Junos® OS

ATM Interfaces Feature Guide for Routing Devices

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The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

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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 http://www.juniper.net/techpubs/.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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Supported Platforms

For the features described in this document, the following platforms are supported:

- ACX Series
- M Series
- MX Series
- T Series
- J Series

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.xsl; }
```

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 the *CLI User Guide*.

Documentation Conventions

Table 1 on page xv 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.

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the**configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`

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

<table>
<tr><th>Convention</th><th>Description</th><th>Examples</th></tr>
<tr><td>Italic text like this</td><td>• Introduces or emphasizes important new terms.
• Identifies book names.
• Identifies RFC and Internet draft titles.</td><td>• A policy term is a named structure that defines match conditions and actions.
• Junos OS System Basics Configuration Guide
• RFC 1997, BGP Communities Attribute</td></tr>
<tr><td>Italic text like this</td><td>Represents variables (options for which you substitute a value) in commands or configuration statements.</td><td>Configure the machine's domain name:

[edit]
root@# set system domain-name
  domain-name</td></tr>
<tr><td>Text like this</td><td>Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.</td><td>• To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level.
• The console port is labeled CONSOLE.</td></tr>
<tr><td>< > (angle brackets)</td><td>Enclose optional keywords or variables.</td><td>stub <default-metric <i>metric</i>>;</td></tr>
<tr><td>| (pipe symbol)</td><td>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.</td><td>broadcast | multicast

(string1 | string2 | string3)</td></tr>
<tr><td># (pound sign)</td><td>Indicates a comment specified on the same line as the configuration statement to which it applies.</td><td>rsvp { # Required for dynamic MPLS only</td></tr>
<tr><td>[ ] (square brackets)</td><td>Enclose a variable for which you can substitute one or more values.</td><td>community name members [community-ids]</td></tr>
<tr><td>Indention and braces ({ })</td><td>Identify a level in the configuration hierarchy.</td><td rowspan="2">[edit]
routing-options {
  static {
    route default {
      nexthop address;
      retain;
    }
  }
}</td></tr>
<tr><td>; (semicolon)</td><td>Identifies a leaf statement at a configuration hierarchy level.</td></tr>
<tr><td colspan="3">GUI Conventions</td></tr>
<tr><td>Bold text like this</td><td>Represents graphical user interface (GUI) items you click or select.</td><td>• In the Logical Interfaces box, select All Interfaces.
• To cancel the configuration, click Cancel.</td></tr>
<tr><td>> (bold right angle bracket)</td><td>Separates levels in a hierarchy of menu selections.</td><td>In the configuration editor hierarchy, select Protocols>Ospf.</td></tr>
</table>

Documentation Feedback

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- Document or topic name
- URL or page number
- Software release 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 J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
- Product warranties—For product warranty information, visit http://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:

- Find CSC offerings: http://www.juniper.net/customers/support/
- Search for known bugs: http://www2.juniper.net/kb/
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- Join and participate in the Juniper Networks Community Forum: http://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: http://www.juniper.net/cm/

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

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/.
- 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 http://www.juniper.net/support/requesting-support.html.

PART 1

Overview

CHAPTER 1

ATM Interfaces

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

- ATM1 Physical and Logical Configuration Statement Hierarchies on page 5
- ATM2 IQ Physical and Logical Configuration Statement Hierarchies on page 7
- Supported Features on ATM1 and ATM2 IQ Interfaces on page 9
- Configuring Communication with Directly Attached ATM Switches and Routers on page 20
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- Enabling Passive Monitoring on ATM Interfaces on page 22
- Removing MPLS Labels from Incoming Packets on page 22
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- Configuring ATM Cell-Relay Promiscuous Mode on page 25
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- Configuring Layer 2 Circuit Cell-Relay Promiscuous Mode on page 41
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- Configuring CoS Queues in Layer 2 Circuit Trunk Mode on page 44
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- Configuring the OAM F4 Cell Flows on page 48
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- Configuring a Multicast-Capable ATM1 or ATM2 IQ Connection on page 51
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- Configuring the ATM2 IQ Transmission Weight on page 61
- Defining the ATM OAM F5 Loopback Cell Period on page 62
- Configuring the ATM OAM F5 Loopback Cell Threshold on page 62

ATM1 Physical and Logical Configuration Statement Hierarchies

To configure ATM1 physical interface properties, include the **atm-options**, **e3-options**, **t3-options**, and **sonet-options** statements at the **[edit interfaces at-*fpc/pic/port*]** hierarchy level:

ATM1 Physical Configuration Hierarchy

```
[edit interfaces at-fpc/pic/port]
atm-options {
  ilmi;
  mpls {
    pop-all-labels {
      required-depth number;
    }
  }
  pic-type atm1;
  promiscuous-mode {
    vpi vpi-identifier;
  }
  vpi vpi-identifier {
    maximum-vcs maximum-vcs;
  }
}
e3-options {
  atm-encapsulation (direct | plcp);
  buildout feet;
  framing (g.751 | g.832);
  loopback (local | remote);
  (payload-scrambler | no-payload-scrambler);
  }
encapsulation (atm-ccc-cell-relay | atm-pvc | ethernet-over-atm);
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);
    }
    t3-options {
        atm-encapsulation (direct | plcp);
        buildout feet;
        (cbit-parity | no-cbit-parity);
        loopback (local | payload | remote);
        (payload-scrambler | no-payload-scrambler);
    }
```

To configure ATM1 logical interface properties, include the following statements:

ATM1 Logical Configuration Hierarchy

```
allow-any-vci;
multicast-vci vpi-identifier.vci-identifier;
oam-liveness {
    up-count cells;
    down-count cells;
}
oam-period (disable | seconds);
shaping {
    (cbr rate | vbr peak rate sustained rate burst length);
    queue-length number;
}
vci vpi-identifier.vci-identifier;
vpi vpi-identifier;
family inet {
    address address {
        multipoint-destination address {
            inverse-arp;
            oam-liveness {
                up-count cells;
                down-count cells;
            }
            oam-period (disable | seconds);
            shaping {
                (cbr rate | vbr peak rate sustained rate burst length);
```



```
            queue-length number;
          }
          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 an ATM1 Cell-Relay Circuit on page 65
- Configuring the ATM1 Queue Length on page 58
- Displaying ATM1 and ATM2 Alarms and Errors on page 348
- Configuring Inverse ATM1 or ATM2 ARP on page 51

ATM2 IQ Physical and Logical Configuration Statement Hierarchies

To configure ATM2 IQ physical interface properties, include the **atm-options** and **sonet-options** statements at the **[edit interfaces at-*fpc/pic/port*]** hierarchy level:

ATM2 IQ Physical Configuration Hierarchy

```
[edit interfaces at-fpc/pic/port]
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 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);
  }
```

```
        vpi vpi-identifier {
            oam-liveness {
                up-count;
                down-count;
            }
            oam-period (disable | seconds);
            shaping {
                (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
                    burst length);
            }
        }
    }
    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);
    }
```

To configure ATM2 IQ logical interface properties, include the following statements:

