the logical interface is configured with **vlan-bridge** type encapsulation
- **ccc**—Circuit cross-connect protocol suite. You can configure this protocol family for the logical interface of CCC physical interfaces. When you use this encapsulation type, you can configure the **ccc** family only.
- **inet**—Internet Protocol version 4 suite. You must configure this protocol family for the logical interface to support IP protocol traffic, including Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), Internet Control Message Protocol (ICMP), and Internet Protocol Control Protocol (IPCP).
- **inet6**—Internet Protocol version 6 suite. You must configure this protocol family for the logical interface to support IPv6 protocol traffic, including Routing Information Protocol for IPv6 (RIPng), Intermediate System-to-Intermediate System (IS-IS), BGP, and Virtual Router Redundancy Protocol for IPv6 (VRRP).
- **iso**—International Organization for Standardization Open Systems Interconnection (ISO OSI) protocol suite. You must configure this protocol family for the logical interface to support IS-IS traffic.
- **mlfr-end-to-end**—Multilink Frame Relay FRF.15. You must configure this protocol or multilink Point-to-Point Protocol (MLPPP) for the logical interface to support multilink bundling.
- **mlfr-uni-nni**—Multilink Frame Relay FRF.16. You must configure this protocol or **mlfr-end-to-end** for the logical interface to support link services and voice services bundling.
- **multilink-ppp**—Multilink Point-to-Point Protocol. You must configure this protocol (or **mlfr-end-to-end**) for the logical interface to support multilink bundling.
- **mpls**—Multiprotocol Label Switching (MPLS). You must configure this protocol family for the logical interface to participate in an MPLS path.
- **pppoe**—Point-to-Point Protocol over Ethernet
- **tcc**—Translational cross-connect protocol suite. You can configure this protocol family for the logical interface of TCC physical interfaces.

- **tnp**—Trivial Network Protocol. This protocol is used to communicate between the Routing Engine and the router’s packet forwarding components. The Junos OS automatically configures this protocol family on the router’s internal interfaces only, as discussed in *Understanding Internal Ethernet Interfaces*.
- **vpls**—(M Series and T Series routers only) Virtual private LAN service. You can optionally configure this protocol family for the logical interface on which you configure VPLS. VPLS provides an Ethernet-based point-to-multipoint Layer 2 VPN to connect customer edge (CE) routers across an MPLS backbone. When you configure a VPLS encapsulation type, the **family vpls** statement is assumed by default.  
  
MX Series routers support dynamic profiles for VPLS pseudowires, VLAN identifier translation, and automatic bridge domain configuration.

For more information about VPLS, see the *Junos OS VPNs Library for Routing Devices*.

The remaining statements are explained separately. See [CLI Explorer](#).

**Required Privilege Level**

- interface—To view this statement in the configuration.
- interface-control—To add this statement to the configuration.

**Release History Table**

Release	Description
<a href="#">20.1R1</a>	Starting in Junos OS Release 20.1R1, aggregated ethernet interfaces supports VLAN TCC (Translational cross-connect) encapsulation on MX series platforms.

**RELATED DOCUMENTATION**

| *Configuring the Protocol Family*

## fast-aps-switch

### Syntax

```
fast-aps-switch;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced in Junos OS Release 12.1.

### Description

(M320 routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only, EX Series switches, and MX series routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only using container interfaces) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.

#### NOTE:

- The fast APS switching feature is supported only within a single chassis on a MX series router using a container interface.
- Configuring this statement reduces the APS switchover time only when the Layer 2 circuit encapsulation type for the interface receiving traffic from a Layer 2 circuit neighbor is SAToP.
- When the **fast-aps-switch** statement is configured in revertive APS mode, you must configure an appropriate value for revert time to achieve reduction in APS switchover time.
- To prevent the logical interfaces in the data path from being shut down, configure appropriate hold-time values on all the interfaces in the data path that support TDM.
- The **fast-aps-switch** statement cannot be configured when the APS **annex-b** option is configured.
- The interfaces that have the **fast-aps-switch** statement configured cannot be used in virtual private LAN service (VPLS) environments.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Reducing APS Switchover Time in Layer 2 Circuits*

## force

### Syntax

```
force (protect | working);
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Perform a forced switch between the protect and working circuits. This statement is honored only if there are no higher-priority reasons to switch. It can be overridden by a signal failure on the protect circuit, thus causing a switch to the working circuit.

### Options

**protect**—Request the circuit to become the protect circuit.

**working**—Request the circuit to become the working circuit.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Configuring Switching Between the Working and Protect Circuits*

[request](#) | [382](#)

## forwarding-class (ATM2 IQ Scheduler Maps)

### Syntax

```
forwarding-class class-name {
  epd-threshold cells plp1 cells;
  linear-red-profile profile-name;
  priority (high | low);
  transmit-weight (cells number | percent number);
}
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options scheduler-maps map-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, define forwarding class name and option values.

### Options

***class-name***—Name of forwarding class.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview](#) | 134

*Applying Scheduler Maps to ATM Interfaces*

## framing (E1, E3, and T1 Interfaces)

### Syntax

```
framing (g704 | g704-no-crc4 | g.751 | g.832 | unframed | sf | esf);
```

### Hierarchy Level

```
[edit interfaces ce1-fpc/pic/port],  
[edit interfaces ct1-fpc/pic/port],  
[edit interfaces at-fpc/pic/port e3-options],  
[edit interfaces e1-fpc/pic/port e1-options],  
[edit interfaces t1-fpc/pic/port t1-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro Routers.

### Description

Configure the framing format.

**NOTE:** When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the **framing** statement must be included at the **[edit interfaces ce1-fpc/pic/port]** or **[edit interfaces ct1-fpc/pic/port]** hierarchy level as appropriate.

### Default

**esf** for T1 interfaces; **g704** for E1 interfaces. There is no default value for E3 over ATM interfaces.

### Options

**esf**—Extended superframe (ESF) mode for T1 interfaces.

**g704**—G.704 framing format for E1 interfaces.

**g704-no-crc4**—G.704 framing with no cyclic redundancy check 4 (CRC4) for E1 interfaces.

**g.751**—G.751 framing format for E3 over ATM interfaces.

**g.832**—G.832 framing format for E3 over ATM interfaces.

**sf**—Superframe (SF) mode for T1 interfaces.

**unframed**—Unframed mode for E1 interfaces.



**Required Privilege Level**

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

**RELATED DOCUMENTATION**

---

*Configuring E1 Framing*

---

[Configuring E3 and T3 Parameters on ATM Interfaces | 54](#)

---

*Configuring T1 Framing*

## high-plp-max-threshold

### Syntax

```
high-plp-max-threshold percent;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options linear-red-profiles profile-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, define the drop profile fill-level for the high PLP CoS VC. When the fill level exceeds the defined percentage, all packets are dropped.

### Options

***percent***—Fill-level percentage when linear random early discard (RED) is applied to cells with PLP.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview](#) | 134

[low-plp-max-threshold](#) | 357

[low-plp-threshold](#) | 358

[queue-depth](#) | 378

## high-plp-threshold

### Syntax

```
high-plp-threshold percent;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options linear-red-profiles profile-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, define CoS VC drop profile fill-level percentage when linear RED is applied to cells with high PLP. When the fill level exceeds the defined percentage, packets with high PLP are randomly dropped by RED. This statement is mandatory.

### Options

**percent**—Fill-level percentage when linear RED is applied to cells with PLP.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview](#) | [134](#)

[high-plp-max-threshold](#) | [343](#)

[low-plp-max-threshold](#) | [357](#)

[low-plp-threshold](#) | [358](#)

[queue-depth](#) | [378](#)

## hold-time (APS)

### Syntax

```
hold-time milliseconds;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Hold-time value to use to determine whether a neighbor APS router is operational.

### Options

***milliseconds***—Hold-time value.

**Range:** 1 through 65,534 milliseconds

**Default:** 3000 milliseconds (3 times the advertisement interval)

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Configuring APS Timers*

[advertise-interval](#) | [293](#)

## hold-time (SONET/SDH Defect Triggers)

### Syntax

```
hold-time up milliseconds down milliseconds;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options trigger defect]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM over SONET/SDH and SONET/SDH interfaces only, apply up and down hold times to SONET/SDH defect triggers. When you apply a down hold time to a defect, the defect must remain present for at least the hold-time period before the interface is marked down. When you apply an up hold time to a defect, the defect must remain absent for at least the hold-time period before the interface is marked up, assuming no other defect is outstanding.

#### NOTE:

- When up or down hold times are applied to SONET defect triggers of a 10-Gigabit Ethernet WAN-PHY interface, only the defects generated in the WAN Interface Sublayer (WIS) are damped. Therefore, if the hold times are applied to SONET defect triggers only, a 10-Gigabit Ethernet WAN-PHY interface might be marked up or down because of the faults that are generated in other layers, such as the Physical Coding Sublayer (PCS) or Physical Medium Attachment Sublayer (PMA), 10 Gigabit Media Independent Interface (XGMII) Extender Sublayer (XGXS), and Media Access Control (MAC). To damp the interface up or down events of a 10-Gigabit Ethernet WAN-PHY interface, you need to apply up or down hold-times for the interface at the **[edit interfaces *interface-name*]** hierarchy level.
- On M Series and T Series platforms with Channelized SONET IQ PICs and Channelized SONET IQE PICs, the SONET defect alarm trigger **hold-time** statement is not supported.

### Default

If you do not include this statement, when a defect is detected the interface is marked down immediately, and when the defect becomes absent the interface is marked up immediately.

### Options

**down *milliseconds***—Hold time to wait before the interface is marked down.

**Range:** 1 through 65,534 milliseconds

**Default:** No hold time

**up *milliseconds***—Hold time to wait before the interface is marked up.

**Range:** 1 through 65,534 milliseconds

**Default:** No hold time

#### **Required Privilege Level**

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

#### **RELATED DOCUMENTATION**

*Configuring SONET/SDH Defect Triggers*

*hold-time (Physical Interface)*

## idle-cell-format

### Syntax

```
idle-cell-format {
    itu-t;
    payload-pattern payload-pattern-byte;
}
```

### Hierarchy Level

```
[edit chassis fpc slot-number pic pic-number idle-cell-format],
[edit chassis lcc number fpc slot-number pic pic-number idle-cell-format] (Routing Matrix)
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 PICs only, configure the format of the idle cell header and payload bytes.

### Options

**itu-t**—Configure the idle cell header to use the International Telecommunications Union (ITU-T) standard of 0x00000001.

**Default:** (4 bytes): 0x00000000

***payload-pattern-byte***—Configure the idle cell payload pattern. The payload pattern byte can range from 0x00 through 0xff.

**Default:** cell payload (48 bytes)

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Configuring the Junos OS to Enable Idle Cell Format and Payload Patterns for ATM Devices](#) | 177

## ilmi

### Syntax

```
ilmi;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Enable the router to communicate with directly attached ATM switches and routers. The router uses the VC 0.16 to communicate with the ATM switch or router. Once configured, you can display the IP address and port number of an ATM switch or router using the **show interfaces *interface-name* switch-id** command.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring Communication with Directly Attached ATM Switches and Routers | 52](#)

[show ilmi | 433](#)

[show ilmi statistics | 435](#)



## inverse-arp

### Syntax

```
inverse-arp;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],  
[edit interfaces interface-name unit logical-unit-number family inet address address multipoint-destination destination],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet address  
  address multipoint-destination destination]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 11.1 for the QFX Series.

### Description

For ATM encapsulation, enable responses to receive inverse ATM ARP requests. For Frame Relay encapsulation, enable responses to receive inverse Frame Relay ARP requests.

### Default

Inverse ARP is disabled on all ATM and Frame Relay interfaces.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring Inverse ATM1 or ATM2 ARP | 134](#)

[Configuring Inverse Frame Relay ARP](#)

## inner-vlan-id-range

### Syntax

```
inner-vlan-id-range start start-id end end-id;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],
```

### Release Information

Statement introduced in Junos OS Release 9.0.

### Description

The range of VLAN IDs to be used in the ATM-to-Ethernet interworking cross-connect. Specify the starting VLAN ID and ending VLAN ID.

### Options

***start-id***—The lowest VLAN ID to be used.

***end-id***—The highest VLAN ID to be used.

**Range:** 32 through 4094

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

| [Configuring ATM-to-Ethernet Interworking](#) | 154

## linear-red-profile

### Syntax

```
linear-red-profile profile-name;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options scheduler-maps map-name forwarding-class class-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, assign a linear RED profile to a specified forwarding class. To define the linear RED profiles, include the [linear-red-profiles](#) statement at the [\[edit interfaces at-fpc/pic/port atm-options\]](#) hierarchy level.

### Default

If you do not include either the **epd-threshold** or the **linear-red-profile** statement in the forwarding class configuration, the Junos OS uses an EPD threshold based on the available bandwidth and other parameters.

### Options

***profile-name***—Name of the linear RED profile.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring an ATM Scheduler Map | 137](#)

[linear-red-profiles | 353](#)

[Applying Scheduler Maps to ATM Interfaces](#)

[epd-threshold](#)

## linear-red-profiles

### Syntax

```
linear-red-profiles profile-name {  
    high-plp-threshold percent;  
    low-plp-threshold percent;  
    queue-depth cells;  
}
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, define CoS virtual circuit drop profiles for RED. When a packet arrives, RED checks the queue fill level. If the fill level corresponds to a nonzero drop probability, the RED algorithm determines whether to drop the arriving packet.

### Options

***profile-name***—Name of the drop profile.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview](#) | 134

*Configuring Linear RED Profiles on ATM Interfaces*

## lockout

### Syntax

```
lockout;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure a lockout of protection, forcing the use of the working circuit and locking out the protect circuit regardless of anything else.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

| *Configuring Switching Between the Working and Protect Circuits*

## loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3)

### Syntax

```
loopback (local | payload | remote);
```

### Hierarchy Level

```
[edit interfaces ce1-fpc/pic/port],
[edit interfaces ct1-fpc/pic/port],
[edit interfaces t1-fpc/pic/port],
[edit interfaces interface-name ds0-options],
[edit interfaces interface-name dsl-options],
[edit interfaces interface-name e1-options],
[edit interfaces interface-name e3-options],
[edit interfaces interface-name shdsl-options],
[edit interfaces interface-name sonet-options],
[edit interfaces interface-name t1-options],
[edit interfaces interface-name t3-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro Routers.

### Description

Configure a loopback connection. To turn off the loopback capability, remove the **loopback** statement from the configuration.

**NOTE:** When configuring CE1 or CT1 interfaces on 10-port Channelized E1/T1 IQE PICs, the **loopback** statement must be included with the **local** or **remote** option at the **[edit interfaces *ce1-fpc/pic/port*]** or **[edit interfaces *ct1-fpc/pic/port*]** hierarchy level as appropriate.

When configuring T1 interfaces on 10-port Channelized E1/T1 IQE PICs, the **loopback** statement must be included with the **payload** option at the **[edit interfaces *t1-fpc/pic/port*]** hierarchy level.

**NOTE:** When configuring CE1 or CT1 interfaces on the 16-port Channelized E1/T1 MIC (MIC-3D-16CHE1-T1-CE), you must include the **loopback** statement at the **[edit interfaces *ce1-fpc/pic/port*]** hierarchy level, or **[edit interfaces *ct1-fpc/pic/port*]**

To configure loopback on channelized IQ and IQE PICs, SONET/SDH level, use the **sonet-options loopback** statement **local** and **remote** options at the controller interface (coc48, cstm16, coc12, cstm4, coc3, cstm1). It is ignored for path-level interfaces **so-fpc/pic/port** or **so-fpc/pic/port:channel**.

**Options**

**local**—Loop packets, including both data and timing information, back on the local router’s PIC. NxDS0 IQ interfaces do not support local loopback.

**payload**—For channelized T3, T1, and NxDS0 IQ interfaces only, loop back data only (without clocking information) on the remote router’s PIC. With payload loopback, overhead is recalculated. Neither ATM-over-asymmetrical digital subscriber line (ADSL) interfaces nor ATM-over-SHDSL interfaces support payload loopback.

**remote**—Loop packets, including both data and timing information, back on the remote router’s interface card. NxDS0 IQ interfaces do not support remote loopback.

**Required Privilege Level**

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

<a href="#">Configuring E3 and T3 Parameters on ATM Interfaces   54</a>
<a href="#">Configuring E1 Loopback Capability</a>
<a href="#">Configuring E3 Loopback Capability</a>
<a href="#">Configuring SONET/SDH Loopback Capability to Identify a Problem as Internal or External</a>
<a href="#">Configuring SHDSL Operating Mode on an ATM Physical Interface   196</a>
<a href="#">Configuring T1 Loopback Capability</a>
<a href="#">Configuring T3 Loopback Capability</a>
<a href="#">feac-loop-respond</a>

## low-plp-max-threshold

### Syntax

```
low-plp-max-threshold percent;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options linear-red-profiles profile-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, define the drop profile fill-level for the low PLP CoS VC. When the fill level exceeds the defined percentage, all packets are dropped.

### Options

**percent**—Fill-level percentage when linear RED is applied to cells with PLP.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview | 134](#)

[high-plp-max-threshold | 343](#)

[low-plp-threshold | 358](#)

*Configuring Linear RED Profiles on ATM Interfaces*

*high-plp-max-threshold*

[queue-depth | 378](#)



# low-plp-threshold

## Syntax

```
low-plp-threshold percent;
```

## Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options linear-red-profiles profile-name]
```

## Release Information

Statement introduced before Junos OS Release 7.4.

## Description

For ATM2 IQ interfaces only, define the CoS VC drop profile fill-level percentage when linear RED is applied to cells with low PLP. When the fill level exceeds the defined percentage, packets with low PLP are randomly dropped by RED. This statement is mandatory.

## Options

**percent**—Fill-level percentage when linear RED is applied to cells with low PLP.

## Required Privilege Level

- interface—To view this statement in the configuration.
- interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

<a href="#">ATM2 IQ VC Tunnel CoS Components Overview</a>	<a href="#">134</a>
<a href="#">high-plp-max-threshold</a>	<a href="#">343</a>
<a href="#">high-plp-threshold</a>	<a href="#">344</a>
<a href="#">Configuring Linear RED Profiles on ATM Interfaces</a>	
<a href="#">high-plp-max-threshold</a>	
<a href="#">high-plp-threshold</a>	
<a href="#">low-plp-max-threshold</a>	<a href="#">357</a>
<a href="#">queue-depth</a>	<a href="#">378</a>

## maximum-vcs

### Syntax

```
maximum-vcs maximum-vcs;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options vpi vpi-identifier]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM1 interfaces, configure the maximum number of virtual circuits (VCs) allowed on a virtual path (VP). When configuring ATM1 interfaces on the router, you must include this statement.

For a configured virtual path identifier (VPI), valid virtual channel identifier (VCI) numbers are from 0 through (*maximum-vcs* value – 1). VCI numbers 0 through 31 are reserved by the ATM Forum. It is recommended that you use a VCI number higher than 31 when connecting to an ATM switch.

### Options

*maximum-vcs*—Maximum number of VCs on the VP.

**Range:** 1 through 4090

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring the Maximum Number of ATM1 VCs on a VP | 51](#)

[multipoint-destination | 362](#)

[promiscuous-mode | 376](#)

[vci | 414](#)

## mpls (Interfaces)

### Syntax

```
mpls {  
  pop-all-labels {  
    required-depth number;  
  }  
}
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options],  
[edit interfaces interface-name sonet-options],  
[edit interfaces interface-name fastether-options],  
[edit interfaces interface-name gige-ether-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For passive monitoring on ATM and SONET/SDH interfaces and 10-Gigabit Ethernet interfaces in WAN PHY mode, process incoming IP packets that have MPLS labels.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

---

[Removing MPLS Labels from Incoming Packets](#) | 181

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*Enabling Packet Flow Monitoring on SONET/SDH Interfaces*

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*Junos OS Services Interfaces Library for Routing Devices*

## multicast-vci

### Syntax

```
multicast-vci vpi-identifier.vci-identifier;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM encapsulation only, and for point-to-multipoint ATM logical interfaces only, enable the support of multicast on the interface. You can configure multicast support on the interface if the ATM switch performs multicast replication.

### Options

**vci-identifier**—ATM virtual circuit identifier.

**Range:** 0 through 16,384

**vpi-identifier**—ATM virtual path identifier.

**Range:** 0 through 255

**Default:** 0

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring a Multicast-Capable ATM1 or ATM2 IQ Connection](#) | 98

[multipoint-destination](#) | 362

[vci](#) | 414

## multipoint-destination

### Syntax

```

multipoint-destination address dlci dlci-identifier;
multipoint-destination address {
  epd-threshold cells;
  inverse-arp;
  oam-liveness {
    down-count cells;
    up-count cells;
  }
  oam-period (disable | seconds);
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
    queue-length number;
  }
  vci vpi-identifier.vci-identifier;
}

```

### Hierarchy Level

```

[edit interfaces interface-name unit logical-unit-number family family address address],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address
address]

```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For point-to-multipoint Frame Relay or ATM interfaces only, enable the support of multicast on the interface. You can configure multicast support on the interface if the Frame Relay or ATM switch performs multicast replication.

### Options

**address**—Address of the remote side of the point-to-multipoint connection.

**dlci-identifier**—For Frame Relay interfaces, the data-link connection identifier.

**Range:** 0 through 0xFFFFFFFF (24 bits)

**vci-identifier**—For ATM interfaces, the virtual circuit identifier.

**Range:** 0 through 16,384

**vpi-identifier**—For ATM interfaces, the virtual path identifier.

**Range:** 0 through 255

**Default:** 0

The remaining statements are explained separately. See [CLI Explorer](#).

**Required Privilege Level**

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

<a href="#">Configuring a Point-to-Point ATM1 or ATM2 IQ Connection   132</a>
<a href="#">Configuring a Point-to-Multipoint Frame Relay Connection</a>
<a href="#">dlci</a>
<a href="#">encapsulation (Logical Interface)   317</a>

## neighbor (Automatic Protection Switching for SONET/SDH)

### Syntax

```
neighbor address;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

If you are configuring one router to be the working router and a second to be the protect router, configure the address of the remote interface. You configure this on one or both of the interfaces.

The address you specify for the neighbor must never be routed through the interface on which APS is configured, or instability will result. We strongly recommend that you directly connect the working and protect routers and that you configure the interface address of this shared network as the neighbor address.

### Options

***address***—Neighbor's address.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

| *Configuring Basic Automatic Protect Switching*

## oam-liveness

### Syntax

```
oam-liveness {
  down-count cells;
  up-count cells;
}
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier],
[edit interfaces interface-name unit logical-unit-number],
[edit interfaces interface-name unit logical-unit-number family family address address multipoint-destination address],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address
  address multipoint-destination address]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 11.1 for the QFX Series.

### Description

For ATM encapsulation only, configure Operation, Administration, and Maintenance (OAM) F5 loopback cell count thresholds. Not supported on ATM-over-SHDSL interfaces.

For ATM2 IQ PICs only, configure OAM F4 loopback cell count thresholds at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level.

### Options

**down-count cells**—Minimum number of consecutive OAM F4 or F5 loopback cells lost before a VC is declared down.

**Range:** 1 through 255

**Default:** 5 cells

**up-count cells**—Minimum number of consecutive OAM F4 or F5 loopback cells received before a VC is declared up.

**Range:** 1 through 255

**Default:** 5 cells

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.



## RELATED DOCUMENTATION

| [Configuring the ATM OAM F5 Loopback Cell Threshold](#) | 98

## oam-period

### Syntax

```
oam-period (disable | seconds);
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier],
[edit interfaces interface-name unit logical-unit-number],
[edit interfaces interface-name unit logical-unit-number family family address address multipoint-destination address],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address
address multipoint-destination address]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 11.1 for the QFX Series.

### Description

For ATM encapsulation only, configure the OAM F5 loopback cell period. Not supported on ATM-over-SHDSL interfaces.

For ATM2 IQ PICs only, configure the OAM F4 loopback cell period at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level.

### Default

If you omit this statement, OAM F5 loopback cells are not initiated, but the interface still responds if it receives OAM F5 loopback cells.

### Options

**disable**—Disable the OAM loopback cell transmit feature.

**seconds**—OAM loopback cell period.

**Range:** 1 through 900 seconds

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

## paired-group

### Syntax

```
paired-group group-name;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure load sharing between two working protect circuit pairs.

### Options

***group-name***—Circuit's group name, as configured with the **protect-circuit** or **working-circuit** statement.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Configuring APS Load Sharing*

[working-circuit](#) | [421](#)

## passive-monitor-mode

### Syntax

```
passive-monitor-mode;
```

### Hierarchy Level

```
[edit interfaces interface-name],  
[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Monitor packet flows from another router. If you include this statement in the configuration, the interface does not send keepalives or alarms, and does not participate actively on the network.

This statement is supported on ATM, Ethernet, and SONET/SDH interfaces. For more information, see *ATM Interfaces User Guide for Routing Devices*.

For ATM and Ethernet interfaces, you can include this statement on the physical interface only.

For SONET/SDH interfaces, you can include this statement on the logical interface only.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Enabling Passive Monitoring on ATM Interfaces](#) | 180

[Passive Monitoring on Ethernet Interfaces Overview](#)

[Enabling Packet Flow Monitoring on SONET/SDH Interfaces](#)

[multiservice-options](#)

[Junos OS Services Interfaces Library for Routing Devices](#)

## payload-scrambler

### Syntax

```
(payload-scrambler | no-payload-scrambler);
```

### Hierarchy Level

```
[edit interfaces interface-name e3-options],  
[edit interfaces interface-name sonet-options],  
[edit interfaces interface-name t3-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Enable or disable HDLC scrambling on an E3, a SONET/SDH, or a T3 interface. This type of scrambling provides better link stability. Both sides of a connection must either use or not use scrambling.

If you commit a T3 interface configuration that has HDLC payload scrambling enabled, the interface must also be configured to be compatible with the channel service unit (CSU) at the remote end of the line.

Disable payload scrambling on an E3 interface if Digital Link compatibility mode is used.

On a channelized OC12 interface, the **sonet payload-scrambler** statement is ignored. To configure scrambling on the DS3 channels on the interface, you can include the **t3-options payload-scrambler** statement in the configuration for each DS3 channel.

**NOTE:** The **payload-scrambler** statement at the **[edit interfaces *interface-name* e3-options]** hierarchy level is not valid for IQE PICs.

### Default

Payload scrambling is disabled on all E3 and T3 interfaces; it is enabled by default on E3/T3 over ATM interfaces and on SONET/SDH interfaces.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Configuring E3 and T3 Parameters on ATM Interfaces | 54](#)

*Configuring E3 HDLC Payload Scrambling*

*Configuring SONET/SDH HDLC Payload Scrambling for Link Stability*

*Configuring T3 HDLC Payload Scrambling*

*Examples: Configuring T3 Interfaces*

*compatibility-mode*

## pic-type

### Syntax

```
pic-type (atm1 | atm2);
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM interfaces, configure the type of ATM PIC installed in your router.

### Options

**atm1**—ATM1 PIC.

**atm2**—ATM2 IQ PIC.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring the ATM PIC Type | 43](#)

## plp1

### Syntax

```
plp1 cells;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],
[edit interfaces interface-name unit logical-unit-number address address family family multipoint-destination address],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number address address family
family multipoint-destination address]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 11.1 for QFX Series switches.

### Description

For ATM2 IQ interfaces only, define the EPD threshold on a VC. The EPD threshold is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are discarded. This threshold applies to packets that have a PLP of 1.

### Default

EPD threshold is unregulated.

### Options

**cells**—Maximum number of cells.

**Range:** For 1-port and 2-port OC12 interfaces, 1 through 425,984 cells  
 For 1-port OC48 interfaces, 1 through 425,984 cells  
 For 2-port OC3, DS3, and E3 interfaces, 1 through 212,992 cells  
 For 4-port DS3 and E3 interfaces, 1 through 106,496 cells

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring Two EPD Thresholds per Queue | 153](#)

[Configuring an ATM Scheduler Map | 137](#)

[linear-red-profile | 352](#)

## plp-to-clp

### Syntax

```
plp-to-clp;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options],  
[edit interfaces at-fpc/pic/port unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, enable the PLP setting to be copied to the cell-loss priority (CLP) bit.

### Default

If you omit this statement, the Junos OS does not copy the PLP setting to the CLP bit.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Enabling the PLP Setting to Be Copied to the CLP Bit | 146](#)

*Copying the Packet Loss Priority to the CLP Bit on ATM Interfaces*



## pop-all-labels

### Syntax

```
pop-all-labels {  
    required-depth number;  
}
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options mpls],  
[edit interfaces interface-name sonet-options mpls],  
[edit interfaces interface-name fastether-options mpls],  
[edit interfaces interface-name gigeether-options mpls]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.

### Description

For passive monitoring on ATM, SONET/SDH, Fast Ethernet, and Gigabit Ethernet interfaces only, removes up to two MPLS labels from incoming IP packets. For passive monitoring on T Series devices, removes up to five MPLS labels from incoming IP packets. For passive monitoring on MX Series routers with MPCs, all labels are popped by default and the **required-depth** statement is ignored.

This statement has no effect on IP packets with more than two MPLS labels, or IP packets with more than five MPLS labels on T Series devices. Packets with MPLS labels cannot be processed by the Monitoring Services PIC; if packets with MPLS labels are forwarded to the Monitoring Services PIC, they are discarded.

The remaining statement is explained separately. See [CLI Explorer](#).

### Default

If you omit this statement, the MPLS labels are not removed, and the packet is not processed by the Monitoring Services PIC.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Removing MPLS Labels from Incoming Packets](#) | 181

## priority (Schedulers)

### Syntax

```
priority (high | low);
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options scheduler-maps map-name forwarding-class class-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, assign queuing priority to a forwarding class.

### Options

**low**—Forwarding class has low priority.

**high**—Forwarding class has high priority.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview](#) | 134

## promiscuous-mode

### Syntax

```
promiscuous-mode {  
    vpi vpi-identifier;  
}
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro Routers.

### Description

For ATM interfaces with **atm-ccc-cell-relay** encapsulation, map all incoming cells from either an interface port or a VP to a single label-switched path (LSP) without restricting the VCI number. Promiscuous mode allows you to map traffic from all 65,535 VCIs to a single LSP, or from all 256 VPIs to a single LSP.

**NOTE:** In ACX Series routers, the statement supports only Inverse Multiplexing for ATM (IMA).

### Options

**vpi-identifier**—Open this VPI in promiscuous mode.

**Range:** 0 through 255

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring ATM Cell-Relay Promiscuous Mode](#) | 46

[vpi \(ATM CCC Cell-Relay Promiscuous Mode\)](#) | 418

## protect-circuit

### Syntax

```
protect-circuit group-name;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure the protect router in an APS circuit pair. When the working interface fails, APS brings up the protection circuit and the traffic is moved to the protection circuit.

### Options

***group-name***—Circuit's group name.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Configuring Basic Automatic Protect Switching*

[working-circuit](#) | **421**

## queue-depth

### Syntax

```
queue-depth cells;
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options linear-red-profiles profile-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, define maximum queue depth in the CoS VC drop profile. Packets are always dropped beyond the defined maximum. This statement is mandatory; there is no default configuration.

### Default

Buffer usage is unregulated.

### Options

*cells*—Maximum number of cells the queue can contain.

**Range:** 1 through 64,000 cells

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview | 134](#)

[Configuring Linear RED Profiles on ATM Interfaces](#)

[high-plp-threshold | 344](#)

[low-plp-threshold | 358](#)

## queue-length

### Syntax

```
queue-length number;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number address address family family
multipoint-destination address shaping ],
[edit interfaces interface-name unit logical-unit-number shaping ],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number address address family
family multipoint-destination address shaping ],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number shaping ]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 11.1 for the QFX Series.

### Description

For ATM1 interfaces only, define the maximum queue length in the traffic-shaping profile. For ATM1 PICs, each VC has its own independent shaping parameters.

### Default

Buffer usage is unregulated.

### Options

***number***—Maximum number of packets the queue can contain.

**Range:** 1 through 16,383 packets

**Default:** 16,383 packets

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring the ATM1 Queue Length](#) | 131

## receive-options-packets

### Syntax

```
receive-options-packets;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family inet],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For a Monitoring Services PIC and an ATM or SONET/SDH PIC installed in an M160, M40e, or T Series router, guarantee conformity with cflowd records structure. This statement is required when you enable passive monitoring.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Enabling Passive Monitoring on ATM Interfaces | 180](#)

[Enabling Packet Flow Monitoring on SONET/SDH Interfaces](#)

## receive-ttl-exceeded

### Syntax

```
receive-ttl-exceeded;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family inet],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For Monitoring Services PIC and an ATM or SONET/SDH PIC installed in an M160, M40e, or T Series router, guarantee conformity with cflowd records structure. This statement is required when you enable passive monitoring.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Enabling Passive Monitoring on ATM Interfaces | 180](#)

[Enabling Packet Flow Monitoring on SONET/SDH Interfaces](#)



## request

### Syntax

```
request (protect | working);
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Perform a manual switch between the protect and working circuits. This statement is honored only if there are no higher-priority reasons to switch.

### Options

**protect**—Request that the circuit become the protect circuit.

**working**—Request that the circuit become the working circuit.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Configuring Switching Between the Working and Protect Circuits*

[force](#) | [339](#)

## required-depth

### Syntax

```
required-depth number;
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options mpls pop-all-labels],
[edit interfaces interface-name sonet-options mpls pop-all-labels],
[edit interfaces interface-name fastether-options mpls pop-all-labels],
[edit interfaces interface-name gigeether-options mpls pop-all-labels]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.

### Description

For passive monitoring on ATM and SONET/SDH interfaces only, specify the number of MPLS labels an incoming packet must have for the **pop-all-labels** statement to take effect.

If you include the **required-depth 1** statement, the **pop-all-labels** statement takes effect for incoming packets with one label only. If you include the **required-depth 2** statement, the **pop-all-labels** statement takes effect for incoming packets with two labels only.

### Options

**number**—Number of MPLS labels on incoming IP packets.

**Range:** 1 or 2 labels

**Default:** If you omit this statement, the **pop-all-labels** statement takes effect for incoming packets with one or two labels. The default is equivalent to including the **required-depth [ 1 2 ]** statement.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Removing MPLS Labels from Incoming Packets | 181](#)

*Enabling Packet Flow Monitoring on SONET/SDH Interfaces*

*Junos OS Services Interfaces Library for Routing Devices*

## revert-time (Interfaces)

### Syntax

```
revert-time seconds;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure APS revertive mode.

### Default

APS operates in nonrevertive mode.

### Options

***seconds***—Amount of time to wait after the working circuit has again become functional before making the working circuit active again.

**Range:** 1 through 65,535 seconds

**Default:** None (APS operates in nonrevertive mode)

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

| *Configuring Revertive Mode*

## rfc-2615

### Syntax

```
rfc-2615;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Include this statement to enable features described in RFC 2615, *PPP over SONET/SDH*.

### Default

Settings required by RFC 1619, *PPP over SONET/SDH*.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

| *Configuring PPP Support on SONET/SDH Interfaces*

## rtvbr

### Syntax

```
rtvbr peak rate sustained rate burst length;
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier shaping ],
[edit interfaces interface-name unit logical-unit-number address address family family
multipoint-destination address shaping ],
[edit interfaces interface-name unit logical-unit-number shaping ],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number shaping ],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number address address family
family multipoint-destination address shaping ]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ PICs only, define the real-time variable bandwidth utilization in the traffic-shaping profile.

When you configure the real-time bandwidth utilization, you must specify all three options (**burst**, **peak**, and **sustained**). You can specify the rate in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000). You can also specify the rate in cells per second by entering a decimal number followed by the abbreviation **c**; values expressed in cells per second are converted to bits per second using the formula 1 cps = 384 bps.

### Default

If the **rtvbr** statement is not included, bandwidth utilization is unlimited.