ATM2 IQ Logical Configuration Hierarchy

```
allow-any-vci;
atm-scheduler-map (map-name | default);
cell-bundle-size cells;
epd-threshold cells;
multicast-vci vpi-identifier.vci-identifier;
oam-liveness {
    up-count cells;
    down-count cells;
}
```

```
oam-period (disable | seconds);
plp-to-clp;
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst
    length);
}
transmit-weight number;
trunk-id number;
vci vpi-identifier.vci-identifier;
vpi vpi-identifier;
family inet address 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);
  }
  transmit-weight number;
  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*]

Supported Features on ATM1 and ATM2 IQ Interfaces

Table 3 on page 9 lists the supported features on ATM1 and ATM2 IQ interfaces.

Table 3: ATM1 and ATM2 IQ Supported Features

Item	ATM1	ATM2 IQ	Comments
Encapsulation and Transport Modes			
ATM Adaptation Layer 5 (AAL5) circuit cross-connect (CCC)	Supported	Supported	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. See “Configuring ATM Interface Encapsulation” on page 62.
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	Cell-relay accumulation mode is per PIC, not per port. If you configure accumulation mode, the entire ATM1 PIC uses the configured mode. See “Configuring ATM Interface Encapsulation” on page 62.

Table 3: ATM1 and ATM2 IQ Supported Features *(continued)*

Item	ATM1	ATM2 IQ	Comments
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	For promiscuous mode, you must configure the port with **atm-ccc-cell-relay** encapsulation. 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 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 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. See "Configuring ATM Cell-Relay Promiscuous Mode" on page 25.
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	
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 *maximum-vcs*) 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 "Configuring ATM Interface Encapsulation" on page 62.
Cell-relay port mode: All cells in the VCI range (0 through *maximum-vcs*) 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 "Configuring ATM Interface Encapsulation" on page 62.
Ethernet over ATM encapsulation: Allows ATM interfaces to connect to devices that support only bridged-mode protocol data units (PDUs).	Supported	Supported	See "Configuring ATM Interface Encapsulation" on page 62.

Table 3: 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	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. Layer 2 circuit cell-relay mode supports both VP- and port-promiscuous modes. See "Configuring Layer 2 Circuit Transport Mode" on page 29.
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 *Junos OS VPNs Library for Routing Devices*.
Point-to-Point Protocol (PPP) over ATM encapsulation: Associates a PPP link with an ATM AAL5 PVC.	Not supported	Supported	For ATM2 IQ interfaces, the Junos OS supports three PPP over ATM encapsulation types: • **atm-ppp-llc**—PPP over AAL5 logical link control (LLC). • **atm-ppp-vc-mux**—PPP over AAL5 multiplex. • **atm-mlppp-llc**—Multilink PPP over AAL5 LLC. Requires a Link Services or Voice Services PIC. See "Configuring PPP over ATM2 Encapsulation" on page 67.
Other ATM Attributes			
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	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. See "Configuring the ATM2 IQ EPD Threshold" on page 59 and "Configuring ATM2 IQ VC Tunnel CoS Components" on page 72.
OAM F4 cell flows: Identify and report virtual path connection (VPC) defects and failures.	Not supported	Supported	See "Configuring the OAM F4 Cell Flows" on page 48.

Table 3: ATM1 and ATM2 IQ Supported Features *(continued)*

Item	ATM1	ATM2 IQ	Comments
OAM F5 loopback cell responses	Supported	Supported	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. 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. See "Defining the ATM OAM F5 Loopback Cell Period" on page 62 and "Configuring the ATM OAM F5 Loopback Cell Threshold" on page 62.
Passive monitoring mode	Supported	Supported	See "Enabling Passive Monitoring on ATM Interfaces" on page 22.
PIC type	Supported	Supported	For ATM1 interfaces, you can include the **pic-type atm1** statement. For ATM2 IQ interfaces, you can include the **pic-type atm2** statement. See "Configuring the ATM PIC Type" on page 24.
Ping	Supported	Supported	For ATM1 and ATM2 IQ interfaces, when you issue the ATM **ping** command, you must include a logical unit number in the interface name, as shown in the following example: **ping atm interface at-1/0/0.5 vci 0.123 count 3** The logical unit number is **5** on physical interface **at-1/0/0**. See the *Junos OS Operational Mode Commands*.
Queue length: Limits the queue size in packets of a particular VC.	Supported	Not supported	See "Configuring the ATM1 Queue Length" on page 58.
Real-time variable bit rate (VBR): Supports VBR data traffic with average and peak traffic parameters.	Not supported	Supported	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. See "Configuring ATM2 IQ Real-Time VBR" on page 54.

Table 3: ATM1 and ATM2 IQ Supported Features *(continued)*

Item	ATM1	ATM2 IQ	Comments
Shaping rates: Peak and sustained rates of traffic.	Supported	Supported	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. 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). For ATM2 IQ OC48 interfaces, the rate can be from 33 Kbps through 2,170,107,168 bits per second (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: • For DS3 interfaces with direct ATM encapsulation, the maximum rate is 40,038,968 bps. • For DS3 interfaces with Physical Layer Convergence Protocol (PLCP) ATM encapsulation, the maximum rate is 36,864,000 bps. • For E3 interfaces with g.751 framing and direct ATM encapsulation, the maximum rate is 30,801,509 bps. • For E3 interfaces with g.751 framing PLCP ATM encapsulation, the maximum rate is 27,648,000 bps. • For E3 interfaces with g.832 framing, the maximum rate is 30,720,000 bps. See “Defining the ATM Traffic-Shaping Profile” on page 52.
VC tunnel CoS: Allows VCs to be opened as VC tunnels.	Not supported	Supported	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. See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 72.

Table 3: ATM1 and ATM2 IQ Supported Features *(continued)*

Item	ATM1	ATM2 IQ	Comments
VCI management	Supported	Supported	For ATM1 interfaces, you must specify the maximum number of VCIs by including the **maximum-vcs** statement in the configuration. This restricts VCIs to the range 0 through *maximum-vcs*. See “Configuring the Maximum Number of ATM1 VCs on a VP” on page 29. For ATM2 interfaces, you must not include the **maximum-vcs** 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: • Number of tunnels • Sparseness of VCI numbers (the more sparse, the fewer VCIs supported) For ATM1 and ATM2 IQ interfaces with promiscuous mode, the allowable maximum number of VCIs is 65,535.
VCI statistics	Supported	Supported	For ATM1 interfaces, multipoint VCI statistics are collected from indirect sources. For ATM2 IQ interfaces, multipoint VCI statistics are collected directly from the PIC. For ATM1 and ATM2 IQ interfaces, point-to-point VCI statistics are the same as logical interface statistics.

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 on page 37
- Example: Configuring Layer 2 Circuit Transport Mode on ATM MICs on page 38

Understanding Inverse Multiplexing for ATM

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

An IMA frame consists of ATM cells, an ICP cell, and filler cells (if required). 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.

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*

PART 2

Configuration

CHAPTER 2

ATM Interfaces

- Configuring ATM Interface Encapsulation on page 62
- Configuring an ATM1 Cell-Relay Circuit on page 65
- Configuring PPP over ATM2 Encapsulation on page 67
- Configuring E3 and T3 Parameters on ATM Interfaces on page 70
- Configuring SONET/SDH Parameters on ATM Interfaces on page 71
- Configuring ATM2 IQ VC Tunnel CoS Components on page 72
- Configuring ATM Scheduler on Ethernet VPLS over a Bridged ATM Interface on page 83
- Example: Configuring ATM1 Interfaces on page 83
- Example: Configuring ATM2 IQ Interfaces on page 85
- Example: Configuring ATM Scheduler Map on Ethernet VPLS over Bridged ATM Interfaces on page 87

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;
```

Example: Configuring Communication with Directly Attached ATM Switches and Routers

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 on page 145

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 4 on page 21.

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

Table 4: 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 29.

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 20.

Example: Enabling ILMI for Cell Relay

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;
  }
}
```

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

- atm-options on page 115
- mpls on page 153
- pop-all-labels on page 165
- required-depth on page 171

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.

Example: Configuring the ATM PIC Type

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.

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;
  }
  ...
}
```

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 24.
- 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.

Examples: Configuring ATM Cell-Relay Promiscuous Mode

This section includes the following examples:

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;
  }
}
```

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;
  }
}
```

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;
}
```

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;
        }
    }
}
```

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;
        }
    }
}
```

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 25.

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 71.

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 );
   ```

   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* and the *Junos OS Feature Guides*.

   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" on page 42.

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;
   ```

   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*]**

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 Relase 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 Routing Devices*. For a comprehensive example, see the *Junos OS Feature Guides*.

Examples: Configuring IQ Layer 2 Circuit Transport Mode

Configure Layer 2 circuit AAL5 transport mode and cell-relay transport mode.

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;
  }
}
```


Configuring Layer 2 Circuit Cell-Relay Transport Mode

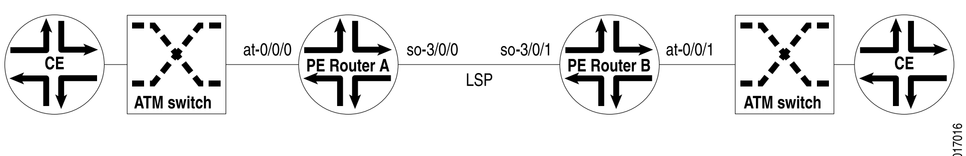
```
[edit chassis]
fpc 0 {
  pic 1 {
    atm-l2circuit-mode cell;
  }
}
[edit interfaces]
at-0/1/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    vpi 0;
  }
  unit 0 {
    encapsulation atm-ccc-cell-relay;
    point-to-point;
    vci 0.32;
  }
}
```

Configuring Layer 2 Circuit Trunk Transport Mode

In Figure 1 on page 33, 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 "Configuring ATM2 IQ VC Tunnel CoS Components" on page 72.