### Options

**burst length**—Burst length, in cells. If you set the length to 1, the peak traffic rate is used.

**Range:** 1 through 4000 cells

**peak rate**—Peak rate, in bits per second or cells per second.

**Range:** For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure..

**sustained rate**—Sustained rate, in bps or cps.

**Range:** For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure.

**Required Privilege Level**

- interface—To view this statement in the configuration.
- interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

<a href="#">Configuring ATM CBR   124</a>
<a href="#">Configuring ATM2 IQ Real-Time VBR   123</a>
<a href="#">Applying Scheduler Maps to Logical ATM Interfaces</a>
<a href="#">cbr   309</a>
<a href="#">vbr   411</a>

## scheduler-maps (For ATM2 IQ Interfaces)

### Syntax

```
scheduler-maps map-name {
  forwarding-class (class-name | assured-forwarding | best-effort | expedited-forwarding | network-control);
  vc-cos-mode (alternate | strict);
}
```

### Hierarchy Level

```
[edit at-fpc/pic/port interface-name atm-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, define CoS parameters assigned to forwarding classes.

### Options

**map-name**—Name of the scheduler map.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview](#) | 134

[Applying Scheduler Maps to ATM Interfaces](#)

[atm-scheduler-map](#) | 303

## shaping

### Syntax

```
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
  queue-length number;
}
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier],
[edit interfaces interface-name unit logical-unit-number],
[edit interfaces interface-name unit logical-unit-number address address family family multipoint-destination address],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number address address family family multipoint-destination address]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM encapsulation only, define the traffic-shaping profile.

For Circuit Emulation PICs, specify traffic shaping in the ingress and egress directions.

For ATM2 IQ interfaces, changing or deleting VP tunnel traffic shaping causes all logical interfaces on a VP to be deleted and then re-added.

VP tunnels are not supported on multipoint interfaces.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Defining Virtual Path Tunnels | 130](#)

[Defining the ATM Traffic-Shaping Profile Overview | 123](#)

[Configuring ATM QoS or Shaping](#)





## t3-options

### Syntax

```
t3-options {
  atm-encapsulation (direct | plcp);
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  (cbit-parity | no-cbit-parity);
  compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
  fcs (16 | 32);
  (feac-loop-respond | no-feac-loop-respond);
  idle-cycle-flag value;
  (long-buildout | no-long-buildout);
  (loop-timing | no-loop-timing);
  loopback (local | payload | remote);
  start-end-flag value;
}
```

### Hierarchy Level

```
[edit interfaces interface-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure T3-specific physical interface properties, including the properties of DS3 channels on a channelized OC12 interface. The **long-buildout** statement is not supported for DS3 channels on a channelized OC12 interface.

On T3 interfaces, the default encapsulation is PPP.

For ATM1 interfaces, you can configure a subset of E3 options statements.

The remaining statements are explained separately. See [CLI Explorer](#).

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

## transmit-weight (ATM2 IQ CoS Forwarding Class)

### Syntax

```
transmit-weight (cells number | percent number);
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options scheduler-maps map-name forwarding-class class-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, assign a transmission weight to a forwarding class.

### Default

95 percent for queue 0, 5 percent for queue 3.

### Options

**percent *percent***—Transmission weight of the forwarding class as a percentage of the total bandwidth.

**Range:** 5 through 100

**cells *number***—Transmission weight of the forwarding class as a number of cells.

**Range:** 0 through 32,000

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview](#) | 134

## transmit-weight (ATM2 IQ Virtual Circuit)

### Syntax

```
transmit-weight number;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ PICs only, configure the transmission weight.

Each VC is serviced in weighted round robin (WRR) mode. When VCs have data to send, they send the number of cells equal to their weight before passing control to the next active VC. This allows proportional bandwidth sharing between multiple VCs within a rate-shaped VP tunnel. VP tunnels are not supported on multipoint interfaces.

### Options

***number***—Number of cells a VC sends before passing control to the next active VC within a VP tunnel.

**Range:** 1 through 32,767

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

| [Configuring the ATM2 IQ Transmission Weight](#) | 154

## trigger

### Syntax

```
trigger {
    defect ignore;
    defect hold-time up milliseconds down milliseconds;
}
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM over SONET/SDH, SONET/SDH interfaces, and 10-Gigabit Ethernet interfaces in WAN PHY mode, configure SONET/SDH defect triggers to be ignored.

### Default

If you do not include this statement, all SONET/SDH defect triggers are honored.

### Options

**defect**—Defect to ignore or hold. It can be one of the following:

- **ais-l**—Line alarm indication signal
- **ais-p**—Path alarm indication signal
- **ber-sd**—Bit error rate signal degrade
- **ber-sf**—Bit error rate signal fault
- **locd** (ATM only)—Loss of cell delineation
- **lof**—Loss of frame
- **lol**—PHY loss of light
- **lop-p**—Path loss of pointer
- **los**—Loss of signal
- **pll**—PHY phase-locked loop out of lock
- **plm-p**—Path payload (signal) label mismatch
- **rfl-l**—Line remote failure indication

- **rfi-p**—Path remote failure indication
- **uneq-p**—Path unequipped

The remaining statements are explained separately. See [CLI Explorer](#).

#### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

#### RELATED DOCUMENTATION

| *Configuring SONET/SDH Defect Triggers*

## trunk-bandwidth

### Syntax

```
trunk-bandwidth rate;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces configured to use Layer 2 circuit trunk mode, configure a scheduler so that unused bandwidth from any inactive trunk is proportionally shared among the active trunks.

During congestion, each trunk receives a proportional share of the leftover bandwidth, thus minimizing the latency on each trunk.

### Options

**rate**—Peak rate, in bits per second (bps) or cells per second (cps). You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation **c**; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps.

**Range:** 1,000,000 through 542,526,792 bps

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Configuring Layer 2 Circuit Trunk Mode Scheduling Overview](#) | 86

## trunk-id

### Syntax

```
trunk-id number;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces with ATM CCC cell-relay encapsulation, configure the trunk identification number.

When you associate a trunk ID number with a logical interface, you are in effect specifying the interfaces that are allowed to send ATM traffic over an LSP.

### Options

***number***—A valid trunk identifier.

**Range:** For UNI mode, 0 through 7. For NNI mode, 0 through 31.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

| [Configuring Layer 2 Circuit Transport Mode](#) | 60



## unit

### Syntax

```

unit logical-unit-number {
  accept-source-mac {
    mac-address mac-address {
      policer {
        input cos-policer-name;
        output cos-policer-name;
      }
    }
  }
  accounting-profile name;
  advisory-options {
    downstream-rate rate;
    upstream-rate rate;
  }
  allow-any-vci;
  atm-scheduler-map (map-name | default);
  auto-configure {
    agent-circuit-identifier {
      dynamic-profile profile-name;
    }
    line-identity {
      include {
        accept-no-ids;
        circuit-id;
        remote-id;
      }
      dynamic-profile profile-name;
    }
  }
  backup-options {
    interface interface-name;
  }
  bandwidth rate;
  cell-bundle-size cells;
  clear-dont-fragment-bit;
  compression {
    rtp {
      maximum-contexts number <force>;
      f-max-period number;
      queues [queue-numbers];
      port {

```

```
        minimum port-number;  
        maximum port-number;  
    }  
}  
}  
compression-device interface-name;  
copy-tos-to-outer-ip-header;
```

```

demux {
  inet {
    address-source address;
    auto-configure {
      address-ranges {
        authentication {
          password password-string;
          username-include {
            auth-server-realm realm-string;
            delimiter delimiter-character;
            domain-name domain-name;
            interface-name;
            source-address;
            user-prefix user-prefix-string;
          }
        }
      }
      dynamic-profile profile-name {
        network ip-address {
          range name {
            low lower-limit;
            high upper-limit;
          }
        }
      }
    }
  }
}

inet6 {
  address-source address;
  auto-configure {
    address-ranges {
      authentication {
        password password-string;
        username-include {
          auth-server-realm realm-string;
          delimiter delimiter-character;
          domain-name domain-name;
          interface-name;
          source-address;
          user-prefix user-prefix-string;
        }
      }
    }
    dynamic-profile profile-name {
      network ip-address {

```



```

dynamic-call-admission-control {
    activation-priority priority;
    bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
family family-name {
    ... the family subhierarchy appears after the main [edit interfaces interface-name unit logical-unit-number] hierarchy
    ...
}
fragment-threshold bytes;
host-prefix-only;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap |
    swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
    vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
    up-count cells;
    down-count cells;
}
oam-period (disable | seconds);

```

```

output-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap |
    swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
}

```

```

passive-monitor-mode;

```

```

peer-unit unit-number;

```

```

plp-to-clp;

```

```

point-to-point;

```

```

ppp-options {

```

```

    mru size;

```

```

    mtu (size | use-lower-layer);

```

```

    chap {

```

```

        access-profile name;

```

```

        default-chap-secret name;

```

```

        local-name name;

```

```

        passive;
    }

```

```

    compression {

```

```

        acfc;

```

```

        pfc;
    }

```

```

    dynamic-profile profile-name;

```

```

    ipcp-suggest-dns-option;

```

```

    lcp-restart-timer milliseconds;

```

```

    loopback-clear-timer seconds;

```

```

    ncp-restart-timer milliseconds;

```

```

    pap {

```

```

        access-profile name;

```

```

        default-pap-password password;

```

```

        local-name name;

```

```

        local-password password;

```

```

        passive;
    }
}

```

```

pppoe-options {

```

```

    access-concentrator name;

```

```

    auto-reconnect seconds;

```

```

    (client | server);

```

```

    service-name name;

```

```

    underlying-interface interface-name;
}

```

```

pppoe-underlying-options {
    access-concentrator name;
    direct-connect;
    dynamic-profile profile-name;
    max-sessions number;
}
proxy-arp;
service-domain (inside | outside);
shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
    queue-length number;
}
short-sequence;
targeted-distribution;
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
    backup-destination address;
    destination address;
    key number;
    routing-instance {
        destination routing-instance-name;
    }
    source source-address;
    ttl number;
}
vci vpi-identifier.vci-identifier;
vci-range start start-vci end end-vci;
vpi vpi-identifier;
vlan-id number;
vlan-id-range number-number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;

```

```

family family {
  accounting {
    destination-class-usage;
    source-class-usage {
      (input | output | input output);
    }
  }
  access-concentrator name;
  address address {
    ... the address subhierarchy appears after the main [edit interfaces interface-name unit logical-unit-number
      family family-name] hierarchy ...
  }
  bundle interface-name;
  core-facing;
  demux-destination {
    destination-prefix;
  }
  demux-source {
    source-prefix;
  }
  direct-connect;
  duplicate-protection;
  dynamic-profile profile-name;
  filter {
    group filter-group-number;
    input filter-name;
    input-list [filter-names];
    output filter-name;
    output-list [filter-names];
  }
  interface-mode (access | trunk);
  ipsec-sa sa-name;
  keep-address-and-control;
  mac-validate (loose | strict);
  max-sessions number;
  mtu bytes;
  multicast-only;
  no-redirects;
  policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
  }
  primary;

```



```

protocols [inet iso mpls];
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check {
    fail-filter filter-name
    mode loose;
}
sampling {
    input;
    output;
}
service {
    input {
        post-service-filter filter-name;
        service-set service-set-name <service-filter filter-name>;
    }
    output {
        service-set service-set-name <service-filter filter-name>;
    }
}
service-name-table table-name
targeted-options {
    backup backup;
    group group;
    primary primary;
    weight ($junos-interface-target-weight | weight-value);
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
translate-plp-control-word-de;
unnumbered-address interface-name destination address destination-profile profile-name;
vlan-id number;
vlan-id-list [number number-number];

```

```

address address {
  arp ip-address (mac | multicast-mac) mac-address <publish>;
  broadcast address;
  destination address;
  destination-profile name;
  eui-64;
  master-only;
  multipoint-destination address {
    dlci dlcid-identifier;
    epd-threshold cells <plp1 cells>;
    inverse-arp;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
    shaping {
      (cbr rate | rtvbr burst length peak rate sustained rate | vbr burst length peak rate sustained rate);
      queue-length number;
    }
    vci vpi-identifier.vci-identifier;
  }
  preferred;
  primary;
  (vrrp-group | vrrp-inet6-group) group-number {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-type authentication;
    authentication-key key;
    fast-interval milliseconds;
    (preempt | no-preempt) {
      hold-time seconds;
    }
    priority number;
    track {
      interface interface-name {
        bandwidth-threshold bits-per-second priority-cost number;
      }
      priority-hold-time seconds;
      route ip-address/prefix-length routing-instance instance-name priority-cost cost;
    }
    virtual-address [addresses];
    virtual-link-local-address ipv6-address;
    vrrp-inherit-from {

```

```

        active-interface interface-name;
        active-group group-number;
    }
}
}
}
}

```

### Hierarchy Level

```

[edit interfaces interface-name],
[edit logical-systems logical-system-name interfaces interface-name],
[edit interfaces interface-set interface-set-name interface interface-name]

```

### Release Information

Statement introduced before Junos OS Release 7.4.

Range increased for static pseudowire interfaces to 1,073,741,823 in Junos OS Release 18.3R1.

### Description

Configure a logical interface on the physical device. You must configure a logical interface to be able to use the physical device.

### Options

***logical-unit-number***—Number of the logical unit.

**Range:** 0 through 1,073,741,823 for demux, PPPoE, and pseudowire static interfaces. 0 through 16,385 for all other static interface types.

***etree-ac-role (leaf | root)***—To configure an interface as either leaf or root.

The remaining statements are explained separately. Search for a statement in [CLI Explorer](#) or click a linked statement in the Syntax section for details.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring Logical Interface Properties | 197](#)

*Junos OS Services Interfaces Library for Routing Devices*

## use-null-cw

### Syntax

```
use-null-cw;
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options]
```

### Release Information

Statement introduced in Junos OS Release 8.3.

### Description

Insert (for sending traffic) or strip (for receiving traffic) a null control word in MPLS packets when an MPLS Layer 2 circuit is configured with cell transport mode on a router running Junos OS Release 8.3 or later. When cell relay transport mode is configured, the **use-null-cw** statement allows interoperability between routers running Junos OS Release 8.2 and earlier and those running Junos OS Release 8.3 and later.

**NOTE:** The **use-null-cw** statement is supported only on routers running Junos OS Release 8.3 or later.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

Configuring Layer 2 Circuit Transport Mode | 60

## up-count

### Syntax

```
up-count cells;
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier oam-liveness],
[edit interfaces interface-name unit logical-unit-number oam-liveness],
[edit interfaces interface-name unit logical-unit-number family family address address multipoint-destination address
oam-liveness],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number oam-liveness],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address
address multipoint-destination address oam-liveness]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM encapsulation only, configure Operation, Administration, and Maintenance (OAM) F5 loopback cell count thresholds. Not supported on ATM-over-SHDSL interfaces.

For ATM2 IQ PICs only, configure OAM F4 loopback cell count thresholds at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level.

### Options

**cells**—Minimum number of consecutive OAM F4 or F5 loopback cells received before a VC is declared up.

**Range:** 1 through 255

**Default:** 5 cells

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

Configuring the ATM OAM F5 Loopback Cell Threshold | 98

## vbr

### Syntax

```
vbr peak rate sustained rate burst length;
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier shaping],
[edit interfaces interface-name unit logical-unit-number address address family family multipoint-destination address
  shaping ],
[edit interfaces interface-name unit logical-unit-number shaping ],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number address address family
  family multipoint-destination address shaping ],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number shaping ]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM encapsulation only, define the variable bandwidth utilization in the traffic-shaping profile.

When you configure the variable bandwidth utilization, you must specify all three options (**burst**, **peak**, and **sustained**). You can specify the rate in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000). You can also specify the rate in cells per second by entering a decimal number followed by the abbreviation **c**; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps.

### Default

If the **vbr** statement is not specified, bandwidth utilization is unlimited.

### Options

**burst length**—Burst length, in cells. If you set the length to 1, the peak traffic rate is used.

**Range:** 1 through 4000 cells

**peak rate**—Peak rate, in bits per second or cells per second.

**Range:** For ATM1 interfaces, 33 Kbps through 135.6 Mbps (ATM OC3); 33 Kbps through 276 Mbps (ATM OC12). For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure.

**sustained rate**—Sustained rate, in bits per second or cells per second.

**Range:** For ATM1 interfaces, 33 Kbps through 135.6 Mbps (ATM OC3); 33 Kbps through 276 Mbps (ATM OC12). For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure.

**Required Privilege Level**

- interface—To view this statement in the configuration.
- interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

<a href="#">Configuring ATM CBR   124</a>
<i>Applying Scheduler Maps to Logical ATM Interfaces</i>
<a href="#">cbr   309</a>
<a href="#">rtvbr   386</a>
<a href="#">shaping   389</a>

## vc-cos-mode

### Syntax

```
vc-cos-mode (alternate | strict);
```

### Hierarchy Level

```
[edit interfaces interface-name atm-options scheduler-maps map-name]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM2 IQ interfaces only, specify packet-scheduling priority value for ATM2 IQ VC tunnels.

### Options

**alternate**—VC CoS queue has high priority. The scheduling of the queues alternates between the high-priority queue and the remaining queues, so every other scheduled packet is from the high-priority queue.

**strict**—VC CoS queue has strictly high priority. A queue with strict high priority is always scheduled before the remaining queues. The remaining queues are scheduled in round-robin fashion.

**Default:** alternate

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[ATM2 IQ VC Tunnel CoS Components Overview](#) | 134

*Applying Scheduler Maps to ATM Interfaces*



## vci

### Syntax

```
vci vpi-identifier.vci-identifier;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port unit logical-unit-number],
[edit interfaces at-fpc/pic/port unit logical-unit-number family family address address multipoint-destination address],
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number],
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number family family address
address multipoint-destination address]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Statement introduced in Junos OS Release 11.1 for the QFX Series.

Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro routers.

### Description

For ATM point-to-point logical interfaces only, configure the virtual circuit identifier (VCI) and virtual path identifier (VPI).

To configure a VPI for a point-to-multipoint interface, specify the VPI in the [multipoint-destination](#) statement.

VCIs 0 through 31 are reserved for specific ATM values designated by the ATM Forum.

### Options

**vci-identifier**—ATM virtual circuit identifier. Unless you configure the interface to use promiscuous mode, this value cannot exceed the highest-numbered VC configured for the interface with the **maximum-vcs** option of the **vpi** statement.

**Range:** 0 through 4089 or 0 through 65,535 with promiscuous mode, with VCIs 0 through 31 reserved.

**vpi-identifier**—ATM virtual path identifier.

**Range:** 0 through 255

**Default:** 0

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring a Point-to-Point ATM1 or ATM2 IQ Connection | 132](#)[Applying Scheduler Maps to Logical ATM Interfaces](#)

## vci-range

### Syntax

```
vci-range start start-vci end end-vci;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number]
```

### Release Information

Statement introduced in Junos OS Release 9.0.

### Description

Range of VCI values used in ATM-to-Ethernet interworking cross-connects. VCI 0 through 31 are reserved. VCI 0 through 31 should not be used.

### Options

***start-vci***—Lowest number VCI in the range.

***end-vci***—Highest number VCI in the range.

**Range:** 0 through 255

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring ATM-to-Ethernet Interworking | 154](#)

## vlan-id (Outer VLAN ID)

### Syntax

```
vlan-id outer-vlan-id;
```

### Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

### Release Information

Statement introduced in Junos OS Release 9.0.

### Description

The outer VLAN ID to be used in ATM-to-Ethernet interworking cross-connects. Outer VLAN IDs are converted to the ATM VPI. The outer VLAN ID must match the VPI value configured. The allowable VPI range is 0 to 255. Do not configure the outer VLAN ID to be greater than 255.

### Options

**outer-vlan-id**—Outer VLAN ID number.

**Range:** 0 through 4094

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

### RELATED DOCUMENTATION

[Configuring ATM-to-Ethernet Interworking](#) | 154

## vlan-vci-tagging

### Syntax

```
vlan-vci-tagging;
```

### Hierarchy Level

```
[edit interfaces interface-name],  
[edit logical-systems logical-system-name interfaces interface-name]
```

### Release Information

Statement introduced in Junos OS Release 9.0.

### Description

Enable the ATM-to-Ethernet interworking cross-connect function on a Gigabit Ethernet, 10-Gigabit Ethernet, or aggregated Ethernet interface.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring ATM-to-Ethernet Interworking](#) | 154

## vpi (ATM CCC Cell-Relay Promiscuous Mode)

### Syntax

```
vpi vpi-identifier;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port atm-options promiscuous-mode]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

Junos OS Release 12.2 for the ACX Series Universal Metro routers.

### Description

For ATM interfaces, allow all VCI in this VPI to open in ATM CCC cell-relay mode.

When you include **vpi** statements at the `[edit interfaces interface-name atm-options promiscuous-mode]` hierarchy level, the specified VPIs open in promiscuous mode.

### Options

**vpi-identifier**—ATM virtual path identifier. This is one of the VPIs that you define in the **vci** statement. (For a list of hierarchy levels at which you can include the **vci** statement, see **vci**.)

**Range:** 0 through 255

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

Configuring ATM Cell-Relay Promiscuous Mode | 46

## vpi (Define Virtual Path)

### Syntax

```
vpi vpi-identifier {
  maximum-vcs maximum-vcs;
  oam-liveness {
    up-count cells;
    down-count cells;
  }
  oam-period (disable | seconds);
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
    queue-length number;
  }
}
```

### Hierarchy Level

[edit interfaces at-fpc/pic/port atm-options]

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

For ATM interfaces, configure the virtual path (VP).

**NOTE:** Certain options apply only to specific platforms.

### Options

**vpi-identifier**—ATM virtual path identifier. This is one of the VPIs that you define in the **vci** statement. (For a list of hierarchy levels at which you can include the **vci** statement, see **vci**.)

**Range:** 0 through 255

The remaining statements are explained separately. Search for a statement in [CLI Explorer](#) or click a linked statement in the Syntax section for details.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring the Maximum Number of ATM1 VCs on a VP | 51](#)

## vpi (Logical Interface and Interworking)

### Syntax

```
vpi virtual-path-identifier;
```

### Hierarchy Level

```
[edit interfaces at-fpc/pic/port unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces at-fpc/pic/port unit logical-unit-number]
```

### Release Information

Statement introduced in Junos OS Release 9.0.

Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro routers.

### Description

VPI used in an ATM-to-Ethernet interworking cross-connect.

### Options

**virtual-path-identifier**—VPI to be used.

**Range:** 0 through 255

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

[Configuring ATM-to-Ethernet Interworking | 154](#)[Configuring ATM Cell-Relay Promiscuous Mode | 46](#)

## working-circuit

### Syntax

```
working-circuit group-name;
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options aps]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure the working router in an APS circuit pair.

### Options

***group-name***—Circuit's group name.

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Configuring Basic Automatic Protect Switching*

[protect-circuit](#) | [377](#)



## z0-increment

### Syntax

```
(z0-increment | no-z0-increment);
```

### Hierarchy Level

```
[edit interfaces interface-name sonet-options]
```

### Release Information

Statement introduced before Junos OS Release 7.4.

### Description

Configure an incremental STM ID rather than a static one.

### Default

**no-Z0-increment**

### Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

## RELATED DOCUMENTATION

*Configuring an Incrementing STM ID to Interoperate with Older Equipment in SDH Mode*  
*sonet-options*

# Operational Commands

## IN THIS CHAPTER

- [clear ilmi statistics | 424](#)
- [ping atm | 425](#)
- [show class-of-service | 427](#)
- [show class-of-service forwarding-class | 430](#)
- [show ilmi | 433](#)
- [show ilmi statistics | 435](#)
- [show interfaces \(ATM\) | 440](#)

## clear ilmi statistics

### Syntax

```
clear ilmi statistics
```

### Release Information

Command introduced before Junos OS Release 7.4.

### Description

Set Integrated Local Management Interface (ILMI) statistics to zero.

### Options

This command has no options.

### Required Privilege Level

clear

## RELATED DOCUMENTATION

[show ilmi statistics](#) | [435](#)

### List of Sample Output

[clear ilmi statistics on page 424](#)

### Output Fields

When you enter this command, you are provided feedback on the status of your request.

## Sample Output

```
clear ilmi statistics
```

```
user@host> clear ilmi statistics
```

## ping atm

### Syntax

```
ping atm interface interface-name vci vci
<brief>
<count count>
<end-to-end | segment>
<interval seconds>
<sequence-number sequence-number>
```

### Release Information

Command introduced before Junos OS Release 7.4.

### Description

Check the reachability of a remote Asynchronous Transfer Mode (ATM) node. All packets are 53 bytes. Type Ctrl+c to interrupt a **ping atm** command.

### Options

**interface *interface-name***—Interface to use to send the ATM ping requests. For ATM 1 and ATM 2 interfaces, you must include a logical unit number in the interface name

**vci *vci***—ATM point-to-point virtual circuit identifier. It can be a virtual circuit identifier (**vci**) or a virtual private identifier (**vpi.vci**).

**brief**—(Optional) Display only the ATM ping summary statistics. These are displayed after you type Ctrl+c to interrupt the **ping atm** command.

**count *count***—(Optional) Number of ping requests to send. The range of values is **0** through **10,000**. The default value is an unlimited number of requests.

**end-to-end**—(Optional) Cells are sent to the end node. This is the default.

**segment**—(Optional) Cells are sent only to the intermediate node.

**interval *seconds***—(Optional) How often to send ping requests. The range of values, in seconds, is **1** through **10,000**. The default value is **1**.

**sequence-number *sequence-number***—(Optional) Starting sequence number (correlation tag). The range of values is **0** through **65,468**. The default value is **1**.

### Required Privilege Level

network

### List of Sample Output

[ping atm on page 426](#)

### Output Fields

When you enter this command, you are provided feedback on the status of your request. An exclamation point (!) indicates that an echo reply was received. A period (.) indicates that an echo reply was not received within the timeout period. An x indicates that an echo reply was received with an error code. Packets with an error code are not counted in the received packets count. They are accounted for separately.

## Sample Output

### ping atm

```
user@host> ping atm interface at-4/0/1.0 vci 0.33
```

```
53 byte oam cell received on (vpi=0 vci=33): seq=1
53 byte oam cell received on (vpi=0 vci=33): seq=2
^C[abort]
--- atmping statistics ---
5 cells transmitted, 5 cells received, 0% cell loss
```

## show class-of-service

### Syntax

```
show class-of-service
```

### Release Information

Command introduced before Junos OS Release 7.4.

Command introduced in Junos OS Release 9.0 for EX Series switches.

### Description

Display the entire class-of-service (CoS) configuration, including system-chosen defaults. Executing this command is equivalent to executing all **show class-of-service** commands in succession.

### Options

This command has no options.

### Required Privilege Level

view

### List of Sample Output

[show class-of-service on page 427](#)

### Output Fields

See the output field descriptions for the commands.

## Sample Output

### show class-of-service

```
user@host> show class-of-service
```

```
Forwarding class           Queue
best-effort                0
expedited-forwarding       1
assured-forwarding         2
network-control            3
Code point type: dscp
Alias      Bit pattern
af11       001010
af12       001100
af13       001110
```

```

...
Code point type: dscp-ipv6
  Alias          Bit pattern
  af11           001010
  af12           001100
  af13           001110
...
Code point type: exp
  Alias          Bit pattern
  af11           100
  af12           101
  be             000
...
Code point type: ieee-802.1
  Alias          Bit pattern
  af11           100
  af12           101
  be             000
...
Classifier: dscp-default, Code point type: dscp, Index: 6
  Code point      Forwarding class      Loss priority
  000000          best-effort            low
  000001          best-effort            low
  000010          best-effort            low
....
Classifier: dscp-ipv6-default, Code point type: dscp-ipv6, Index: 7
  Code point      Forwarding class      Loss priority
  000000          best-effort            low
  000001          best-effort            low
  000010          best-effort            low
...
Loss-priority-map: frame-relay-de-default, Code point type: frame-relay-de, Index:
12
  Code point      Loss priority
  0               low
  1               high

Rewrite rule: dscp-default, Code point type: dscp, Index: 23
  Forwarding class      Loss priority      Code point
  best-effort           low                000000
  best-effort           high               000000
  expedited-forwarding  low                101110
...
Rewrite rule: dscp-ipv6-default, Code point type: dscp-ipv6, Index: 24

```

```

Forwarding class          Loss priority    Code point
best-effort               low           000000
best-effort               high          000000
...
....
Drop profile: <default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
      100          100

Scheduler map: <default>, Index: 2

Scheduler: <default-be>, Forwarding class: best-effort, Index: 16
  Transmit rate: 95 percent, Rate Limit: none, Buffer size: 95 percent, Priority:
low
  Drop profiles:
    Loss priority  Protocol    Index    Name
    Low           any         1        <default-drop-profile>
    Medium low    any         1        <default-drop-profile>
    Medium high   any         1        <default-drop-profile>
    High          any         1        <default-drop-profile>
...
Physical interface: fe-0/0/0, Index: 137
Queues supported: 8, Queues in use: 4
  Scheduler map: <default>, Index: 2

Logical interface: fe-0/0/0.0, Index: 69
  Object          Name                Type          Index
  Adaptive-shaper  fr-shaper                    35320
  Classifier       ipprec-compatibility  ip            11

Physical interface: fe-0/0/1, Index: 138
Queues supported: 8, Queues in use: 4
  Scheduler map: <default>, Index: 2
...

```



# show class-of-service forwarding-class

## Syntax

```
show class-of-service forwarding-class <forwarding-class-map-name>
```

## Release Information

Command introduced before Junos OS Release 7.4.

## Description

Display the mapping of forwarding class maps and names to queue numbers.

## Options

**forwarding-class-map-name**—(Optional) Display the forwarding class configuration for a specific forwarding class map name. If this option is omitted, information for all forwarding class maps will be displayed.

## Required Privilege Level

view

## List of Sample Output

[show class-of-service forwarding-class on page 431](#)

[show class-of-service forwarding-class forwarding-class-map-name on page 431](#)

## Output Fields

[Table 29 on page 430](#) describes the output fields for the **show class-of-service forwarding-class** command. Output fields are listed in the approximate order in which they appear.

Table 29: show class-of-service forwarding-class Output Fields

Field Name	Field Description
<b>Forwarding class map</b>	Classification of a packet affecting the forwarding, scheduling, and marking policies applied as the packet transits the router.
<b>ID</b>	Forwarding class identifier.
<b>Queue</b>	Queue corresponding to the forwarding class name.
<b>Restricted Queue</b>	(T Series platforms only) Forwarding class restricted queue number. The queue number assigned if the PIC is restricted to four queues.
<b>Fabric Priority</b>	(M320 and T Series platforms only) Forwarding class queue priority.

## Sample Output

**show class-of-service forwarding-class**

user@host> **show class-of-service forwarding-class**

Forwarding class map FCMAP1	ID	Queue	Restricted queue	Fabric Priority
fc0	0	0	0	low
fc2	1	1	1	low
fc4	2	2	2	low
fc6	3	3	3	low
fc1	4	0	0	low
fc3	5	1	1	low
fc5	6	2	2	low
fc7	7	3	3	low
fc8	8	4	0	low
fc9	9	4	0	low
fc10	10	5	1	low
fc11	11	5	1	low
fc12	12	6	2	low
fc13	13	6	2	low
fc14	14	7	3	low
fc15	15	7	3	low

## Sample Output

**show class-of-service forwarding-class  
forwarding-class-map-name**

user@host> **show class-of-service forwarding-class FCMAP1**

Forwarding class map FCMAP1	ID	Queue	Restricted queue	Fabric Priority
fc0	0	0	0	low
fc2	1	1	1	low
fc4	2	2	2	low
fc6	3	3	3	low
fc1	4	0	0	low
fc3	5	1	1	low
fc5	6	2	2	low
fc7	7	3	3	low
fc8	8	4	0	low

fc9	9	4	0	low
fc10	10	5	1	low
fc11	11	5	1	low
fc12	12	6	2	low
fc13	13	6	2	low
fc14	14	7	3	low
fc15	15	7	3	low

# show ilmi

## Syntax

```
show ilmi
<all | interface interface-name>
```

## Release Information

Command introduced before Junos OS Release 7.4.

## Description

Display Integrated Local Management Interface (ILMI) information.

## Options

**none**—Display information for all ILMI-enabled ATM devices.

**all | interface *interface-name***—(Optional) Display IP addresses and port names for all ILMI-enabled ATM devices or for a particular device.

## Required Privilege Level

view

## List of Sample Output

[show ilmi all on page 434](#)

[show ilmi interface on page 434](#)

## Output Fields

[Table 30 on page 433](#) lists the output fields for the **show ilmi** command. Output fields are listed in the approximate order in which they appear.

Table 30: show ilmi Output Fields

Field Name	Field Description
Physical interface	Name of the physical interface.
VCI	Virtual connection identifier.
Peer IP address	IP address of the peer.
Peer interface name	Port interface name of the peer.

## Sample Output

**show ilmi all**

user@host> **show ilmi all**

```
Physical interface: at-6/2/1, VCI: 0.16
  Peer IP address: 192.168.4.24, Peer interface name: 1C4
Physical interface: at-6/3/0, VCI: 0.16
  Peer IP address: 192.168.7.6, Peer interface name: 2C3
Physical interface: at-6/4/0, VCI: 0.16
  Peer IP address: 192.168.9.10, Peer interface name: 1C2
```

**show ilmi interface**

user@host> **show ilmi interface at-6/2/1**

```
Physical interface: at-6/2/1, VCI: 0.16
  Peer IP address: 192.168.4.24, Peer interface name: 1C4
```

## show ilmi statistics

### Syntax

```
show ilmi statistics
```

### Release Information

Command introduced before Junos OS Release 7.4.

### Description

Display input and output Integrated Local Management Interface (ILMI) statistics.

### Options

This command has no options.

### Required Privilege Level

view

## RELATED DOCUMENTATION

[clear ilmi statistics](#) | [424](#)

### List of Sample Output

[show ilmi statistics on page 438](#)

### Output Fields

[Table 31 on page 436](#) lists the output fields for the **show ilmi statistics** command. Output fields are listed in the approximate order in which they appear.