Figure 1: 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;
    }
  }
}
```

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 for Routing Devices*. For a comprehensive example, see the *Junos OS Feature Guides*.

Related Documentation

- Layer 2 Circuit Transport Mode on ATM MICs Overview on page 14
- Example: Configuring Layer 2 Circuit Transport Mode on ATM MICs on page 38

Example: Configuring Layer 2 Circuit Transport Mode on ATM MICs

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

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

- Configuring Layer 2 Circuit AAL5 Transport Mode on page 39
- Configuring Layer 2 Circuit Cell-Relay Transport Mode on page 40

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 9.99
```

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 on page 37

Configuring Layer 2 Circuit Cell-Relay Promiscuous Mode

By default, all incoming cells are mapped from a single virtual circuit (VC) to an external LSP. For ATM interfaces with Layer 2 circuit cell-relay transport mode and **atm-ccc-cell-relay** encapsulation, you can configure promiscuous 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 25.

Example: Configuring Layer 2 Circuit Cell-Relay Promiscuous Mode

Configure Layer 2 circuit cell-relay VP- and port-promiscuous mode:

VP-Promiscuous Mode

```
[edit interfaces]
at-0/1/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    cell-bundle-size 4;
    promiscuous-mode {
      vpi 0;
    }
  }
  unit 0 {
    encapsulation atm-ccc-cell-relay;
    point-to-point;
    vci 0.32;
  }
}
```

Port-Promiscuous Mode

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

```
}
```

Configure Layer 2 circuit cell-relay VP-promiscuous and port-promiscuous modes on ATM MICs:

VP-Promiscuous Mode

```
[edit interfaces]
at-0/1/0 {
  atm-options {
    promiscuous-mode {
      vpi 1;
    }
  }
  unit 0 {
    encapsulation atm-ccc-cell-relay;
    vpi 1;
  }
}
```

Port-Promiscuous Mode

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

Configuring Layer 2 Circuit Trunk Mode Scheduling

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 29. For general information about ATM CoS scheduling, see "Configuring ATM2 IQ VC Tunnel CoS Components" on page 72.

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**.

Example: Configuring Layer 2 Circuit Trunk Mode Scheduling

Configure two logical interfaces to use Layer 2 circuit trunk mode, ATM CoS scheduling, and proportional bandwidth sharing:

```
[edit interface]
at-1/1/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    ilmi;
    scheduler-maps {
      trunk-map {
        vc-cos-mode strict;
        forwarding-class cbr-class {
          priority high;
          transmit-weight percent 40;
          epd-threshold 100;
        }
        forwarding-class rtvbr-class {
          priority low;
          transmit-weight percent 30;
          epd-threshold 100;
        }
        forwarding-class nrtvbr-class {
          priority low;
          transmit-weight percent 20;
          epd-threshold 100;
        }
        forwarding-class ubr-class {
          priority low;
          transmit-weight percent 10;
          epd-threshold 100;
        }
      }
    }
```

```
    }
    unit 0 {
        encapsulation atm-ccc-cell-relay;
        trunk-id 1;
        trunk-bandwidth 10m;
        atm-scheduler-map trunk-map;
        family ccc {
            filter {
                output atm-trunk-01;
            }
        }
    }
    unit 1 {
        encapsulation atm-ccc-cell-relay;
        trunk-id 3;
        trunk-bandwidth 30m;
        atm-scheduler-map trunk-map;
    }
}
```

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 "Configuring ATM2 IQ VC Tunnel CoS Components" on page 72.

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 74.

For information about trunk identification numbers, see "Configuring Layer 2 Circuit Transport Mode" on page 29. For information about trunk bandwidths, see "Configuring Layer 2 Circuit Trunk Mode Scheduling" on page 42.

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" on page 42.

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 "Configuring VC CoS Mode" on page 80.

For general information about Layer 2 circuit trunk mode, see "Configuring Layer 2 Circuit Transport Mode" on page 29.

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 61.

Example: Configuring CoS Queues in Layer 2 Circuit Trunk Mode

Configure a scheduler map and trunk bandwidth:

```
[edit interfaces]
at-6/1/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    scheduler-maps {
      cos0 {
        vc-cos-mode strict;
        forwarding-class cbr-class {
          priority high;
          transmit-weight percent 10;
        }
        forwarding-class rtvbr-class {
          priority low;
          transmit-weight percent 20;
        }
        forwarding-class nrtvbr-class {
          priority low;
          transmit-weight percent 30;
        }
        forwarding-class ubr-class {
          priority low;
          transmit-weight percent 40;
        }
      }
    }
  }
  unit 0 {
    trunk-id 0;
    trunk-bandwidth 10m;
    atm-scheduler-map cos0;
  }
}
```

Configuring the Layer 2 Circuit Cell-Relay Cell Maximum

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 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 VCIs that belong to the VPI are marked down. When a VPI is marked up, all the VCIs 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 85.

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 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. VCIs 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" on page 52. For information about ATM2 IQ shaping values, see "Specifying ATM2 IQ Shaping Values" on page 57.

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 29.

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 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 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 62.

Defining the ATM Traffic-Shaping Profile

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 49.

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**. On J Series routers, ATM CBR shaping is not supported.

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 5 on page 53.

Table 5: 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 6 on page 56 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).

  actual-rate = (128 * *line-rate*) / (trunc ((128 * *line-rate*) / *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:

line-rate = 155,520,000 bps *(26/27) * (48/53) = 135,631,698.1 bps

For OC12c interfaces, the line rate is calculated as follows:

line-rate = 622,080,000 bps * (26/27) * (48/53) = 542,526,792.45 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:

actual-rate = (1 / (trunc (line-rate / desired-rate) +1)) * line-rate

For example, for OC12 interfaces, the actual rates for shaping below 4,271,864 bps are calculated as follows:

1 / 127 * 542,526,792.45 bps = 4,271,864 bps (11124 cells/second)
1 / 128 * 542,526,792.45 bps = 4,238,490 bps (11038 cells/second)
1 / 129 * 542,526,792.45 bps = 4,205,634 bps (10952 cells/second)
...

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 6 on page 56 shows ATM1 traffic-shaping rates.

Table 6: ATM1 Traffic-Shaping Rates

Interface Type	Line Rate (bps)	Line Rate (cps)	Percentage of Total Line Rate
OC3			
	135,600,000	353,125	100.00
	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
OC12			
	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 bps * 0.8 = 108,480,000 bps

  Because 108,480,000 bps is greater than 1/31 of OC3 ATM cell line rate:

  actual-rate = (128 * 135,600,000.1) / (trunc ((128 * 135,600,000.1) / 108,480,000))
  actual-rate = 17,356,800,013 / (trunc (17,356,800,013 / 108,480,000))
  actual-rate = 17,356,800,013 / 160
  actual-rate = 108,480,000 bps

- OC12c:

  271,263,396 bps * 0.8 = 217,010,716.8 bps

  Because 217,010,716.8 bps is greater than 1/127 of OC12 ATM cell line rate:

  actual-rate = (128 * 542,526,792.45) / (trunc ((128 * 542,526,792.45)/217,010,716.8))
  actual-rate = 69,443,429,434 / (trunc (69,443,429,434 / 217,010,716.8))
  actual-rate = 69,443,429,434 / 320
  actual-rate = 217,010,717 bps

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:

  actual-rate= (1 / (trunc (line-rate / desired-rate) + 1)) * line-rate
  actual-rate = (1 / (trunc (135,631,698 / 3,000,000) + 1)) * 135,631,698
  actual-rate = (1 / (45 + 1)) * 135,631,698
  actual-rate = (1 / 46) * 135,631,698
  actual-rate = 2,948,515 bps

- OC12c:

  Because 3,000,000 bps is smaller than 1/127 of OC12 ATM cell line rate:

  actual-rate = (1 / (trunc (line-rate / desired-rate) + 1)) * line-rate
  actual-rate = (1 / (trunc (542,526,792 / 3,000,000) + 1)) * 542,526,792
  actual-rate = (1 / (180 + 1)) * 542,526,792
  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.

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 / (Round Up (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 / (Round Up (4482 / 480)) = 1638 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:

(PVC queue-length in packets x MTU) / (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 x 4482) / (3,840,000 / 8) = 233 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 the ATM2 IQ EPD Threshold

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:

default epd-threshold = number of buffers * shaping rate / 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 7 on page 60.

Table 7: 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 61.

Example: Configuring the ATM2 IQ EPD Threshold

Configure the EPD threshold for a point-to-point ATM2 interface and a point-to-multipoint ATM2 interface.

On a Point-to-Point ATM2 Interface

```
[edit interfaces at-1/0/0]
unit 0 {
  vci 0.123;
  epd-threshold 1300;
  ...
}
```

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 7 on page 60.