Table 31: show ilmi statistics Output Fields

Field Name	Field Description
Input	

Table 31: show ilmi statistics Output Fields (*continued*)

Field Name	Field Description
	<p>Information about received ILMI packets:</p> <ul style="list-style-type: none"> <li>• <b>Packets</b>—Total number of messages delivered to the ILMI entity from the transport service.</li> <li>• <b>Bad versions</b>—Total number of messages delivered to the ILMI entity that were for an unsupported ILMI version.</li> <li>• <b>Bad community names</b>—Total number of messages delivered to the ILMI entity that did not use an ILMI community name.</li> <li>• <b>Bad community uses</b>—Total number of messages delivered to the ILMI entity that represented an ILMI operation that was not allowed by the ILMI community named in the message.</li> <li>• <b>ASN parse errors</b>—Total number of ASN.1 or BER errors encountered by the ILMI entity when decoding received ILMI messages.</li> <li>• <b>Too big</b>—Total number of ILMI packets delivered to the ILMI entity with an error status field of <b>tooBig</b>.</li> <li>• <b>No such names</b>—Total number of ILMI packets delivered to the ILMI entity with an error status field of <b>noSuchName</b>.</li> <li>• <b>Bad values</b>—Total number of ILMI packets delivered to the ILMI entity with an error status field of <b>badValue</b>.</li> <li>• <b>Read only</b>—Total number of valid ILMI packets delivered to the ILMI entity with an error status field of <b>readOnly</b>. Only incorrect implementations of ILMI generate this error.</li> <li>• <b>General errors</b>—Total number of ILMI packets delivered to the ILMI entity with an error status field of <b>genErr</b>.</li> <li>• <b>Total request varbinds</b>—Total number of objects retrieved successfully by the ILMI entity as a result of receiving valid ILMI <b>GetRequest</b> and <b>GetNext</b> packets.</li> <li>• <b>Total set varbinds</b>—Total number of objects modified successfully by the ILMI entity as a result of receiving valid ILMI <b>SetRequest</b> packets.</li> <li>• <b>Get requests</b>—Total number of ILMI <b>GetRequest</b> packets that have been accepted and processed by the ILMI entity.</li> <li>• <b>Get nexts</b>—Total number of ILMI <b>GetNext</b> packets that have been accepted and processed by the ILMI entity.</li> <li>• <b>Set requests</b>—Total number of ILMI <b>SetRequest</b> packets that have been accepted and processed by the ILMI entity.</li> <li>• <b>Get responses</b>—Total number of ILMI <b>GetResponse</b> packets that have been accepted and processed by the ILMI entity.</li> <li>• <b>Traps</b>—Total number of ILMI traps received by the ILMI entity.</li> <li>• <b>Silent drops</b>—Total number of <b>GetRequest</b>, <b>GetNextRequest</b>, <b>GetBulkRequest</b>, <b>SetRequest</b>, and <b>InformRequest</b> packets delivered to the ILMI entity that were silently dropped because the size of a reply containing an alternate response packet with an empty variable-bindings field was greater than either a local constraint or the maximum message size associated with the originator of the requests.</li> </ul>



Table 31: show ilmi statistics Output Fields (*continued*)

Field Name	Field Description
	<ul style="list-style-type: none"> <li>• <b>Proxy drops</b>—Total number of <b>GetRequest</b>, <b>GetNextRequest</b>, <b>GetBulkRequest</b>, <b>SetRequest</b>, and <b>InformRequest</b> packets delivered to the ILMI entity that were silently dropped because the transmission of the (possibly translated) message to a proxy target failed in such a way (other than a timeout) that no response packet could be returned.</li> </ul>
<b>Output</b>	<p>Information about transmitted ILMI packets:</p> <ul style="list-style-type: none"> <li>• <b>Packets</b>—Total number of messages passed from the ILMI entity to the transport service.</li> <li>• <b>Too bigs</b>—Total number of ILMI packets generated by the ILMI entity with an error status field of <b>tooBig</b>.</li> <li>• <b>No such names</b>—Total number of ILMI packets generated by the ILMI entity with an error status field of <b>noSuchName</b>.</li> <li>• <b>Bad values</b>—Total number of ILMI packets generated by the ILMI entity with an error status field of <b>badValue</b>.</li> <li>• <b>General errors</b>—Total number of ILMI packets generated by the ILMI entity with an error status field of <b>genErr</b>.</li> <li>• <b>Get requests</b>—Total number of ILMI <b>GetRequest</b> packets that have been generated by the ILMI entity.</li> <li>• <b>Get nexts</b>—Total number of ILMI <b>GetNext</b> packets that have been generated by the ILMI entity.</li> <li>• <b>Set requests</b>—Total number of ILMI <b>SetRequest</b> packets that have been generated by the ILMI entity.</li> <li>• <b>Get responses</b>—Total number of ILMI <b>GetResponse</b> packets that have been generated by the ILMI entity.</li> <li>• <b>Traps</b>—Total number of ILMI traps generated by the ILMI entity.</li> </ul>

## Sample Output

**show ilmi statistics**

user@host> **show ilmi statistics**

```
ILMI statistics:
Input:
  Packets: 0, Bad versions: 0, Bad community names: 0,
  Bad community uses: 0, ASN parse errors: 0,
  Too bigs: 0, No such names: 0, Bad values: 0,
  Read onlys: 0, General errors: 0,
  Total request varbinds: 0, Total set varbinds: 0,
  Get requests: 0, Get nexts: 0, Set requests: 0,
  Get responses: 0, Traps: 0,
  Silent drops: 0, Proxy drops 0
```

Output:

```
Packets: 0, Too bigs: 0, No such names: 0,  
Bad values: 0, General errors: 0,  
Get requests: 0, Get nexts: 0, Set requests: 0,  
Get responses: 0, Traps: 0
```

## show interfaces (ATM)

### Syntax

```
show interfaces at-fpc/pic/port
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index snmp-index>
<statistics>
```

### Release Information

Command introduced before Junos OS Release 7.4.

### Description

(M Series and T Series routers only) Display status information about the specified ATM interface.

### Options

**at-*fpc/pic/port***—Display standard information about the specified ATM interface.

**brief | detail | extensive | terse**—(Optional) Display the specified level of output.

**descriptions**—(Optional) Display interface description strings.

**media**—(Optional) Display media-specific information about network interfaces.

**snmp-index *snmp-index***—(Optional) Display the SNMP index of the interface.

**statistics**—(Optional) Display static interface statistics.

### Required Privilege Level

view

### List of Sample Output

[show interfaces \(ATM, IMA Group\) on page 462](#)

[show interfaces extensive \(ATM IMA Group\) on page 463](#)

[show interfaces \(ATM1, SONET Mode\) on page 465](#)

[show interfaces brief \(ATM1, SONET Mode\) on page 465](#)

[show interfaces detail \(ATM1, SONET Mode\) on page 466](#)

[show interfaces extensive \(ATM1, SONET Mode\) on page 467](#)

[show interfaces \(ATM2, SDH Mode\) on page 470](#)

[show interfaces brief \(ATM2, SDH Mode\) on page 472](#)

[show interfaces detail \(ATM2, SDH Mode\) on page 472](#)

[show interfaces extensive \(ATM2, SDH Mode\) on page 474](#)

[show interfaces \(ATM2, SONET Mode\) on page 478](#)

[show interfaces brief \(ATM2, SONET Mode\) on page 480](#)

[show interfaces detail \(ATM2, SONET Mode\) on page 481](#)

[show interfaces extensive \(ATM2, SONET Mode\) on page 484](#)

## Output Fields

Table 32 on page 441 lists the output fields for the **show interfaces** (ATM) command. Output fields are listed in the approximate order in which they appear.

Table 32: ATM show interfaces Output Fields

Field Name	Field Description	Level of Output
<b>Physical Interface</b>		
<b>Physical interface</b>	Name of the physical interface.	All levels
<b>Enabled</b>	State of the interface. Possible values are described in the “Enabled Field” section under <i>Common Output Fields Description</i> .	All levels
<b>Description</b>	Configured interface description.	All levels
<b>Interface index</b>	Physical interface's index number, which reflects its initialization sequence.	<b>detail extensive</b> none
<b>SNMP ifIndex</b>	SNMP index number for the physical interface.	<b>detail extensive</b> none
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Link-level type</b>	<p>Encapsulation being used on the physical interface:</p> <ul style="list-style-type: none"> <li>• <b>ATM-CCC-CELL-RELAY</b>—ATM cell relay for CCC.</li> <li>• <b>ATM-CCC-VC-MUX</b>—ATM virtual circuit (VC) for CCC.</li> <li>• <b>ATM-CISCO-NLPID</b>—Cisco-compatible ATM NLPID encapsulation.</li> <li>• <b>ATM-MIPP-LLC</b>—ATM MLPPP over ATM Adaptation Layer 5 (AAL5)/logical link control (LLC).</li> <li>• <b>ATM-NLPID</b>—ATM NLPID encapsulation.</li> <li>• <b>ATM-PPP-LLC</b>—ATM PPP over AAL5/LLC.</li> <li>• <b>ATM-PPP-VC-MUX</b>—ATM PPP over raw AAL5.</li> <li>• <b>ATM-PVC</b>—ATM permanent virtual circuits.</li> <li>• <b>ATM-SNAP</b>—ATM LLC/SNAP encapsulation.</li> <li>• <b>ATM-TCC-SNAP</b>—ATM LLC/SNAP for translational cross-connection.</li> <li>• <b>ATM-TCC-VC-MUX</b>—ATM VC for translational cross-connection.</li> <li>• <b>ATM-VC-MUX</b>—ATM VC multiplexing.</li> <li>• <b>ETHER-OVER-ATM-LLC</b>—Ethernet over ATM (LLC/SNAP) encapsulation.</li> <li>• <b>ETHER-VPLS-OVER-ATM-LLC</b>—Ethernet VPLS over ATM (bridging) encapsulation.</li> </ul>	All levels
<b>MTU</b>	MTU size on the physical interface.	All levels
<b>Clocking</b>	Reference clock source: <b>Internal</b> or <b>External</b> .	All levels
<b>framing Mode</b>	Framing mode: <b>SONET</b> or <b>SDH</b> .	All levels
<b>Speed</b>	Speed at which the interface is running as represented by the interface type (for example, <b>OC3</b> , <b>ADSL2+</b> , and <b>SHDSL(2-wire)</b> ).	All levels
<b>Loopback</b>	Whether loopback is enabled and the type of loopback ( <b>local</b> or <b>remote</b> ).	All levels
<b>Payload scrambler</b>	Whether payload scrambling is enabled.	All levels
<b>Device flags</b>	Information about the physical device. Possible values are described in the “Device Flags” section under <i>Common Output Fields Description</i> .	All levels
<b>Link flags</b>	Information about the link. Possible values are described in the “Link Flags” section under <i>Common Output Fields Description</i> .	All levels

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>CoS queues</b>	Number of CoS queues configured.	<b>detail extensive</b> none
<b>Hold-times</b>	Current interface hold-time up and hold-time down, in milliseconds.	<b>detail extensive</b>
<b>Current address</b>	Ethernet MAC address for this interface for Ethernet over ATM encapsulation.	<b>detail extensive</b> none
<b>Last flapped</b>	Date, time, and how long ago the interface went from down to up. The format is <b>Last flapped: year-month-day hour:minute:second timezone (hour:minute:second ago)</b> . For example, <b>Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)</b> .	<b>detail extensive</b> none
<b>Input Rate</b>	Input rate in bits per second (bps) and packets per second (pps).	None specified
<b>Output Rate</b>	Output rate in bps and pps.	None specified
<b>Statistics last cleared</b>	Time when the statistics for the interface were last set to zero.	<b>detail extensive</b>
<b>Traffic statistics</b>	Statistics for traffic on the interface. <ul style="list-style-type: none"> <li>• <b>Input bytes</b>—Number of bytes received on the interface</li> <li>• <b>Output bytes</b>—Number of bytes transmitted on the interface.</li> <li>• <b>Input packets</b>—Number of packets received on the interface</li> <li>• <b>Output packets</b>—Number of packets transmitted on the interface.</li> </ul>	<b>detail extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Input errors</b>	<p>Input errors on the interface whose definitions are as follows:</p> <ul style="list-style-type: none"> <li>• <b>Errors</b>—Sum of the incoming frame aborts and frame check sequence (FCS) errors.</li> <li>• <b>Drops</b>—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's random early detection (RED) mechanism.</li> <li>• <b>Invalid VCs</b>—Number of cells that arrived for a nonexistent VC.</li> <li>• <b>Framing errors</b>—Sum of AAL5 packets that have FCS errors, reassembly timeout errors, and length errors.</li> <li>• <b>Policed discards</b>—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle.</li> <li>• <b>L3 incompletes</b>—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded.</li> <li>• <b>L2 channel errors</b>—Number of times the software did not find a valid logical interface for an incoming frame.</li> <li>• <b>L2 mismatch timeouts</b>—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable.</li> <li>• <b>Resource errors</b>—Sum of transmit drops.</li> </ul>	<b>extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Output errors</b>	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> <li>• <b>Carrier transitions</b>—Number of times the interface has gone from <b>down</b> to <b>up</b>. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and up, or another problem occurs. If the number of carrier transitions increments quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If it increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC or PIM is malfunctioning.</li> <li>• <b>Errors</b>—Sum of the outgoing frame aborts and FCS errors.</li> <li>• <b>Drops</b>—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism.</li> <li>• <b>Aged packets</b>—Number of packets that remained so long in shared packet SDRAM that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware.</li> <li>• <b>MTU errors</b>—Number of packets larger than the MTU threshold.</li> <li>• <b>Resource errors</b>—Sum of transmit drops.</li> </ul>	<b>extensive</b>
<b>Egress queues</b>	Total number of egress queues supported on the specified interface.	<b>detail extensive</b>
<b>Queue counters</b>	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> <li>• <b>Queued packets</b>—Number of queued packets.</li> <li>• <b>Transmitted packets</b>—Number of transmitted packets.</li> <li>• <b>Dropped packets</b>—Number of packets dropped by the ASIC's RED mechanism.</li> </ul> <p><b>NOTE:</b> Physical interface queue counters of ATM2 PICs displayed by the <b>show interfaces at-fpc/pic/port detail</b> command show the packet forwarding stream statistics associated with the ATM2 ports. Since multiple ports of the ATM2 PICs (except for the ATM2 dual-port OC12) share one packet forwarding stream, the physical interface queue counters reflect the aggregate of ATM2 port statistics.</p>	<b>detail extensive</b>



Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
SONET alarms SONET defects	SONET media-specific defects that prevent the interface from passing packets. When a defect persists for a certain period, it is promoted to an alarm. Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router or light the red or yellow alarm LED on the craft interface. See these fields for possible alarms and defects: <b>SONET PHY</b> , <b>SONET section</b> , <b>SONET line</b> , and <b>SONET path</b> .	<b>detail extensive</b> none
SONET PHY	Counts of specific SONET errors with detailed information.  <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> Subfields are: <ul style="list-style-type: none"> <li>• <b>PLL Lock</b>—Phase-locked loop</li> <li>• <b>PHY Light</b>—Loss of optical signal</li> </ul>	<b>extensive</b>
SONET section	Counts of specific SONET errors with detailed information.  <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> Subfields are: <ul style="list-style-type: none"> <li>• <b>BIP-B1</b>—Bit interleaved parity for SONET section overhead</li> <li>• <b>SEF</b>—Severely errored framing</li> <li>• <b>LOL</b>—Loss of light</li> <li>• <b>LOF</b>—Loss of frame</li> <li>• <b>ES-S</b>—Errored seconds (section)</li> <li>• <b>SES-S</b>—Severely errored seconds (section)</li> <li>• <b>SEFS-S</b>—Severely errored framing seconds (section)</li> </ul>	<b>extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>SONET line</b>	<p>Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B2</b>—Bit interleaved parity for SONET line overhead</li> <li>• <b>REI-L</b>—Remote error indication (near-end line)</li> <li>• <b>RDI-L</b>—Remote defect indication (near-end line)</li> <li>• <b>AIS-L</b>—Alarm indication signal (near-end line)</li> <li>• <b>BERR-SF</b>—Bit error rate fault signal failure</li> <li>• <b>BERR-SD</b>—Bit error rate defect signal degradation</li> <li>• <b>ES-L</b>—Errored seconds (near-end line)</li> <li>• <b>SES-L</b>—Severely errored seconds (near-end line)</li> <li>• <b>UAS-L</b>—Unavailable seconds (near-end line)</li> <li>• <b>ES-LFE</b>—Errored seconds (far-end line)</li> <li>• <b>SES-LFE</b>—Severely errored seconds (far-end line)</li> <li>• <b>UAS-LFE</b>—Unavailable seconds (far-end line)</li> </ul>	<b>extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>SONET path</b>	<p>Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B3</b>—Bit interleaved parity for SONET section overhead</li> <li>• <b>REI-P</b>—Remote error indication</li> <li>• <b>LOP-P</b>—Loss of pointer (path)</li> <li>• <b>AIS-P</b>—Path alarm indication signal</li> <li>• <b>RDI-P</b>—Path remote defect indication</li> <li>• <b>UNEQ-P</b>—Path unequipped</li> <li>• <b>PLM-P</b>—Path payload (signal) label mismatch</li> <li>• <b>ES-P</b>—Errored seconds (near-end STS path)</li> <li>• <b>SES-P</b>—Severely errored seconds (near-end STS path)</li> <li>• <b>UAS-P</b>—Unavailable seconds (near-end STS path)</li> <li>• <b>ES-PFE</b>—Errored seconds (far-end STS path)</li> <li>• <b>SES-PFE</b>—Severely errored seconds (far-end STS path)</li> <li>• <b>UAS-PFE</b>—Unavailable seconds (far-end STS path)</li> </ul>	<b>extensive</b>
<b>Received SONET overhead</b>  <b>Transmitted SONET overhead</b>	<p>Values of the received and transmitted SONET overhead:</p> <ul style="list-style-type: none"> <li>• <b>C2</b>—Signal label. Allocated to identify the construction and content of the STS-level SPE and for PDI-P.</li> <li>• <b>F1</b>—Section user channel byte. This byte is set aside for the purposes of users.</li> <li>• <b>K1</b> and <b>K2</b>—These bytes are allocated for APS signaling for the protection of the multiplex section.</li> <li>• <b>J0</b>—Section trace. This byte is defined for STS-1 number 1 of an STS-N signal. Used to transmit a 1-byte fixed-length string or a 16-byte message so that a receiving terminal in a section can verify its continued connection to the intended transmitter.</li> <li>• <b>S1</b>—Synchronization status. The S1 byte is located in the first STS-1 of an STS-N.</li> <li>• <b>Z3</b> and <b>Z4</b>—Allocated for future use.</li> </ul>	<b>extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
SDH alarms SDH defects	SDH media-specific defects that can prevent the interface from passing packets. When a defect persists for a certain period, it is promoted to an alarm. Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router or light the red or yellow alarm LED on the craft interface. See these fields for possible alarms and defects: <b>SDH PHY</b> , <b>SDH regenerator section</b> , <b>SDH multiplex section</b> , and <b>SDH path</b> .	All levels
SDH PHY	Active alarms and defects, plus counts of specific SDH errors with detailed information.  <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> Subfields are: <ul style="list-style-type: none"> <li>• <b>PLL Lock</b>—Phase-locked loop</li> <li>• <b>PHY Light</b>—Loss of optical signal</li> </ul>	extensive
SDH regenerator section	Active alarms and defects, plus counts of specific SDH errors with detailed information.  <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> Subfields are: <ul style="list-style-type: none"> <li>• <b>RS-BIP8</b>—24-bit BIP for multiplex section overhead (B2 bytes)</li> <li>• <b>OOF</b>—Out of frame</li> <li>• <b>LOS</b>—Loss of signal</li> <li>• <b>LOF</b>—Loss of frame</li> <li>• <b>RS-ES</b>—Errored seconds (near-end regenerator section)</li> <li>• <b>RS-SES</b>—Severely errored seconds (near-end regenerator section)</li> <li>• <b>RS-SEFS</b>—Severely errored framing seconds (regenerator section)</li> </ul>	extensive