For general information about EPD thresholds, see “Configuring the ATM2 IQ EPD Threshold” on page 59.

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 85.

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 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 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 8 on page 63 shows the logical interface encapsulation types for ATM interfaces.

Table 8: ATM Logical Interface Encapsulation Types

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

Table 8: 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 **tcc** family only.
ATM VC multiplex	When you use this encapsulation type, you can configure the **inet** family only.
ATM VC multiplex on TCC circuits	When you use this encapsulation type, you can configure the **tcc** family only.
Cell-relay accumulation mode (CAM)	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 **atm-cell-relay-accumulation** statement at the **[edit chassis fpc *slot-number* pic *pic-number*]** hierarchy level. This encapsulation type is for ATM1 interfaces only. For more information about CAM, see the *Junos OS Administration Library for Routing Devices*.
Cisco ATM NLPID	When you use this encapsulation type, you can configure the **inet** family only.
Ethernet over ATM	This encapsulation type is for interfaces that carry IPv4 traffic. When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.
Ethernet VPLS over ATM	This encapsulation type enables a VPLS instance to support bridging between Ethernet interfaces and ATM interfaces, as described in RFC 2684. Use this encapsulation type to support IEEE 802.1p classification binding on ATM VCs. This encapsulation type is for ATM2 IQ interfaces only. When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.
Multilink PPP over AAL5 LLC	This encapsulation type is for ATM2 IQ interfaces only. When you use this encapsulation type, your router must be equipped with a Link Services or Voice Services PIC.
PPP over AAL5 LLC	This encapsulation type is for ATM2 IQ interfaces only. When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.
PPP over AAL5 multiplex	This encapsulation type is for ATM2 IQ interfaces only. When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.

Configuring an ATM1 Cell-Relay Circuit

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 25.

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

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

```
[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 Nonpromiscuous 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

```
[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

```
[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 on page 112
- atm-options on page 115
- atm-encapsulation on page 114

- encapsulation (Logical Interface) on page 124
- encapsulation (Physical Interface) on page 128
- *unit*

Configuring PPP over ATM2 Encapsulation

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

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

```
[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 on page 124

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 ATM2 IQ VC Tunnel CoS Components

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 generally to all interfaces, see the *Junos OS Class of Service Library for Routing Devices*.

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. For more information, see "Enabling Eight Queues on ATM2 IQ Interfaces" on page 75.

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 *Junos OS Class of Service Library for Routing Devices*.

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.

To configure up to eight queues on the ATM2 IQ interface, you must also include the statements described in "Configuring ATM2 IQ VC Tunnel CoS Components" on page 72.

For general information about configuring up to eight forwarding classes and queues on PICs other than ATM2 IQ PICs, see the *Junos OS Class of Service Library for Routing Devices*.

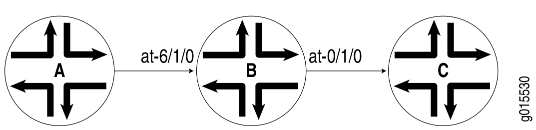
NOTE: When you are considering enabling eight queues on an ATM2 IQ interface, you should note the following:

- 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 *Junos OS Class of Service Library for Routing Devices*.

Example: Enabling Eight Queues on T Series, M120, and M320 Routers

In Figure 2 on page 76, 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 2: 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 29.

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 50 and "Defining the ATM Traffic-Shaping Profile" on page 52.

You can also apply a scheduler map to the chassis traffic that feeds the ATM interfaces. For more information, see the *Junos OS Class of Service Library for Routing Devices*.

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;
      }
    }
  }
}
```


Related Documentation

- Configuring a Point-to-Point ATM1 or ATM2 IQ Connection on page 50
- Defining the ATM Traffic-Shaping Profile on page 52
- atm-scheduler-map on page 116
- vci on page 185

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 (Physical Interface) on page 128
- Example: Configuring ATM Scheduler Map on Ethernet VPLS over Bridged ATM Interfaces on page 87

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 on page 3
- ATM1 Physical and Logical Configuration Statement Hierarchies on page 5
- Configuring the Maximum Number of ATM1 VCs on a VP on page 29
- Displaying the Status of a Specific ATM1 Interface on page 317
- Verifying the Configuration of an ATM1 Interface on page 308
- Displaying ATM1 and ATM2 Alarms and Errors on page 348

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

- ATM2 IQ Physical and Logical Configuration Statement Hierarchies on page 7
- Configuring the ATM2 IQ Transmission Weight on page 61
- Displaying the Status of a Specific ATM2 IQ Interface on page 321
- Monitoring ATM2 IQ Interfaces on page 321
- Supported Features on ATM1 and ATM2 IQ Interfaces on page 9
- Verifying the Configuration of an ATM2 IQ Interface on page 309

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 (Physical Interface) on page 128
- Configuring ATM Scheduler on Ethernet VPLS over a Bridged ATM Interface on page 83

CHAPTER 3

Network Interfaces Configuration Statements and Hierarchy

[edit interfaces] Hierarchy Level

The statements at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level can also be configured at the **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

NOTE: The *accounting-profile* statement is an exception to this rule. The **accounting-profile** statement can be configured at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level, but it cannot be configured at the **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

```
interfaces {
  traceoptions {
    file filename <files number> <match regular-expression> <size size> <world-readable |
      no-world-readable> ;
    flag flag <disable>;
  }
  interface-name {
    account-layer2-overhead (Interface Level) {
      value;
      egress bytes;
      ingress bytes;
    }
    accounting-profile name;
    aggregated-ether-options {
      (flow-control | no-flow-control);
      lacp {
        (active | passive);
        link-protection {
          disable;
        (revertive | non-revertive);
```

```
      periodic interval;
      system-priority priority;
    }
    link-protection;
    link-speed speed;
    (loopback | no-loopback);
    mc-ae{
      chassis-id chassis-id;
      mc-ae-id mc-ae-id;
      mode (active-active | active-standby);
      redundancy-group group-id;
      status-control (active | standby);
    }
    minimum-links number;
    source-address-filter {
      mac-address;
    }
    (source-filtering | no-source-filtering);
  }
  shared-scheduler;
  aggregated-sonet-options {
    link-speed speed | mixed;
    minimum-links number;
  }
  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 {
        down-count cells;
```

```
            up-count cells;
        }
        oam-period (seconds | disable);
        shaping {
            (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
                burst length);
            queue-length number;
        }
    }
}
clocking clock-source;
data-input (system | interface interface-name);
dce;
serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dsr-polarity (negative | positive);
    dte-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dtr-circuit (balanced | unbalanced);
    dtr-polarity (negative | positive);
    encoding (nrz | nrzi);
    indication-polarity (negative | positive);
    line-protocol protocol;
    loopback mode;
    rts-polarity (negative | positive);
    tm-polarity (negative | positive);
    transmit-clock invert;
}
description text;
dialer-options {
    pool pool-name <priority priority>;
}
```



```
disable;
ds0-options {
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  idle-cycle-flag (flags | ones);
  invert-data;
  loopback payload;
  start-end-flag (filler | shared);
}
e1-options {
  bert-error-rate rate;
  bert-period seconds;
  fcs (16 | 32);
  framing (g704 | g704-no-crc4 | unframed);
  idle-cycle-flag (flags | ones);
  invert-data;
  loopback (local | remote);
  start-end-flag (filler | shared);
  timeslots time-slot-range;
}
e3-options {
  atm-encapsulation (direct | plcp);
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  framing feet;
  compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
  fcs (16 | 32);
  framing (g.751 | g.832);
  idle-cycle-flag (filler | shared);
  invert-data;
  loopback (local | remote);
  (payload-scrambler | no-payload-scrambler);
  start-end-flag (filler | shared);
  (unframed | no-unframed);
}
encapsulation type;
es-options {
  backup-interface es-fpc/pic/port;
}
fastether-options {
  802.3ad aex;
  (flow-control | no-flow-control);
  ignore-l3-incompletes;
  ingress-rate-limit rate;
  (loopback | no-loopback);
  mpls {
    pop-all-labels {
      required-depth number;
    }
  }
  source-address-filter {
    mac-address;
```