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>SDH multiplex section</b>	<p>Active alarms and defects, plus counts of specific SDH errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>MS-BIP24</b>—8-bit BIP for high-order path overhead (B3 byte)</li> <li>• <b>MS-FEBE</b>—Far-end block error (multiplex section)</li> <li>• <b>MS-FERF</b>—Far-end remote fail (multiplex section)</li> <li>• <b>MS-AIS</b>—Alarm indication signal (multiplex section)</li> <li>• <b>BERR-SF</b>—Bit error rate fault (signal failure)</li> <li>• <b>BERR-SD</b>—Bit error rate defect (signal degradation)</li> <li>• <b>MS-ES</b>—Errored seconds (near-end multiplex section)</li> <li>• <b>MS-SES</b>—Severely errored seconds (near-end multiplex section)</li> <li>• <b>MS-UAS</b>—Unavailable seconds (near-end multiplex section)</li> <li>• <b>MS-ES-FE</b>—Errored seconds (far-end multiplex section)</li> <li>• <b>MS-SES-FE</b>—Severely errored seconds (far-end multiplex section)</li> <li>• <b>MS-UAS-FE</b>—Unavailable seconds (far-end multiplex section)</li> </ul>	<b>extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>SDH path</b>	<p>Active alarms and defects, plus counts of specific SDH errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>HP-BIP8</b>—8-bit BIP for regenerator section overhead (B1 byte)</li> <li>• <b>HP-FEBE</b>—Far-end block error (high-order path)</li> <li>• <b>HP-LOP</b>—Loss of pointer (high-order path)</li> <li>• <b>HP-AIS</b>—High-order-path alarm indication signal</li> <li>• <b>HP-FERF</b>—Far-end remote fail (high-order path)</li> <li>• <b>HP-UNEQ</b>—Unequipped (high-order path)</li> <li>• <b>HP-PLM</b>—Payload label mismatch (high-order path)</li> <li>• <b>HP-ES</b>—Errored seconds (near-end high-order path)</li> <li>• <b>HP-SES</b>—Severely errored seconds (near-end high-order path)</li> <li>• <b>HP-UAS</b>—Unavailable seconds (near-end high-order path)</li> <li>• <b>HP-ES-FE</b>—Errored seconds (far-end high-order path)</li> <li>• <b>HP-SES-FE</b>—Severely errored seconds (far-end high-order path)</li> <li>• <b>HP-UAS-FE</b>—Unavailable seconds (far-end high-order path)</li> </ul>	<b>extensive</b>
<b>Received SDH overhead</b>  <b>Transmitted SDH overhead</b>	<p>Values of the received and transmitted SONET overhead:</p> <ul style="list-style-type: none"> <li>• <b>C2</b>—Signal label. This byte is allocated to identify the construction and content of the STS-level SPE and for PDI-P.</li> <li>• <b>F1</b>—Section user channel byte. This byte is set aside for the purposes of users.</li> <li>• <b>K1</b> and <b>K2</b>—These bytes are allocated for APS signaling for the protection of the multiplex section.</li> <li>• <b>J0</b>—Section trace. This byte is defined for STS-1 number 1 of an STS-N signal. This byte is used to transmit a 1-byte fixed-length string or a 16-byte message so that a receiving terminal in a section can verify its continued connection to the intended transmitter.</li> <li>• <b>S1</b>—Synchronization status. The S1 byte is located in the first STS-1 of an STS-N.</li> <li>• <b>Z3</b> and <b>Z4</b>—These bytes are allocated for future use.</li> </ul>	<b>extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Received path trace</b>  <b>Transmitted path trace</b>	SONET/SDH interfaces allow path trace bytes to be sent inband across the SONET/SDH link. Juniper Networks and other router manufacturers use these bytes to help diagnose misconfigurations and network errors by setting the transmitted path trace message so that it contains the system hostname and name of the physical interface. The received path trace value is the message received from the router at the other end of the fiber. The transmitted path trace value is the message that this router transmits.	<b>extensive</b>
<b>ATM Status</b>	ATM state information: <ul style="list-style-type: none"> <li>• <b>HCS State</b>—Status of the header check sequence. ATM uses the HCS field in the cell header in the cell delineation process to frame ATM cell boundaries. The HCS is an FCS-8 calculation over the first four octets of the ATM cell header.</li> <li>• <b>LOC</b>—Current loss of cell (LOC) delineation state. <b>OK</b> means that no LOC is currently asserted.</li> </ul>	<b>extensive</b>

Table 32: ATM show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
ATM Statistics		extensive



Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
	<p>ATM statistics for the interface:</p> <ul style="list-style-type: none"> <li>• <b>Uncorrectable HCS errors</b>—Number of cells dropped because the cell delineation failed. These errors most likely indicate that a SONET/SDH layer problem has occurred.</li> <li>• <b>Correctable HCS errors</b>—Number of correctable HCS errors that occurred. The cell delineation process can recover from these errors and locate the ATM cell boundary, although the framing process is not quite stable. The ATM cell is not dropped. This counter increases when the cell delineation process changes its state from <b>present</b> to <b>sync</b> (for example, when a cable is plugged into the interface).</li> </ul> <p>The following error statistics are from the framer:</p> <ul style="list-style-type: none"> <li>• <b>Tx cell FIFO overruns</b>—Number of overruns in the transmit FIFO.</li> <li>• <b>Rx cell FIFO overruns</b>—Number of overruns in the receive FIFO.</li> <li>• <b>Rx cell FIFO underruns</b>—Number of underruns in the receive FIFO.</li> <li>• <b>Input cell count</b>—Number of ATM cells received by the interface (not including idle cells).</li> <li>• <b>Output cell count</b>—Number of ATM cells transmitted by the interface (including idle cells).</li> <li>• <b>Output idle cell count</b>—Number of idle cells sent by the port. When ATM has nothing to send, it sends idle cells to fill the time slot.</li> <li>• <b>Output VC queue drops</b>—Number of packets dropped by a port on the PIC. Packets are dropped because of queue limits on the VCs.</li> </ul> <p>The following error statistics are from the SAR:</p> <ul style="list-style-type: none"> <li>• <b>Input no buffers</b>—Number of AAL5 packets dropped because no channel blocks or buffers were available to handle them.</li> <li>• <b>Input length errors</b>—Number of AAL5 packets dropped because their length was incorrect. Usually, these errors occur because a cell has been corrupted or lost, or because the length field was corrupted. They can also mean the AAL5 length field was zero.</li> <li>• <b>Input timeouts</b>—Number of AAL5 packets dropped because of a reassembly timeout.</li> <li>• <b>Input invalid VCs</b>—Number of AAL5 packets dropped because the header was unrecognized (because the VC was not correct or not configured).</li> <li>• <b>Input bad CRCs</b>—Number of AAL5 packets dropped because of frame check sequence errors.</li> <li>• <b>Input OAM cell no buffers</b>—Number of received OAM cells or raw cells</li> </ul>	

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
	<p>dropped because no buffers were available to handle them.</p> <ul style="list-style-type: none"> <li>• <b>L2 circuit out-of-sequence packets</b>—(Layer 2 AAL5 mode) Number of AAL5 packets that are out of sequential order.</li> <li>• <b>Denied packets count</b>—The number of packets dropped due to VLAN priority deny packets or due to an error forwarding configuration that might cause a negative frame length, that is, the stripping size is larger than the packet size.</li> </ul>	
<b>Packet Forwarding Engine configuration</b>	<p>Information about the configuration of the Packet Forwarding Engine:</p> <ul style="list-style-type: none"> <li>• <b>Destination slot</b>—FPC slot number.</li> </ul>	<b>extensive</b>
<b>CoS information</b>	<p>Information about the CoS queue for the physical interface.</p> <ul style="list-style-type: none"> <li>• <b>CoS transmit queue</b>—Queue number and its associated user-configured forwarding class name.</li> <li>• <b>Bandwidth %</b>—Percentage of bandwidth allocated to the queue.</li> <li>• <b>Bandwidth bps</b>—Bandwidth allocated to the queue (in bps).</li> <li>• <b>Buffer %</b>—Percentage of buffer space allocated to the queue.</li> <li>• <b>Buffer usec</b>—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time.</li> <li>• <b>Priority</b>—Queue priority: <b>low</b> or <b>high</b>.</li> <li>• <b>Limit</b>—Displayed if rate limiting is configured for the queue. Possible values are <b>none</b> and <b>exact</b>. If <b>exact</b> is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If <b>none</b> is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.</li> </ul>	<b>extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
VPI	<p>(ATM2) Virtual path identifier information:</p> <ul style="list-style-type: none"> <li>• <b>Flags</b>—VPI flags can be one or more of the following: <ul style="list-style-type: none"> <li>• <b>Active</b> (virtual path is up)</li> <li>• <b>OAM</b> (operation and maintenance is enabled)</li> <li>• <b>Shaping</b> (shaping is configured)</li> </ul> </li> <li>• <b>CBR, Peak</b></li> <li>• <b>OAM, Period</b>—Interval at which OAM F4 loopback cells are sent.</li> <li>• <b>Up count</b>—Number of F4 OAM cells required to consider the virtual path up; the range is <b>1</b> through <b>255</b>.</li> <li>• <b>Down count</b>—Number of F4 OAM cells required to consider the virtual path down; the range is <b>1</b> through <b>255</b>.</li> <li>• <b>Total down time</b>—Total number of seconds the VPI has been down since it was opened, using the format <b>Total down time: hh:mm:ss</b> or <b>Never</b>.</li> <li>• <b>Last down</b>—Time of last <b>Down</b> transition, using the format <b>Last down: hh:mm:ss ago</b> or <b>Never</b>.</li> <li>• <b>OAM F4 cell statistics</b>—(Nonpromiscuous mode) OAM F4 statistics: <ul style="list-style-type: none"> <li>• <b>Total received</b>—Number of OAM F4 cells received.</li> <li>• <b>Total sent</b>—Number of OAM F4 cells sent.</li> <li>• <b>Loopback received</b>—Number of OAM F4 loopback cells received.</li> <li>• <b>Loopback sent</b>—Number of OAM F4 loopback cells sent.</li> <li>• <b>Last received</b>—Time at which the last OAM F4 cell was received.</li> <li>• <b>Last sent</b>—Time at which the last OAM F4 cell was sent.</li> <li>• <b>RDI received</b>—Number of OAM F4 cells received with the remote defect indication bit set.</li> <li>• <b>RDI sent</b>—Number of OAM F4 cells sent with the RDI bit set.</li> <li>• <b>AIS received</b>—Number of OAM F4 cells received with the alarm indication signal bit set.</li> <li>• <b>AIS sent</b>—Number of OAM F4 cells sent with the AIS bit set.</li> </ul> </li> </ul> <p><b>Traffic statistics:</b></p> <ul style="list-style-type: none"> <li>• <b>Input bytes</b>—Number of bytes received on the VPI.</li> <li>• <b>Output bytes</b>—Number of bytes transmitted on the VPI.</li> <li>• <b>Input packets</b>—Number of packets received on the VPI.</li> <li>• <b>Output packets</b>—Number of packets transmitted on the VPI.</li> </ul>	<b>detail extensive none</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Logical Interface</b>		
<b>Logical interface</b>	Name of the logical interface.	All levels
<b>Index</b>	Logical interface index number, which reflects its initialization sequence.	<b>detail extensive none</b>
<b>SNMP ifIndex</b>	Logical interface SNMP interface index number.	<b>detail extensive none</b>
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>
<b>Flags</b>	Information about the logical interface. Possible values are described in the “Logical Interface Flags” section under <i>Common Output Fields Description</i> .	All levels
<b>Input packets</b>	Number of packets received on the logical interface.	None specified
<b>Output packets</b>	Number of packets transmitted on the logical interface.	None specified
<b>Encapsulation</b>	Encapsulation on the logical interface.	All levels
<b>Traffic statistics</b>	Total number of bytes and packets received and transmitted on the logical interface. These statistics are the sum of the local and transit statistics. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes a while (generally, less than 1 second) for this counter to stabilize.	<b>detail extensive</b>
<b>Local statistics</b>	Statistics for traffic received from and transmitted to the Routing Engine. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes a while (generally, less than 1 second) for this counter to stabilize.	<b>detail extensive</b>
<b>Transit statistics</b>	Statistics for traffic transiting the router. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes a while (generally, less than 1 second) for this counter to stabilize.	<b>detail extensive</b>
<b>Input packets</b>	Number of packets received on the logical interface.	None specified
<b>Output packets</b>	Number of packets transmitted on the logical interface.	None specified
<b><i>protocol-family</i></b>	Protocol family configured on the logical interface. If the protocol is <b>inet</b> , the IP address of the interface is also displayed.	<b>brief</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Protocol</b>	Protocol family configured on the logical interface.	<b>detail extensive none</b>
<b>MTU</b>	MTU size on the logical interface.	<b>detail extensive none</b>
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>
<b>Route table</b>	Routing table in which the logical interface address is located. For example, 0 refers to the routing table inet.0.	<b>detail extensive</b>
<b>Flags</b>	Information about the protocol family flags. Possible values are described in the “Family Flags” section under <i>Common Output Fields Description</i> .	<b>detail extensive none</b>
<b>Addresses, Flags</b>	Information about the address flags. Possible values are described in the “Addresses Flags” section under <i>Common Output Fields Description</i> .	<b>detail extensive none</b>
<b>Destination</b>	IP address of the remote side of the connection.	<b>detail extensive none</b>
<b>Local</b>	IP address of the logical interface.	<b>detail extensive none</b>
<b>Broadcast</b>	Broadcast address.	<b>detail extensive none</b>
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
VCI	<p>Virtual circuit identifier number and information:</p> <ul style="list-style-type: none"> <li>• <b>Flags</b>—VCI flags: <ul style="list-style-type: none"> <li>• <b>Active</b>—VCI is up and in working condition.</li> <li>• <b>CCC down</b>—VCI CCC is not in working condition.</li> <li>• <b>Closed</b>—VCI is closed because the user disabled the logical or physical interface from the CLI.</li> <li>• <b>Configured</b>—VCI is configured.</li> <li>• <b>Down</b>—VCI is not in working condition. The VCI might have alarms, defects, F5 AIS/RDI, or no response to OAM loopback cells.</li> <li>• <b>ILMI</b>—VCI is up and in working condition.</li> <li>• <b>OAM</b>—OAM loopback is enabled.</li> <li>• <b>Multicast</b>—VCI is a multicast VCI or DLCI.</li> <li>• <b>Multipoint destination</b>—VCI is configured as a multipoint destination.</li> <li>• <b>None</b>—No VCI flags.</li> <li>• <b>Passive-OAM</b>—Passive OAM is enabled.</li> <li>• <b>Shaping</b>—Shaping is enabled.</li> <li>• <b>Sustained</b>—Shaping rate is set to <b>Sustained</b>.</li> <li>• <b>Unconfigured</b>—VCI is not configured.</li> </ul> </li> <li>• <b>Total down time</b>—Total number of seconds the VCI has been down, using the format <b>Total down time: hh:mm:ss</b> or <b>Never</b>.</li> <li>• <b>Last down</b>—Time of last <b>Down</b> transition, using the format <b>Last down: hh:mm:ss</b>.</li> <li>• <b>EPD threshold</b>—(ATM2 only) Threshold at which a packet is dropped when the queue size (in number of cells) exceeds the early packet-discard (EPD) value.</li> </ul>	All levels

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
VCI (continued)	<ul style="list-style-type: none"> <li>• <b>Transmit weight cells</b>—(ATM2 only) Amount of bandwidth assigned to this queue.</li> <li>• <b>ATM per-VC transmit statistics:</b> <ul style="list-style-type: none"> <li>• <b>Tail queue packet drops</b>—Number of packets dropped because of bandwidth constraints. This value indicates that packets are queued to send out at a rate faster than allowed.</li> </ul> </li> <li>• <b>OAM F4 cell statistics</b>—(Nonpromiscuous mode) OAM F4 statistics: <ul style="list-style-type: none"> <li>• <b>Total received</b>—Number of OAM F4 cells received.</li> <li>• <b>Total sent</b>—Number of OAM F4 cells sent.</li> <li>• <b>Loopback received</b>—Number of OAM F4 loopback cells received.</li> <li>• <b>Loopback sent</b>—Number of OAM F4 loopback cells sent.</li> <li>• <b>Last received</b>—Time at which the last OAM F4 cell was received.</li> <li>• <b>Last sent</b>—Time at which the last OAM F4 cell was sent.</li> <li>• <b>RDI received</b>—Number of OAM F4 cells received with the remote defect indication bit set.</li> <li>• <b>RDI sent</b>—Number of OAM F4 cells sent with the RDI bit set.</li> <li>• <b>AIS received</b>—Number of OAM F4 cells received with the alarm indication signal bit set.</li> <li>• <b>AIS sent</b>—Number of OAM F4 cells sent with the AIS bit set.</li> </ul> </li> <li>• <b>Traffic statistics</b>—Number and rate of bytes and packets received and transmitted on the physical interface. <ul style="list-style-type: none"> <li>• <b>Input bytes</b>—Number of bytes received on the interface.</li> <li>• <b>Output bytes</b>—Number of bytes transmitted on the interface.</li> <li>• <b>Input packets</b>—Number of packets received on the interface</li> <li>• <b>Output packets</b>—Number of packets transmitted on the interface.</li> </ul> </li> </ul>	All levels

Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
IMA group properties	<ul style="list-style-type: none"> <li>• <b>Version</b>—The specified IMA specification version, either IMA 1.0 or IMA 1.1.</li> <li>• <b>Frame length</b>—The specified frame size, which can be 32, 64, 128, or 256.</li> <li>• <b>Differential delay</b>—Maximum differential delay among links in milliseconds.</li> <li>• <b>Symmetry</b>—Either Common Transmit Clock or Independent Transmit Clock timing mode.</li> <li>• <b>Transmit clock</b>—The specified IMA clock mode, either common or independent.</li> <li>• <b>Minimum links</b>—The number of minimum active links specified in both transmit and receive directions. <ul style="list-style-type: none"> <li>• <b>Transmit</b>—The per-PIC limit on the number of minimum active links in the transmit direction.</li> <li>• <b>Receive</b>—The per-PIC limit on the number of minimum active links in the receive direction.</li> </ul> </li> <li>• <b>Frame synchronization</b>—The specified IMA frame synchronization state transition variables (Alpha, Beta, and Gamma) and their specified values. <ul style="list-style-type: none"> <li>• <b>Alpha</b>—The number of consecutive invalid ICP cells for IFSM.</li> <li>• <b>Beta</b>—The number of consecutive errored ICP cells for IFSM.</li> <li>• <b>Gamma</b>—The number of consecutive valid ICP cells for IFSM.</li> </ul> </li> <li>• <b>Links</b>—The number of IMA links assigned to the IMA group.</li> </ul>	detail extensive none
IMA group alarms	<ul style="list-style-type: none"> <li>• <b>Start-up-FE</b>—Far-end group alarm status</li> <li>• <b>Config-Aborted</b>—Near-end configuration aborted group alarm status</li> <li>• <b>Config-Aborted-FE</b>—Far-end configuration aborted group alarm status</li> <li>• <b>Insufficient-Links</b>—Near-end insufficient links group alarm status</li> <li>• <b>Insufficient-Links-FE</b>—Far-end insufficient links group alarm status</li> <li>• <b>Blocked-FE</b>—Far-end blocked group alarm status</li> <li>• <b>GR-Timing-Mismatch</b>—Group timing mismatch alarm status</li> </ul>	detail extensive none