```
    }
    (source-filtering | no-source-filtering);
  }
  flexible-vlan-tagging;
  gigether-options {
    802.3ad aex;
    (asynchronous-notification | no-asynchronous-notification);
    (auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
      local-interface-offline>;
    auto-reconnect seconds;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    (loopback | no-loopback);
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
    no-auto-mdix;
    source-address-filter {
      mac-address;
    }
    (source-filtering | no-source-filtering);
    ethernet-switch-profile {
      (mac-learn-enable | no-mac-learn-enable);
      tag-protocol-id [ tpids ];
      ethernet-policer-profile {
        input-priority-map {
          ieee802.1p premium [ values ];
        }
        output-priority-map {
          classifier {
            premium {
              forwarding-class class-name {
                loss-priority (high | low);
              }
            }
          }
        }
        policer cos-policer-name {
          aggregate {
            bandwidth-limit bps;
            burst-size-limit bytes;
          }
          premium {
            bandwidth-limit bps;
            burst-size-limit bytes;
          }
        }
      }
    }
  }
  (gratuitous-arp-reply | no-gratuitous-arp-reply);
  hold-time up milliseconds down milliseconds;
  ima-group-options {
    differential-delay number;
```



```
    frame-length (32 | 64 | 128 | 256);
    frame-synchronization {
        alpha number;
        beta number;
        gamma number;
    }
    minimum-links number;
    symmetry (symmetrical-config-and-operation |
        symmetrical-config-asymmetrical-operation);
    test-procedure {
        ima-test-start;
        ima-test-stop;
        interface name;
        pattern number;
        period number;
    }
    transmit-clock (common | independent);
    version (1.0 |1.1);
}
ima-link-options group-id group-id;
interface-set interface-set-name {
    interface ethernet-interface-name {
        (unit unit-number | vlan-tags-outer vlan-tag);
    }
    interface interface-name {
        (unit unit-number);
    }
}
isdn-options {
    bchannel-allocation (ascending | descending);
    calling-number number;
    pool pool-name <priority priority>;
    spid1 spid-string;
    spid2 spid-string;
    static-tei-val value;
    switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
    t310 seconds;
    tei-option (first-call | power-up);
}
keepalives <down-count number> <interval seconds> <up-count number>;
link-mode mode;
lmi {
    lmi-type (ansi | itu | c-lmi);
    n391dte number;
    n392dce number;
    n392dte number;
    n393dce number;
    n393dte number;
    t391dte seconds;
    t392dce seconds;
}
lsq-failure-options {
    no-termination-request;
    [ trigger-link-failure interface-name ];
}
mac mac-address;
```

```
mlfr-uni-nni-bundle-options {
  acknowledge-retries number;
  acknowledge-timer milliseconds;
  action-red-differential-delay (disable-tx | remove-link);
  drop-timeout milliseconds;
  fragment-threshold bytes;
  cisco-interoperability send-lip-remove-link-for-link-reject;
  hello-timer milliseconds;
  link-layer-overhead percent;
  lmi-type (ansi | itu | c-lmi);
  minimum-links number;
  mrru bytes;
  n391 number;
  n392 number;
  n393 number;
  red-differential-delay milliseconds;
  t391 seconds;
  t392 seconds;
  yellow-differential-delay milliseconds;
}
modem-options {
  dialin (console | routable);
  init-command-string initialization-command-string;
}
mtu bytes;
multi-chassis-protection {
  peer a.b.c.d {
    interfaceinterface-name;
    }
  }
multiservice-options {
  (core-dump | no-core-dump);
  (syslog | no-syslog);
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
  interface-type type;
}
no-vpivci-swapping;
optics-options {
  alarm low-light-alarm {
    (link-down | syslog);
  }
  tx-power dbm;
  warning low-light-warning {
    (link-down | syslog);
  }
  wavelength nm;
}
otn-options {
  bytes transmit-payload-type value;
  fec (efec | gfec | gfec-sdfec | none);
  (is-ma | no-is-ma);
  (laser-enable | no-laser-enable);
```

```
      (line-loopback | no-line-loopback);
      (local-loopback | no-local-loopback);
      (odu-ttim-action-enable | no-odu-ttim-action-enable);
      (otu-ttim-action-enable | no-otu-ttim-action-enable);
      odu-delay-management {
        (bypass | no-bypass);
        (monitor-end-point | no-monitor-end-point);
        (number-of-frames | no-number-of-frames);
        (start-measurement | no-start-measurement);
      }
      (prbs | no-prbs);
      preemptive-fast-reroute {
        (backward-frr-enable | no-backward-frr-enable);
        (signal-degrade-monitor-enable | no-signal-degrade-monitor-enable);
      }
      rate {
        (fixed-stuff-bytes | no-fixed-stuff-bytes);
        otu4;
        (pass-through | no-pass-through);
      }
      signal-degrade {
        ber-threshold-clear value;
        ber-threshold-signal-degrade value;
        interval value;
      }
      trigger trigger-identifier;
      tti tti-identifier;
    }
    partition partition-number oc-slice oc-slice-range interface-type type;
    timeslots time-slot-range;
    passive-monitor-mode;
    per-unit-scheduler;
    ppp-options {
      chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
      }
      compression {
        acfc;
        pfc;
      }
      dynamic-profile profile-name;
      no-termination-request;
      pap {
        access-profile name;
        local-name name;
        local-password password;
        compression;
      }
    }
    psn-vcipsn-vci-identifier;
    psn-vpipsn-vpi-identifier;
    receive-bucket {
      overflow (discard | tag);
```



```
    rate percentage;
    threshold bytes;
}
redundancy-options {
    priority sp-fpc/pic/port;
    secondary sp-fpc/pic/port;
    hot-standby;
}
satop-options {
    payload-size n;
}
schedulers number;
serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dsr-polarity (negative | positive);
    dte-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dtr-circuit (balanced | unbalanced);
    dtr-polarity (negative | positive);
    encoding (nrz | nrzi);
    indication-polarity (negative | positive);
    line-protocol protocol;
    loopback mode;
    rts-polarity (negative | positive);
    tm-polarity (negative | positive);
    transmit-clock invert;
}
services-options {
    inactivity-timeout seconds;
    open-timeout seconds;
    session-limit {
        maximum number;
```

```
      rate new-sessions-per-second;
      }
      syslog {
      host hostname {
        facility-override facility-name;
        log-prefix prefix-number;
        services priority-level;
      }
    }
  }
  shdsl-options {
    annex (annex-a | annex-b);
    line-rate line-rate;
    loopback (local | remote);
    snr-margin {
      current margin;
      snext margin;
    }
  }
  sonet-options {
    aggregate asx;
    aps {
      advertise-interval milliseconds;
      annex-b;
      authentication-key key;
      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;
    }
    bytes {
      c2 value;
      e1-quiet value;
      f1 value;
      f2 value;
      s1 value;
      z3 value;
      z4 value;
    }
    fcs (16 | 32);
    loopback (local | remote);
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
    path-trace trace-string;
    (payload-scrambler | no-payload-scrambler);
```



```
  rfc-2615;
  trigger {
    defect ignore;
    hold-time up milliseconds down milliseconds;
  }
  vtmapping (itu-t | klm);
  (z0-increment | no-z0-increment);
}
speed (10m | 100m | 1g | oc3 | oc12 | oc48);
stacked-vlan-tagging;
switch-options {
  switch-port port-number {
    (auto-negotiation | no-auto-negotiation);
    speed (10m | 100m | 1g);
    link-mode (full-duplex | half-duplex);
  }
}
t1-options {
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  buildout value;
  byte-encoding (nx56 | nx64);
  crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
  crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
  fcs (16 | 32);
  framing (esf | sf);
  idle-cycle-flag (flags | ones);
  invert-data;
  line-encoding (ami | b8zs);
  loopback (local | payload | remote);
  remote-loopback-respond;
  start-end-flag (filler | shared);
  timeslots time-slot-range;
}
t3-options {
  atm-encapsulation (direct | plcp);
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  buildout feet;
  (cbit-parity | no-cbit-parity);
  compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <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);
  (mac | no-mac);
  (payload-scrambler | no-payload-scrambler);
  start-end-flag (filler | shared);
}
traceoptions {
  flag flag <flag-modifier> <disable>;
```



```
}
transmit-bucket {
   overflow discard;
   rate percentage;
   threshold bytes;
}
(traps | no-traps);
unidirectional;
vlan-tagging;
vlan-vci-tagging;
unit logical-unit-number {
   accept-source-mac {
      mac-address mac-address {
         policer {
            input cos-policer-name;
            output cos-policer-name;
         }
      }
   }
   account-layer2-overhead {
      value;
      egress bytes;
      ingress bytes;
   }
   accounting-profile name;
   advisory-options {
      downstream-rate rate;
      upstream-rate rate;
   }
   allow-any-vci;
   atm-scheduler-map (map-name | default);
   backup-options {
      interface interface-name;
   }
   bandwidth rate;
   cell-bundle-size cells;
   clear-dont-fragment-bit;
   compression {
      rtp {
         f-max-period number;
         maximum-contexts number <force>;
         queues [ queue-numbers ];
         port {
            minimum port-number;
            maximum port-number;
         }
      }
   }
   compression-device interface-name;
   copy-tos-to-outer-ip-header;
   demux-destination family;
   demux-source family;
   demux-options {
      underlying-interface interface-name;
   }
   description text;
```