Table 32: ATM show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
IMA group defects	<ul style="list-style-type: none"> <li>• <b>Start-up-FE</b>—Far-end group defect status</li> <li>• <b>Config-Aborted</b>—Near-end configuration aborted group defect status</li> <li>• <b>Config-Aborted-FE</b>—Far-end configuration aborted group defect status</li> <li>• <b>Insufficient-Links</b>—Near-end insufficient links group defect status</li> <li>• <b>Insufficient-Links-FE</b>—Far-end insufficient links group defect status</li> <li>• <b>Blocked-FE</b>—Far-end blocked group defect status</li> <li>• <b>GR-Timing-Mismatch</b>—Group timing mismatch defect status</li> </ul>	detail extensive none
IMA Group state	Near-end and far-end group status	detail extensive none
IMA group media	<p>IMA group media status, including seconds, count and state for the following media parameters:</p> <ul style="list-style-type: none"> <li>• FC</li> <li>• FC-FE</li> <li>• Addr-Mismatch</li> <li>• Running</li> <li>• UAS</li> </ul>	detail extensive none

## Sample Output

### show interfaces (ATM, IMA Group)

user@host> show interfaces at-1/0/0

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  IMA group properties:
    Version           : 1.1
    Frame length      : 128
    Differential delay : 25 milliseconds
    Symmetry          : Symmetrical Configuration and Operation
    Transmit clock     : Common
    Minimum links     : Transmit: 1, Receive: 1
    Frame synchronization: Alpha: 2, Beta: 2, Gamma: 1
    Links             : None
  IMA group alarms   : Start-up-FE Config-Aborted Config-Aborted-FE
  Insufficient-Links Insufficient-Links-FE Blocked-FE GR-Timing-Mismatch
  IMA group defects  : Start-up-FE Config-Aborted Config-Aborted-FE
```

```
Insufficient-Links Insufficient-Links-FE Blocked-FE GR-Timing-Mismatch
```

```
IMA Group state:
```

```
  Near end : Start up
```

```
  Far end  : Start up
```

IMA group media:	Seconds	Count	State
FC		0	
FC-FE		0	
Addr-Mismatch		0	
Running	0		
UAS	0		

### show interfaces extensive (ATM IMA Group)

```
user@host> show interfaces at-0/0/10 extensive
```

```
Physical interface: at-0/0/10, Enabled, Physical link is Up
```

```
  Interface index: 178, SNMP ifIndex: 540, Generation: 531
```

```
  Link-level type: ATM-PVC, MTU: 2048, Speed: Unspecified, Loopback: None, Payload  
scrambler: Enabled
```

```
  Device flags   : Present Running
```

```
  Link flags     : None
```

```
  CoS queues    : 8 supported, 4 maximum usable queues
```

```
  Hold-times    : Up 0 ms, Down 0 ms
```

```
  Current address: 00:00:5e:00:53:0a
```

```
  Last flapped  : 2012-03-16 16:49:15 PDT (2d 07:12 ago)
```

```
  Statistics last cleared: 2012-03-16 16:56:58 PDT (2d 07:05 ago)
```

```
Traffic statistics:
```

```
  Input bytes   : 0 0 bps
```

```
  Output bytes  : 0 0 bps
```

```
  Input packets: 0 0 pps
```

```
  Output packets: 0 0 pps
```

```
IPv6 transit statistics:
```

```
  Input bytes   : 0
```

```
  Output bytes  : 0
```

```
  Input packets: 0
```

```
  Output packets: 0
```

```
Input errors:
```

```
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,  
L3 incompletes: 0, L2 channel errors: 0,
```

```
  L2 mismatch timeouts: 0, Resource errors: 0
```

```
Output errors:
```

```
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,  
Resource errors: 0
```

```
IMA group properties:
```

```

Version           : 1.1
Frame length      : 128
Differential delay : 25 milliseconds
Symmetry          : Symmetrical Configuration and Operation
Transmit clock    : Common
Minimum links     : Transmit: 1, Receive: 1
Frame synchronization: Alpha: 2, Beta: 2, Gamma: 1
Link #1           : t1-0/0/4                up
IMA Group alarms  : None
IMA Group defects : None

```

IMA Group state:

```

Near end : Operational
Far end  : Operational

```

IMA group media:	Seconds	Count	State
FC		0	
FC-FE		0	
Addr-Mismatch		0	
Running	198306		
UAS	0		

ATM status:

```

HCS state:      Sync
LOC           :   OK

```

ATM Statistics:

Uncorrectable HCS errors: 0, Correctable HCS errors: 0, Tx cell FIFO overruns: 0, Rx cell FIFO overruns: 0,

Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 0, Output idle cell count: 0,

Output VC queue drops: 0, Input no buffers: 0, Input length errors: 0, Input timeouts: 0, Input invalid VCs: 0,

Input bad CRCs: 0, Input OAM cell no buffers: 0

Packet Forwarding Engine configuration:

Destination slot: 0

VPI 2

Flags: Active

Total down time: 0 sec, Last down: Never

Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Logical interface at-0/0/10.602 (Index 71) (SNMP ifIndex 1057) (Generation 17226)

```
Flags: Point-To-Point SNMP-Traps CCC-Down 0x0 Encapsulation: ATM-CCC-Cell-Relay
```

```
L2 circuit cell bundle size: 1, bundle timeout: 125 usec, timeout count: 0
```

```
L2 circuit out-of-sequence count: 0, denied packets count: 0
```

### show interfaces (ATM1, SONET Mode)

```
user@host> show interfaces at-1/0/0
```

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 300, SNMP ifIndex: 194
  Description: to allspice at-1/0/0
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode,
  Speed: OC3, Loopback: None, Payload scrambler: Enabled
  Device flags      : Present Running
  Link flags        : None
  CoS queues        : 4 supported, 4 maximum usable queues
  Current address: 00:00:5e:00:53:fe
  Last flapped      : 2006-02-24 14:28:12 PST (6d 01:51 ago)
  Input rate         : 0 bps (0 pps)
  Output rate        : 0 bps (0 pps)
  SONET alarms       : None
  SONET defects      : None

Logical interface at-1/0/0.0 (Index 64) (SNMP ifIndex 204)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
  Input packets : 0
  Output packets: 0
  Protocol inet, MTU: 4470
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 192.168.220.24/30, Local: 192.168.220.26,
      Broadcast: 192.168.220.27
  Protocol iso, MTU: 4470
    Flags: None
  VCI 0.128
    Flags: Active
    Total down time: 0 sec, Last down: Never
      Input packets : 0
      Output packets: 0
```

### show interfaces brief (ATM1, SONET Mode)

```
user@host> show interfaces at-1/0/0 brief
```

```

Physical interface: at-1/0/0, Enabled, Physical link is Up
  Description: to allspice at-1/0/0
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode,
  Speed: OC3, Loopback: None, Payload scrambler: Enabled
  Device flags    : Present Running
  Link flags      : None

Logical interface at-1/0/0.0
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
  inet  192.168.220.26/30
  iso
  VCI 0.128
  Flags: Active
  Total down time: 0 sec, Last down: Never

```

### show interfaces detail (ATM1, SONET Mode)

user@host> show interfaces at-1/0/0 detail

```

Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 300, SNMP ifIndex: 194, Generation: 183
  Description: to allspice at-1/0/0
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode,
  Speed: OC3, Loopback: None, Payload scrambler: Enabled
  Device flags    : Present Running
  Link flags      : None
  CoS queues      : 4 supported, 4 maximum usable queues
  Hold-times      : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:fe
  Last flapped    : 2006-02-24 14:28:12 PST (6d 01:55 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input  bytes   :                0                0 bps
    Output bytes   :                0                0 bps
    Input  packets :                0                0 pps
    Output packets :                0                0 pps
  Egress queues: 4 supported, 4 in use
  Queue counters:
    Queued packets  Transmitted packets  Dropped packets
    0 best-effort   0                    0                    0
    1 expedited-fo  0                    0                    0
    2 assured-forw  0                    0                    0
    3 network-cont  0                    0                    0
  SONET alarms     : None
  SONET defects    : None

```

```

Logical interface at-1/0/0.0 (Index 64) (SNMP ifIndex 204) (Generation 5)
  Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP
  Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0
  Local statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0
  Transit statistics:
    Input  bytes   :                0                0 bps
    Output bytes   :                0                0 bps
    Input  packets :                0                0 pps
    Output packets :                0                0 pps
  Protocol inet, MTU: 4470, Generation: 13, Route table: 0
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 192.168.220.24/30, Local: 192.168.220.26,
      Broadcast: 192.168.220.27, Generation: 14
  Protocol iso, MTU: 4470, Generation: 14, Route table: 0
    Flags: None
  VCI 0.128
    Flags: Active
    Total down time: 0 sec, Last down: Never
    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input  bytes   :                0
      Output bytes   :                0
      Input  packets :                0
      Output packets :                0

```

### show interfaces extensive (ATM1, SONET Mode)

user@host> show interfaces at-1/0/0 extensive

```

Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 300, SNMP ifIndex: 194, Generation: 183
  Description: to allspice at-1/0/0
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode,

```

```

Speed: OC3, Loopback: None, Payload scrambler: Enabled
Device flags   : Present Running
Link flags     : None
CoS queues    : 4 supported, 4 maximum usable queues
Hold-times    : Up 0 ms, Down 0 ms
Current address: 00:00:5e:00:53:fe
Last flapped  : 2006-02-24 14:28:12 PST (6d 01:56 ago)
Statistics last cleared: Never

Traffic statistics:
  Input bytes   :                0                0 bps
  Output bytes  :                0                0 bps
  Input packets :                0                0 pps
  Output packets:                0                0 pps

Input errors:
  Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  Resource errors: 0

Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
  Resource errors: 0

Egress queues: 4 supported, 4 in use
Queue counters:
  Queued packets  Transmitted packets  Dropped packets
  0 best-effort   0                   0                   0
  1 expedited-fo  0                   0                   0
  2 assured-forw  0                   0                   0
  3 network-cont  0                   0                   0

SONET alarms   : None
SONET defects  : None

SONET PHY:
  Seconds      Count  State
  PLL Lock     0       0  OK
  PHY Light    0       0  OK

SONET section:
  BIP-B1       0       0
  SEF          0       0  OK
  LOS          0       0  OK
  LOF          0       0  OK
  ES-S         0
  SES-S        0
  SEFS-S       0

SONET line:
  BIP-B2       0       0
  REI-L        0       0
  RDI-L        0       0  OK
  AIS-L        0       0  OK

```

```

BERR-SF          0          0 OK
BERR-SD          0          0 OK
ES-L             0
SES-L            0
UAS-L            0
ES-LFE           0
SES-LFE           0
UAS-LFE           0
SONET path:
BIP-B3           0          0
REI-P            0          0
LOP-P            0          0 OK
AIS-P            0          0 OK
RDI-P            0          0 OK
UNEQ-P           1          1 OK
PLM-P            0          0 OK
ES-P             1
SES-P            1
UAS-P            0
ES-PFE           0
SES-PFE           0
UAS-PFE           0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, C2(cmp) : 0x13, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
Z4      : 0x00
ATM status:
HCS state:      Sync
LOC           :      OK
ATM Statistics:
Uncorrectable HCS errors: 0, Correctable HCS errors: 0,
Tx cell FIFO overruns: 0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 0,
Output idle cell count: 0, Output VC queue drops: 0, Input no buffers: 0,
Input length errors: 0, Input timeouts: 0, Input invalid VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0
Packet Forwarding Engine configuration:
Destination slot: 1
CoS information:
CoS transmit queue      Bandwidth      Buffer      Priority      Limit

```



	%	bps	%	usec		
0 best-effort	95	147744000	95	0	low	none
3 network-control	5	7776000	5	0	low	none

Logical interface at-1/0/0.0 (Index 64) (SNMP ifIndex 204) (Generation 5)

Flags: Point-To-Point SNMP-Traps Encapsulation: ATM-SNAP

Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Local statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Transit statistics:

Input bytes :	0	0 bps
Output bytes :	0	0 bps
Input packets:	0	0 pps
Output packets:	0	0 pps

Protocol inet, MTU: 4470, Generation: 13, Route table: 0

Flags: None

Addresses, Flags: Is-Preferred Is-Primary

Destination: 192.168.220.24/30, Local: 192.168.220.26,

Broadcast: 192.168.220.27, Generation: 14

Protocol iso, MTU: 4470, Generation: 14, Route table: 0

Flags: None

VCI 0.128

Flags: Active

Total down time: 0 sec, Last down: Never

ATM per-VC transmit statistics:

Tail queue packet drops: 0

Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

### show interfaces (ATM2, SDH Mode)

user@host> show interfaces at-0/2/1

```

Physical interface: at-0/2/1, Enabled, Physical link is Up
  Interface index: 154, SNMP ifIndex: 42
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SDH mode, Speed: OC3,
  Loopback: None, Payload scrambler: Enabled
  Device flags    : Present Running
  Link flags      : None
  CoS queues      : 4 supported, 4 maximum usable queues
  Current address: 00:00:5e:00:53:3f
  Last flapped    : 2006-03-24 13:29:58 PST (00:04:48 ago)
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)
  SDH alarms      : None
  SDH defects     : None
    VPI 0
      Flags: Active
      Total down time: 0 sec, Last down: Never
Traffic statistics:
  Input  packets:                0
  Output packets:                0

Logical interface at-0/2/1.0 (Index 75) (SNMP ifIndex 51)
  Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: ATM-SNAP
  Input packets : 0
  Output packets: 0
  Protocol inet, MTU: 4470
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.0.12.6, Local: 10.0.12.5
  Protocol iso, MTU: 4470
    Flags: None
  VCI 0.128
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 2129, Transmit weight cells: 0
      Input packets : 0
      Output packets: 0

Logical interface at-0/2/1.32767 (Index 76) (SNMP ifIndex 50)
  Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x4000
  Encapsulation: ATM-VCMUX
  Input packets : 0
  Output packets: 0
  VCI 0.4
    Flags: Active

```

```

Total down time: 0 sec, Last down: Never
EPD threshold: 0, Transmit weight cells: 0
  Input packets : 0
  Output packets: 0

```

### show interfaces brief (ATM2, SDH Mode)

user@host> show interfaces at-0/2/1 brief

```

Physical interface: at-0/2/1, Enabled, Physical link is Up
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SDH mode,
  Speed: OC3, Loopback: None, Payload scrambler: Enabled
  Device flags      : Present Running
  Link flags        : None
Logical interface at-0/2/1.0
  Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: ATM-SNAP
  inet  10.0.12.5      --> 10.0.12.6
  iso
  VCI 0.128
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 2129, Transmit weight cells: 0

Logical interface at-0/2/1.32767
  Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x4000
  Encapsulation: ATM-VCMUX
  VCI 0.4
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0

```

### show interfaces detail (ATM2, SDH Mode)

user@host> show interfaces at-0/2/1 detail

```

Physical interface: at-0/2/1, Enabled, Physical link is Up
  Interface index: 154, SNMP ifIndex: 42, Generation: 40
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SDH mode, Speed: OC3,
  Loopback: None, Payload scrambler: Enabled
  Device flags      : Present Running
  Link flags        : None
  CoS queues        : 4 supported, 4 maximum usable queues
  Hold-times        : Up 0 ms, Down 0 ms

```

```

Current address: 00:00:5e:00:53:3f
Last flapped   : 2006-03-24 13:29:58 PST (00:05:10 ago)
Statistics last cleared: Never
Traffic statistics:
  Input  bytes :                0                0 bps
  Output bytes :                0                0 bps
  Input  packets:                0                0 pps
  Output packets:                0                0 pps
Egress queues: 4 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets
  0 best-effort      0                0                0
  1 expedited-fo     0                0                0
  2 assured-forw     0                0                0
  3 network-cont     0                0                0
SDH  alarms   : None
SDH  defects  : None
VPI 0
  Flags: Active
  Total down time: 0 sec, Last down: Never
  Traffic statistics:
    Input  bytes :                0
    Output bytes :                0
    Input  packets:                0
    Output packets:                0

Logical interface at-0/2/1.0 (Index 75) (SNMP ifIndex 51) (Generation 25)
  Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: ATM-SNAP
  Traffic statistics:
    Input  bytes :                0
    Output bytes :                0
    Input  packets:                0
    Output packets:                0
  Local statistics:
    Input  bytes :                0
    Output bytes :                0
    Input  packets:                0
    Output packets:                0
  Transit statistics:
    Input  bytes :                0                0 bps
    Output bytes :                0                0 bps
    Input  packets:                0                0 pps
    Output packets:                0                0 pps
  Protocol inet, MTU: 4470, Generation: 62, Route table: 0
  Flags: None

```

```

    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.0.12.6, Local: 10.0.12.5, Broadcast: Unspecified,
      Generation: 58
Protocol iso, MTU: 4470, Generation: 63, Route table: 0
  Flags: None
VCI 0.128
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 2129, Transmit weight cells: 0
  ATM per-VC transmit statistics:
    Tail queue packet drops: 0
  Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0
Logical interface at-0/2/1.32767 (Index 76) (SNMP ifIndex 50) (Generation 26)
  Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x4000
  Encapsulation: ATM-VCMUX
  Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0
Local statistics:
  Input  bytes   :                0
  Output bytes   :                0
  Input  packets :                0
  Output packets :                0
VCI 0.4
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
  ATM per-VC transmit statistics:
    Tail queue packet drops: 0
  Traffic statistics:
    Input  bytes   :                0
    Output bytes   :                0
    Input  packets :                0
    Output packets :                0