```
interface {
  l2tp-interface-id name;
  (dedicated | shared);
}
dialer-options {
  activation-delay seconds;
  callback;
  callback-wait-period time;
  deactivation-delay seconds;
  dial-string [ dial-string-numbers ];
  idle-timeout seconds;
  incoming-map {
    caller (caller-id | accept-all);
    initial-route-check seconds;
    load-interval seconds;
    load-threshold percent;
    pool pool-name;
    redial-delay time;
    watch-list {
      [ routes ];
    }
  }
}
disable;
disable-mlppp-inner-ppp-pfc;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
  activation-priority priority;
  bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
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 {
  down-count cells;
  up-count cells;
}
oam-period (seconds | disable);
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;
  vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
  chap {
    access-profile name;
    default-chap-secret name;
    local-name name;
    passive;
  }
  compression {
    acfc;
    pfc;
    pap;
    default-pap-password password;
    local-name name;
    local-password password;
    passive;
  }
  dynamic-profile profile-name;
  lcp-max-conf-req number;
  lcp-restart-timer milliseconds;
  loopback-clear-timer seconds;
  ncp-max-conf-req number;
  ncp-restart-timer milliseconds;
}
pppoe-options {
  access-concentrator name;
  auto-reconnect seconds;
  (client | server);
  service-name name;
  underlying-interface interface-name;
}
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;
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-list [vlan-id vlan-id–vlan-id];
vlan-id-range number-number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
vlan-tags-outer tpid.vlan-id inner-list [vlan-id vlan-id–vlan-id];
family family {
  accounting {
    destination-class-usage;
    source-class-usage {
      direction;
    }
  }
  access-concentrator name;
  address address {
    destination address;
  }
  bundle ml-fpc/pic/port | ls-fpc/pic/port);
  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 ];
    }
  }
  ipsec-sa sa-name;
  keep-address-and-control;
  max-sessions number;
  max-sessions-vsa-ignore;
  mtu bytes;
  multicast-only;
  negotiate-address;
  no-redirects;
  policer {
    arp policer-template-name;
```

```
    input policer-template-name;
    output policer-template-name;
}
primary;
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 {
    direction;
}
service {
    input {
        service-set service-set-name <service-filter filter-name>;
        post-service-filter filter-name;
    }
    output {
        service-set service-set-names <service-filter filter-name>;
    }
}
service-name-table table-name;
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max
    maximum-seconds>;
targeted-broadcast {
    forward-and-send-to-re;
    forward-only;
}
(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 | preferred-source-address address>;
address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
    multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
    multipoint-destination address {
        epd-threshold cells plp1 cells;
        inverse-arp;
        oam-liveness {
            up-count cells;
            down-count cells;
        }
        oam-period (seconds | disable);
        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;
            }
            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 number;
              track {
                priority-cost seconds;
                priority-hold-time interface-name {
                  bandwidth-threshold bits-per-second {
                    priority;
                  }
                  interface priority;
                }
                route ip-address/mask routing-instance instance-name priority-cost cost;
              }
              virtual-address [ addresses ];
            }
          }
        }
      }
    }
  }
```

Related Documentation

- *Junos OS Hierarchy and RFC Reference*
- *Ethernet Interfaces*
- *Junos OS Network Interfaces Library for Routing Devices*

[edit logical-systems] Hierarchy Level

The following lists the statements that can be configured at the **[edit logical-systems]** hierarchy level that are also documented in this manual. For more information about logical systems, see the *Logical Systems Feature Guide for Routing Devices*.

```
logical-systems logical-system-name {
  interfaces interface-name {
    unit logical-unit-number {
      accept-source-mac {
        mac-address mac-address {
          policer {
            input cos-policer-name;
            output cos-policer-name;
          }
        }
      }
```

```
allow-any-vci;
atm-scheduler-map (map-name | default);
bandwidth rate;
backup-options {
   interface interface-name;
}
cell-bundle-size cells;
clear-dont-fragment-bit;
compression {
   rtp {
      f-max-period number;
      port {
         minimum port-number;
         maximum port-number;
      }
      queues [ queue-numbers ];
   }
}
compression-device interface-name;
description text;
interface {
   l2tp-interface-id name;
   (dedicated | shared);
}
dialer-options {
   activation-delay seconds;
   deactivation-delay seconds;
   dial-string [ dial-string-numbers ];
   idle-timeout seconds;
   initial-route-check seconds;
   load-threshold number;
   pool pool;
   remote-name remote-callers;
   watch-list {
      [ routes ];
   }
}
disable;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
   activation-priority priority;
   bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
input-vlan-map {
   inner-tag-protocol-id;
   inner-vlan-id;
   (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
   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 (seconds | disable);
output-vlan-map {
   inner-tag-protocol-id;
   inner-vlan-id;
   (pop | pop-pop | pop-swap | push | push-push | swap | swap-swap);
   tag-protocol-id tpid;
   vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
   chap {
      access-profile name;
      default-chap-secret name;
      local-name name;
      passive;
   }
   compression {
      acfc;
      pfc;
      }
   }
   dynamic-profile profile-name;
   pap {
      default-pap-password password;
      local-name name;
      local-password password;
      passive;
   }
}
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;
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;
vlan-id number;
vlan-id-list [vlan-id vlan-id–vlan-id]
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
vlan-tags outer tpid.vlan-id inner-list [vlan-id vlan-id–vlan-id]
vpi vpi-identifier;
family family {
  accounting {
    destination-class-usage;
    source-class-usage {
      direction;
    }
  }
  bundle interface-name;
  filter {
    group filter-group-number;
    input filter-name;
    input-list {
      [ filter-names ];
    }
    output filter-name;
    output-list {
      [ filter-names ];
    }
  }
  ipsec-sa sa-name;
  keep-address-and-control;
  mtu bytes;
  multicast-only;
  no-redirects;
  policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
  }
  primary;
  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 {
  direction;
}
service {
  input {
    service-set service-set-name <service-filter filter-name>;
    post-service-filter filter-name;
  }
  output {
    service-set service-set-name <service-filter filter-name>;
  }
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
unnumbered-address interface-name destination address destination-profile
  profile-name;
address address {
  arp ip-address (mac | multicast-mac) mac-address <publish>;
  broadcast address;
  destination address;
  destination-profile name;
  eui-64;
  multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
  multipoint-destination address {
    epd-threshold cells plp1 cells;
    inverse-arp;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (seconds | disable);
    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;
  }
  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 number;
    track {
      priority-cost seconds;
      priority-hold-time interface-name {
        interface priority;
```