```

**show interfaces extensive (ATM2, SDH Mode)**

user@host> **show interfaces at-0/2/1 extensive**

```

Physical interface: at-0/2/1, Enabled, Physical link is Up
  Interface index: 154, SNMP ifIndex: 42, Generation: 40
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SDH mode, Speed: OC3,
  Loopback: None, Payload scrambler: Enabled
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 4 supported, 4 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:3f
  Last flapped   : 2006-03-24 13:29:58 PST (00:06:49 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes   :                0                0 bps
    Output bytes  :                0                0 bps
    Input packets :                0                0 pps
    Output packets:                0                0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    Resource errors: 0
  Output errors:
    Carrier transitions: 3, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
    Resource errors: 0
  Egress queues: 4 supported, 4 in use
  Queue counters:
    Queued packets  Transmitted packets  Dropped packets
    0 best-effort   0                0                0
    1 expedited-fo  0                0                0
    2 assured-forw  0                0                0
    3 network-cont  0                0                0
  SDH alarms      : None
  SDH defects     : None
  SDH PHY:
    Seconds      Count  State
    PLL Lock     0      0  OK
    PHY Light    1      1  OK
  SDH regenerator section:
    RS-BIP8      2      8828
    OOF          2      2  OK
    LOS          2      1  OK
    LOF          2      1  OK
    RS-ES        4
    RS-SES       3
    RS-SEFS      2
  SDH multiplex section:
    MS-BIP24     2      771

```

```

MS-FEBE          1          17476
MS-FERF          2           1 OK
MS-AIS           2           1 OK
BERR-SF          0           0 OK
BERR-SD          0           0 OK
MS-ES            4
MS-SES           2
MS-UAS           0
MS-ES-FE         3
MS-SES-FE        2
MS-UAS-FE        0
SDH path:
HP-BIP8          1           6
HP-FEBE          1          251
HP-LOP           0           0 OK
HP-AIS           2           1 OK
HP-FERF          3           2 OK
HP-UNEQ          1           1 OK
HP-PLM           2           1 OK
HP-ES            4
HP-SES           3
HP-UAS           0
HP-ES-FE         3
HP-SES-FE        3
HP-UAS-FE        0
Received SDH overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, C2(cmp) : 0x13, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SDH overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
Z4      : 0x00
ATM status:
HCS state:      Sync
LOC           :      OK
ATM Statistics:
Uncorrectable HCS errors: 0, Correctable HCS errors: 0,
Tx cell FIFO overruns: 0, Rx cell FIFO overruns: 0,
Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 0,
Output idle cell count: 0, Output VC queue drops: 0, Input no buffers: 0,
Input length errors: 0, Input timeouts: 0, Input invalid VCs: 0,
Input bad CRCs: 0, Input OAM cell no buffers: 0
Packet Forwarding Engine configuration:

```

Destination slot: 0

VPI 0

Flags: Active

Total down time: 0 sec, Last down: Never

Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Logical interface at-0/2/1.0 (Index 75) (SNMP ifIndex 51) (Generation 25)

Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: ATM-SNAP

Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Local statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Transit statistics:

Input bytes :	0	0 bps
Output bytes :	0	0 bps
Input packets:	0	0 pps
Output packets:	0	0 pps

Protocol inet, MTU: 4470, Generation: 62, Route table: 0

Flags: None

Addresses, Flags: Is-Preferred Is-Primary

Destination: 10.0.12.6, Local: 10.0.12.5, Broadcast: Unspecified,  
Generation: 58

Protocol iso, MTU: 4470, Generation: 63, Route table: 0

Flags: None

VCI 0.128

Flags: Active

Total down time: 0 sec, Last down: Never

EPD threshold: 2129, Transmit weight cells: 0

ATM per-VC transmit statistics:

Tail queue packet drops: 0

Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0



```

        Output packets:                                0
Logical interface at-0/2/1.32767 (Index 76) (SNMP ifIndex 50) (Generation 26)
  Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x4000
  Encapsulation: ATM-VCMUX
  Traffic statistics:
    Input  bytes   :                                0
    Output bytes   :                                0
    Input  packets :                                0
    Output packets :                                0
  Local statistics:
    Input  bytes   :                                0
    Output bytes   :                                0
    Input  packets :                                0
    Output packets :                                0
  VCI 0.4
    Flags: Active
    Total down time: 0 sec, Last down: Never
    EPD threshold: 0, Transmit weight cells: 0
    ATM per-VC transmit statistics:
      Tail queue packet drops: 0
    Traffic statistics:
      Input  bytes   :                                0
      Output bytes   :                                0
      Input  packets :                                0
      Output packets :                                0

```

### show interfaces (ATM2, SONET Mode)

user@host> show interfaces at-0/3/1

```

Physical interface: at-0/3/1, Enabled, Physical link is Up
  Interface index: 139, SNMP ifIndex: 67
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode,
  Speed: OC3, Loopback: None, Payload scrambler: Enabled
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 4 supported, 4 maximum usable queues
  Current address: 00:00:5e:00:53:5e
  Last flapped   : 2006-03-13 17:46:36 PST (16:01:12 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  SONET alarms   : None
  SONET defects  : None
  VPI 0

```

```

    Flags: Active, OAM, Shaping
    CBR, Peak: 50kbps
    OAM, Period 30 sec, Up count: 10, Down count: 10
    Total down time: 0 sec, Last down: Never
    OAM F4 cell statistics:
        Total received: 4, Total sent: 4
        Loopback received: 4, Loopback sent: 4
        RDI received: 0, RDI sent: 0
        AIS received: 0
    Traffic statistics:
        Input  packets:                4
        Output packets:                30
    VPI 10
        Flags: Active
        Total down time: 0 sec, Last down: Never
    Traffic statistics:
        Input  packets:                0
        Output packets:                0
    Logical interface at-0/3/1.0 (Index 78) (SNMP ifIndex 77)
        Flags: Point-To-Point Copy-PLP-To-CLP SNMP-Traps 0x4000
        Encapsulation: ATM-SNAP
        Input packets : 0
        Output packets: 0
        Protocol inet, MTU: 4470
            Flags: None
            Addresses, Flags: Is-Preferred Is-Primary
                Destination: 10.0.59.5, Local: 10.0.59.6
        Protocol iso, MTU: 4470
            Flags: None
    VCI 0.128
        Flags: Active
        Total down time: 0 sec, Last down: Never
        EPD threshold: 2129, Transmit weight cells: 10
        Input packets : 0
        Output packets: 0

    Logical interface at-0/3/1.32767 (Index 79) (SNMP ifIndex 76)
        Flags: Point-To-Multipoint Copy-PLP-To-CLP No-Multicast SNMP-Traps 0x4000
        Encapsulation: ATM-VCMUX
        Input packets : 4
        Output packets: 30
    VCI 0.16
        Flags: Active, ILMI
        Total down time: 0 sec, Last down: Never

```

```

    EPD threshold: 0, Transmit weight cells: 0
      Input packets : 0
      Output packets: 26
VCI 0.4
  Flags: Active, OAM
  OAM, Period 30 sec, Up count: 10, Down count: 10
  Total down time: 0 sec, Last down: Never
  EPD threshold: 2129, Transmit weight cells: 0
    Input packets : 4
    Output packets: 4
OAM F4 cell statistics:
  Total received: 4, Total sent: 4
  Loopback received: 4, Loopback sent: 4
  RDI received: 0, RDI sent: 0
  AIS received: 0, AIS sent: 0

```

### show interfaces brief (ATM2, SONET Mode)

user@host> **show interfaces at-0/3/1 brief**

```

Physical interface: at-0/3/1, Enabled, Physical link is Up
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode,
  Speed: OC3, Loopback: None, Payload scrambler: Enabled
  Device flags      : Present Running
  Link flags        : None

Logical interface at-0/3/1.0
  Flags: Point-To-Point Copy-PLP-To-CLP SNMP-Traps 0x4000
  Encapsulation: ATM-SNAP
  inet  10.0.59.6          --> 10.0.59.5
  iso
VCI 0.128
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 2129, Transmit weight cells: 10

Logical interface at-0/3/1.32767
  Flags: Point-To-Multipoint Copy-PLP-To-CLP No-Multicast SNMP-Traps 0x4000
  Encapsulation: ATM-VCMUX
VCI 0.16
  Flags: Active, ILMI
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
VCI 0.4

```

```

Flags: Active, OAM
Total down time: 0 sec, Last down: Never
EPD threshold: 2129, Transmit weight cells: 0

```

### show interfaces detail (ATM2, SONET Mode)

user@host> show interfaces at-0/3/1 detail

```

Physical interface: at-0/3/1, Enabled, Physical link is Up
Interface index: 139, SNMP ifIndex: 67, Generation: 22
Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode,
Speed: OC3, Loopback: None, Payload scrambler: Enabled
Device flags   : Present Running
Link flags     : None
CoS queues     : 4 supported, 4 maximum usable queues
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:00:5e:00:53:5e
Last flapped   : 2006-03-13 17:46:36 PST (16:02:39 ago)
Statistics last cleared: Never
Traffic statistics:
Input  bytes   :                312                0 bps
Output bytes   :               2952                0 bps
Input  packets :                 6                0 pps
Output packets :                50                0 pps
Egress queues: 4 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets  Dropped packets
0 best-effort        44                44                0
1 expedited-fo        0                 0                0
2 assured-forw        0                 0                0
3 network-cont        6                 6                0
SONET alarms        : None
SONET defects       : None
VPI 0
Flags: Active, OAM, Shaping
CBR, Peak: 50kbps
OAM, Period 30 sec, Up count: 10, Down count: 10
Total down time: 0 sec, Last down: Never
OAM F4 cell statistics:
Total received: 6, Total sent: 6
Loopback received: 6, Loopback sent: 6
Last received: 00:00:29, Last sent: 00:00:29
RDI received: 0, RDI sent: 0
AIS received: 0
Traffic statistics:

```

```

        Input  bytes   :                312
        Output bytes   :               2952
        Input  packets :                 6
        Output packets :                50

```

VPI 10

Flags: Active

Total down time: 0 sec, Last down: Never

Traffic statistics:

```

        Input  bytes   :                0
        Output bytes   :                0
        Input  packets :                0
        Output packets :                0

```

Logical interface at-0/3/1.0 (Index 78) (SNMP ifIndex 77) (Generation 20)

Flags: Point-To-Point Copy-PLP-To-CLP SNMP-Traps 0x4000

Encapsulation: ATM-SNAP

Traffic statistics:

```

        Input  bytes   :                0
        Output bytes   :                0
        Input  packets :                0
        Output packets :                0

```

Local statistics:

```

        Input  bytes   :                0
        Output bytes   :                0
        Input  packets :                0
        Output packets :                0

```

Transit statistics:

```

        Input  bytes   :                0                0 bps
        Output bytes   :                0                0 bps
        Input  packets :                0                0 pps
        Output packets :                0                0 pps

```

Protocol inet, MTU: 4470, Generation: 38, Route table: 0

Flags: None

Addresses, Flags: Is-Preferred Is-Primary

Destination: 10.0.59.5, Local: 10.0.59.6, Broadcast: Unspecified,  
Generation: 44

Protocol iso, MTU: 4470, Generation: 39, Route table: 0

Flags: None

VCI 0.128

Flags: Active

Total down time: 0 sec, Last down: Never

EPD threshold: 2129, Transmit weight cells: 10

ATM per-VC transmit statistics:

Tail queue packet drops: 0

```

Traffic statistics:
  Input  bytes   :                0
  Output bytes   :                0
  Input  packets :                0
  Output packets :                0
Logical interface at-0/3/1.32767 (Index 79) (SNMP ifIndex 76) (Generation 21)
Flags: Point-To-Multipoint Copy-PLP-To-CLP No-Multicast SNMP-Traps 0x4000
Encapsulation: ATM-VCMUX
Traffic statistics:
  Input  bytes   :            360
  Output bytes   :           3302
  Input  packets :             6
  Output packets :            50
Local statistics:
  Input  bytes   :            360
  Output bytes   :           3302
  Input  packets :             6
  Output packets :            50
VCI 0.16
  Flags: Active, ILMI
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0
  ATM per-VC transmit statistics:
    Tail queue packet drops: 0
  Traffic statistics:
    Input  bytes   :                0
    Output bytes   :           2640
    Input  packets :                0
    Output packets :             44
VCI 0.4
  Flags: Active, OAM
  OAM, Period 30 sec, Up count: 10, Down count: 10
  Total down time: 0 sec, Last down: Never
  EPD threshold: 2129, Transmit weight cells: 0
  ATM per-VC transmit statistics:
    Tail queue packet drops: 0
  Traffic statistics:
    Input  bytes   :            312
    Output bytes   :            312
    Input  packets :             6
    Output packets :             6
OAM F4 cell statistics:
  Total received: 6, Total sent: 6
  Loopback received: 6, Loopback sent: 6

```

```

Last received: 00:00:29, Last sent: 00:00:29
RDI received: 0, RDI sent: 0
AIS received: 0, AIS sent: 0

```

### show interfaces extensive (ATM2, SONET Mode)

user@host> show interfaces at-0/3/1 extensive

```

Physical interface: at-0/3/1, Enabled, Physical link is Up
  Interface index: 139, SNMP ifIndex: 67, Generation: 22
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, SONET mode,
  Speed: OC3, Loopback: None, Payload scrambler: Enabled
  Device flags      : Present Running
  Link flags        : None
  CoS queues        : 4 supported, 4 maximum usable queues
  Hold-times        : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:5e
  Last flapped      : 2006-03-13 17:46:36 PST (16:04:12 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input  bytes   :                520                0 bps
    Output bytes   :               4240                0 bps
    Input  packets :                 10                0 pps
    Output packets :                 72                0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    Resource errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
    Resource errors: 0
  Egress queues: 4 supported, 4 in use
  Queue counters:
    Queued packets  Transmitted packets  Dropped packets
    0 best-effort   62                62                0
    1 expedited-fo  0                 0                 0
    2 assured-forw  0                 0                 0
    3 network-cont  10                10                0
  SONET alarms      : None
  SONET defects     : None
  SONET PHY:
    Seconds          Count  State
    PLL Lock         0      0  OK
    PHY Light        0      0  OK
  SONET section:
    BIP-B1           0      0

```

```

SEF          0          0 OK
LOS          0          0 OK
LOF          0          0 OK
ES-S         0
SES-S        0
SEFS-S       0
SONET line:
BIP-B2       0          0
REI-L        0          0
RDI-L        0          0 OK
AIS-L        0          0 OK
BERR-SF      0          0 OK
BERR-SD      0          0 OK
ES-L         0
SES-L        0
UAS-L        0
ES-LFE       0
SES-LFE      0
UAS-LFE      0
SONET path:
BIP-B3       0          0
REI-P        0          0
LOP-P        0          0 OK
AIS-P        0          0 OK
RDI-P        0          0 OK
UNEQ-P       1          1 OK
PLM-P        0          0 OK
ES-P         1
SES-P        1
UAS-P        0
ES-PFE       0
SES-PFE      0
UAS-PFE      0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, C2(cmp) : 0x13, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0x13, F2      : 0x00, Z3      : 0x00
Z4      : 0x00
ATM status:
HCS state:      Sync
LOC      :      OK

```



## ATM Statistics:

Uncorrectable HCS errors: 0, Correctable HCS errors: 0,  
 Tx cell FIFO overruns: 0, Rx cell FIFO overruns: 0,  
 Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 0,  
 Output idle cell count: 0, Output VC queue drops: 0, Input no buffers: 0,  
 Input length errors: 0, Input timeouts: 0, Input invalid VCs: 0,  
 Input bad CRCs: 0, Input OAM cell no buffers: 0

## Packet Forwarding Engine configuration:

Destination slot: 0

## VPI 0

Flags: Active, OAM, Shaping

CBR, Peak: 50kbps

OAM, Period 30 sec, Up count: 10, Down count: 10

Total down time: 0 sec, Last down: Never

## OAM F4 cell statistics:

Total received: 10, Total sent: 10

Loopback received: 10, Loopback sent: 10

Last received: 00:00:02, Last sent: 00:00:02

RDI received: 0, RDI sent: 0

AIS received: 0

## Traffic statistics:

Input bytes :	520
Output bytes :	4240
Input packets:	10
Output packets:	72

## VPI 10

Flags: Active

Total down time: 0 sec, Last down: Never

## Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

## Logical interface at-0/3/1.0 (Index 78) (SNMP ifIndex 77) (Generation 20)

Flags: Point-To-Point Copy-PLP-To-CLP SNMP-Traps 0x4000

Encapsulation: ATM-SNAP

## Traffic statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

## Local statistics:

Input bytes :	0
---------------	---

```

Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Protocol inet, MTU: 4470, Generation: 38, Route table: 0
  Flags: None
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 10.0.59.5, Local: 10.0.59.6, Broadcast: Unspecified,
    Generation: 44
Protocol iso, MTU: 4470, Generation: 39, Route table: 0
  Flags: None
VCI 0.128
  Flags: Active
  Total down time: 0 sec, Last down: Never
  EPD threshold: 2129, Transmit weight cells: 10
  ATM per-VC transmit statistics:
    Tail queue packet drops: 0
  Traffic statistics:
    Input bytes : 0
    Output bytes : 0
    Input packets: 0
    Output packets: 0

Logical interface at-0/3/1.32767 (Index 79) (SNMP ifIndex 76) (Generation 21)
  Flags: Point-To-Multipoint Copy-PLP-To-CLP No-Multicast SNMP-Traps 0x4000
  Encapsulation: ATM-VCMUX
  Traffic statistics:
    Input bytes : 660
    Output bytes : 5473
    Input packets: 11
    Output packets: 83
  Local statistics:
    Input bytes : 660
    Output bytes : 5473
    Input packets: 11
    Output packets: 83
VCI 0.16
  Flags: Active, ILMI
  Total down time: 0 sec, Last down: Never
  EPD threshold: 0, Transmit weight cells: 0

```

```

ATM per-VC transmit statistics:
  Tail queue packet drops: 0
Traffic statistics:
  Input  bytes   :                0
  Output bytes   :             4320
  Input  packets :                0
  Output packets :             72
VCI 0.4
Flags: Active, OAM
OAM, Period 30 sec, Up count: 10, Down count: 10
Total down time: 0 sec, Last down: Never
EPD threshold: 2129, Transmit weight cells: 0
ATM per-VC transmit statistics:
  Tail queue packet drops: 0
Traffic statistics:
  Input  bytes   :             572
  Output bytes   :             572
  Input  packets :              11
  Output packets :             11
OAM F4 cell statistics:
Total received: 11, Total sent: 11
Loopback received: 11, Loopback sent: 11
Last received: 00:00:18, Last sent: 00:00:18
RDI received: 0, RDI sent: 0
AIS received: 0, AIS sent: 0

```