```
                    bandwidth-threshold bits-per-second {
                        priority;
                    }
                }
                route ip-address/mask routing-instance instance-name priority-cost cost;
            }
        }
        virtual-address [ addresses ];
        }
      }
    }
  }
}
```

Related Documentation

- *Junos OS Hierarchy and RFC Reference*
- *Ethernet Interfaces*
- *Junos OS Network Interfaces Library for Routing Devices*

CHAPTER 4

Statement Summary

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 Access 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 on page 65

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 statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Automatic Protection Switching and Multiplex Section Protection Overview*

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 on page 70
- **encapsulation (Physical Interface) on page 128**

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 Access Routers.

Description Configure ATM-specific physical interface properties.

The statements are explained separately.

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
- *Interface Encapsulations Overview*
- multipoint-destination on page 155
- shaping on page 175
- vci on page 185

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
- Configuring ATM2 IQ VC Tunnel CoS Components on page 72
- scheduler-maps on page 174

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 *Junos OS High Availability Library for Routing Devices*.

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 on page 70

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*
- *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 on page 70
- *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 on page 52
- rtvbr on page 173
- shaping on page 175
- vbr on page 183

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.

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 on page 46

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 on page 62

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 statements are explained separately.

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*
- atm-options on page 115

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);

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*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers (**vlan-ccc** and **vlan-tcc** options only).
Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers. Only the **atm-ccc-cell-relay** and **atm-ccc-vc-mux** options are supported on ACX Series routers.

Description Configure a logical link-layer encapsulation type.

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 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.

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. J Series routers do not support frame-relay-ppp encapsulation.

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—For underlying Ethernet interfaces on J Series routers, use PPP over Ethernet encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, configure the interface address on the PPP interface. You also 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—(J Series routers and 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.

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 Switching Cross-Connects Using CCC*
- *Configuring the Encapsulation for Layer 2 Switching TCCs*
- *Configuring Interface Encapsulation on Logical Interfaces*
- *Configuring MPLS LSP Tunnel Cross-Connects Using CCC*
- *Circuit and Translational Cross-Connects Overview*
- *Identifying the Access Concentrator*
- Configuring ATM Interface Encapsulation on page 62
- *Configuring VLAN Encapsulation*
- *Configuring Extended VLAN Encapsulation*
- *Configuring ISDN Logical Interface Properties*
- *Configuring ATM-to-Ethernet Interworking*
- *Configuring Interface Encapsulation on PTX Series Packet Transport Routers*
- *Configuring CCC Encapsulation for Layer 2 VPNs*
- *Configuring TCC Encapsulation for Layer 2 VPNs and Layer 2 Circuits*
- *Configuring ATM for Subscriber Access*
- *Junos OS Services Interfaces Library for Routing Devices*
- *CoS on ATM IMA Pseudowire Interfaces Overview*
- *Configuring Policing on an ATM IMA Pseudowire*

encapsulation (Physical Interface)

Syntax 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);

Hierarchy Level [edit interfaces *interface-name*],
[edit interfaces rlsq *number*:*number*]

Release Information Statement introduced before Junos OS Release 7.4.
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 Specify the physical link-layer encapsulation type. Not all encapsulation types are supported on the switches. See the switch CLI.

Default **ppp**—Use serial PPP encapsulation.

Options **atm-ccc-cell-relay**—Use ATM cell-relay encapsulation.

atm-pvc—Use ATM PVC encapsulation.

cisco-hdlc—Use Cisco-compatible High-Level Data Link Control (HDLC) framing.

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-ccc—Use Ethernet CCC encapsulation on Ethernet interfaces that must accept packets carrying standard Tag Protocol ID (TPID) values. For 8-port, 12-port, and 48-port Fast Ethernet PICs, CCC is not supported.

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.

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. 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), 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.

frame-relay-ccc—Use Frame Relay encapsulation on CCC circuits.

frame-relay-ether-type—Use Frame Relay ether type encapsulation for compatibility with the Cisco Frame Relay.

frame-relay-ether-type-tcc—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect different media.

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. When you use this encapsulation type, you can configure the **ccc** family only.

frame-relay-tcc—Use Frame Relay encapsulation on TCC circuits to connect different media.

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.

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-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.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *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 on page 62
- *Configuring ATM-to-Ethernet Interworking*
- *Configuring VLAN Encapsulation*
- *Configuring 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 an MPLS-Based Layer 2 VPN (CLI Procedure)*
- *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*
- *Understanding Encapsulation on an Interface*

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 on page 59
- Configuring Two EPD Thresholds per Queue on page 61

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 on page 74
- linear-red-profile on page 147

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 ...
  }
  bridge-domain-type (bvlan | svlan);
  bundle interface-name;
  core-facing;
  demux-destination {
    destination-prefix;
  }
  demux-source {
    source-prefix;
  }
  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;
  isid-list all-service-groups;
  keep-address-and-control;
  mac-validate (loose | strict);
  max-sessions number;
  max-sessions-vsa-ignore;
  mtu bytes;
  multicast-only;
  negotiate-address;
  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>;
(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 dlci-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-addressipv6-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-vsa-ignore** introduced in Junos OS Release 11.4.

Description Configure protocol family information for the logical interface.

NOTE: Not all subordinate stanzas 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.

- **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
- **inet**—Internet Protocol version 4 suite
- **inet6**—Internet Protocol version 6 suite
- **iso**—International Organization for Standardization Open Systems Interconnection (ISO OSI) protocol suite
- **mlfr-end-to-end**—Multilink Frame Relay FRF.15
- **mlfr-uni-nni**—Multilink Frame Relay FRF.16
- **multilink-ppp**—Multilink Point-to-Point Protocol
- **mpls**—Multiprotocol Label Switching (MPLS)
- **pppoe**—Point-to-Point Protocol over Ethernet
- **tcc**—Translational cross-connect protocol suite
- **tnp**—Trivial Network Protocol
- **vpls**—(M Series and T Series routers only) Virtual private LAN service

The remaining statements are 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 the Protocol Family*
- *Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX Series Routers*
- *Junos OS Services Interfaces Library for Routing Devices*

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 and EX Series switches) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.

NOTE:

- 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 on page 170

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 statements are 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 ATM2 IQ VC Tunnel CoS Components on page 72
- *Configuring Scheduler Maps on 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 Access 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 on page 70
- *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

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72
- low-plp-max-threshold on page 150
- low-plp-threshold on page 151
- queue-depth on page 168

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

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72
- high-plp-max-threshold on page 142
- low-plp-max-threshold on page 150
- low-plp-threshold on page 151
- queue-depth on page 168

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 on page 111

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)*

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 on page 20
- **show ilmi** **on page 198**
- *show ilmi statistics*

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 on page 51
- *Configuring Inverse Frame Relay ARP*

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 on page 74
- linear-red-profiles on page 148
- *Configuring Scheduler Maps on 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 statements are 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 ATM2 IQ VC Tunnel CoS Components on page 72
- *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 Access 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. *N*xDS0 IQ interfaces do not support local loopback.

payload—For channelized T3, T1, and *N*xDS0 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. *N*xDS0 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

- Configuring E3 and T3 Parameters on ATM Interfaces on page 70
- *Configuring E1 Loopback Capability*
- *Configuring E3 Loopback Capability*
- *Configuring SONET/SDH Loopback Capability*
- *Configuring SHDSL Operating Mode on an ATM Physical Interface*
- *Configuring T1 Loopback Capability*
- *Configuring T3 Loopback Capability*
- *feac-loop-respond*

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

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72
- **high-plp-max-threshold on page 142**
- **low-plp-threshold on page 151**
- *Configuring Linear RED Profiles on ATM Interfaces*
- *high-plp-max-threshold*
- **queue-depth on page 168**

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

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72
- high-plp-max-threshold on page 142
- high-plp-threshold on page 142

- *Configuring Linear RED Profiles on ATM Interfaces*
- *high-plp-max-threshold*
- *high-plp-threshold*

- low-plp-max-threshold on page 150
- queue-depth on page 168

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 on page 29
- **multipoint-destination on page 155**
- **promiscuous-mode on page 167**
- **vci on page 185**

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* gigether-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.

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 on page 22
- *Removing MPLS Labels from Incoming Packet*
- *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 on page 51
- **multipoint-destination on page 155**
- **vci on page 185**

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 0xFFFFFF (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.

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 on page 50
- *Configuring a Point-to-Multipoint Frame Relay Connection*
- *dlci*
- encapsulation (Logical Interface) on page 124

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 on page 62

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

- Defining the ATM OAM F5 Loopback Cell Period on page 62

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 on page 188

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 Feature 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 on page 22
- *Passive Monitoring on Ethernet Interfaces Overview*
- *Enabling Passive 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 on page 70
- *Configuring E3 HDLC Payload Scrambling*
- *Configuring SONET/SDH HDLC Payload Scrambling*
- *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 on page 24

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 cellsFor 1-port OC48 interfaces, 1 through 425,984 cellsFor 2-port OC3, DS3, and E3 interfaces, 1 through 212,992 cellsFor 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 on page 61
- Configuring an ATM Scheduler Map on page 74
- **linear-red-profile on page 147**

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 on page 81
- *Copying the PLP Setting 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* gigether-options mpls]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Access 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.

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.

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 on page 22
- *Removing MPLS Labels from Incoming Packet*
- *Junos OS Services Interfaces Library for Routing Devices*

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

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72

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 Access 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 on page 25
- **vpi (ATM CCC Cell-Relay Promiscuous Mode) on page 186**

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 on page 188

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

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72
- *Configuring Linear RED Profiles on ATM Interfaces*
- high-plp-threshold on page 142
- low-plp-threshold on page 151

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 on page 58

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 on page 22
- *Enabling Passive 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 on page 22
- *Enabling Passive 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 on page 140

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* gigether-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 Access 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 on page 22
- *Removing MPLS Labels from Incoming Packets*
- *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 SONET/SDH RFC 2615 Support*

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

- Configuring ATM2 IQ Real-Time VBR on page 54
- Configuring ATM2 IQ Real-Time VBR on page 54

- *Applying Scheduler Maps to Logical ATM Interfaces*

- cbr on page 120
- vbr on page 183

scheduler-maps

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 interfaces *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.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72
- atm-scheduler-map on page 116

- *Junos OS Class of Service Library for Routing Devices*

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 statements are explained separately.

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 on page 49
- Defining the ATM Traffic-Shaping Profile on page 52
- *Configuring ATM QoS or Shaping*
- *Applying Scheduler Maps to Logical ATM Interfaces*

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 statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *T3 Interfaces Overview*

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

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72

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 on page 61

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
- **rfi-l**—Line remote failure indication
- **rfi-p**—Path remote failure indication
- **uneq-p**—Path unequipped

The remaining statements are 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 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 on page 42

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 on page 29

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 on page 29

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 on page 62

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
- Configuring ATM CBR on page 53
- *Applying Scheduler Maps to Logical ATM Interfaces*

- cbr on page 120
- rtvbr on page 173
- shaping on page 175

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

- Configuring ATM2 IQ VC Tunnel CoS Components on page 72

- *Configuring Scheduler Maps on 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 Access 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 on page 50
- *Applying Scheduler Maps to Logical ATM Interfaces*
- multipoint-destination on page 155
- promiscuous-mode on page 167
- vpi (ATM CCC Cell-Relay Promiscuous Mode) on page 186

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 Access routers.

Description For ATM interfaces, allow all VCIs 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 on page 25

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.

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 on page 29
- multipoint-destination on page 155
- promiscuous-mode on page 167
- vci on page 185

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 Access 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*
- Configuring ATM Cell-Relay Promiscuous Mode on page 25

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 on page 168

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.

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*
- *sonet-options*

PART 3

Administration

CHAPTER 5

Monitoring Commands

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 194

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 196
show class-of-service forwarding-class forwarding-class-map-name on page 197

Output Fields Table 9 on page 196 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 9: show class-of-service forwarding-class Output Fields

Field Name	Field Description
Forwarding class map	Classification of a packet affecting the forwarding, scheduling, and marking policies applied as the packet transits the router.
ID	Forwarding class identifier.
Queue	Queue corresponding to the forwarding class name.
Restricted Queue	(T Series platforms only) Forwarding class restricted queue number. The queue number assigned if the PIC is restricted to four queues.
Fabric Priority	(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 198
show ilmi interface on page 198

Output Fields

Table 10 on page 198 lists the output fields for the **show ilmi** command. Output fields are listed in the approximate order in which they appear.

Table 10: 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 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 214
show interfaces extensive (ATM IMA Group) on page 215
show interfaces (ATM1, SONET Mode) on page 216
show interfaces brief (ATM1, SONET Mode) on page 217
show interfaces detail (ATM1, SONET Mode) on page 217
show interfaces extensive (ATM1, SONET Mode) on page 218
show interfaces (ATM2, SDH Mode) on page 220
show interfaces brief (ATM2, SDH Mode) on page 221
show interfaces detail (ATM2, SDH Mode) on page 222
show interfaces extensive (ATM2, SDH Mode) on page 223
show interfaces (ATM2, SONET Mode) on page 226
show interfaces brief (ATM2, SONET Mode) on page 227
show interfaces detail (ATM2, SONET Mode) on page 228
show interfaces extensive (ATM2, SONET Mode) on page 230

Output Fields

Table 11 on page 199 lists the output fields for the **show interfaces** (ATM) command. Output fields are listed in the approximate order in which they appear.

Table 11: ATM show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under *Common Output Fields Description*.	All levels
Description	Configured interface description.	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP index number for the physical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Link-level type	Encapsulation being used on the physical interface: • **ATM-CCC-CELL-RELAY**—ATM cell relay for CCC. • **ATM-CCC-VC-MUX**—ATM virtual circuit (VC) for CCC. • **ATM-CISCO-NLPID**—Cisco-compatible ATM NLPID encapsulation. • **ATM-MIPP-LLC**—ATM MLPPP over ATM Adaptation Layer 5 (AAL5)/logical link control (LLC). • **ATM-NLPID**—ATM NLPID encapsulation. • **ATM-PPP-LLC**—ATM PPP over AAL5/LLC. • **ATM-PPP-VC-MUX**—ATM PPP over raw AAL5. • **ATM-PVC**—ATM permanent virtual circuits. • **ATM-SNAP**—ATM LLC/SNAP encapsulation. • **ATM-TCC-SNAP**—ATM LLC/SNAP for translational cross-connection. • **ATM-TCC-VC-MUX**—ATM VC for translational cross-connection. • **ATM-VC-MUX**—ATM VC multiplexing. • **ETHER-OVER-ATM-LLC**—Ethernet over ATM (LLC/SNAP) encapsulation. • **ETHER-VPLS-OVER-ATM-LLC**—Ethernet VPLS over ATM (bridging) encapsulation.	All levels
MTU	MTU size on the physical interface.	All levels
Clocking	Reference clock source: **Internal** or **External**.	All levels
***framing* Mode**	Framing mode: **SONET** or **SDH**.	All levels
Speed	Speed at which the interface is running as represented by the interface type (for example, **OC3**, **ADSL2+**, and **SHDSL(2-wire)**.	All levels
Loopback	Whether loopback is enabled and the type of loopback (**local** or **remote**).	All levels
Payload scrambler	Whether payload scrambling is enabled.	All levels
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under *Common Output Fields Description*.	All levels

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Link flags	Information about the link. Possible values are described in the "Link Flags" section under *Common Output Fields Description*.	All levels
CoS queues	Number of CoS queues configured.	**detail extensive** none
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	**detail extensive**
Current address	Ethernet MAC address for this interface for Ethernet over ATM encapsulation.	**detail extensive** none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is **Last flapped:** ***year-month-day hour:minute:second timezone*** **(*hour:minute:second* ago)**. For example, **Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)**.	**detail extensive** none
Input Rate	Input rate in bits per second (bps) and packets per second (pps).	None specified
Output Rate	Output rate in bps and pps.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**
Traffic statistics	Statistics for traffic on the interface. • **Input bytes**—Number of bytes received on the interface • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface • **Output packets**—Number of packets transmitted on the interface.	**detail extensive**
Input errors	Input errors on the interface whose definitions are as follows: • **Errors**—Sum of the incoming frame aborts and frame check sequence (FCS) errors. • **Drops**—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. • **Invalid VCs**—Number of cells that arrived for a nonexistent VC. • **Framing errors**—Sum of AAL5 packets that have FCS errors, reassembly timeout errors, and length errors. • **Policed discards**—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. • **L3 incompletes**—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. • **L2 channel errors**—Number of times the software did not find a valid logical interface for an incoming frame. • **L2 mismatch timeouts**—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • **Resource errors**—Sum of transmit drops.	**extensive**

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Output errors	Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Carrier transitions**—Number of times the interface has gone from **down** to **up**. 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. • **Errors**—Sum of the outgoing frame aborts and FCS errors. • **Drops**—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. • **Aged packets**—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. • **MTU errors**—Number of packets larger than the MTU threshold. • **Resource errors**—Sum of transmit drops.	**extensive**
Egress queues	Total number of egress queues supported on the specified interface.	**detail extensive**
Queue counters	CoS queue number and its associated user-configured forwarding class name. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism. NOTE: Physical interface queue counters of ATM2 PICs displayed by the **show interfaces at-*fpc/pic/port* detail** 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.	**detail extensive**
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: **SONET PHY**, **SONET section**, **SONET line**, and **SONET path**.	**detail extensive** none

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
SONET PHY	Counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **PLL Lock**—Phase-locked loop • **PHY Light**—Loss of optical signal	**extensive**
SONET section	Counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **BIP-B1**—Bit interleaved parity for SONET section overhead • **SEF**—Severely errored framing • **LOL**—Loss of light • **LOF**—Loss of frame • **ES-S**—Errored seconds (section) • **SES-S**—Severely errored seconds (section) • **SEFS-S**—Severely errored framing seconds (section)	**extensive**
SONET line	Active alarms and defects, plus counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **BIP-B2**—Bit interleaved parity for SONET line overhead • **REI-L**—Remote error indication (near-end line) • **RDI-L**—Remote defect indication (near-end line) • **AIS-L**—Alarm indication signal (near-end line) • **BERR-SF**—Bit error rate fault signal failure • **BERR-SD**—Bit error rate defect signal degradation • **ES-L**—Errored seconds (near-end line) • **SES-L**—Severely errored seconds (near-end line) • **UAS-L**—Unavailable seconds (near-end line) • **ES-LFE**—Errored seconds (far-end line) • **SES-LFE**—Severely errored seconds (far-end line) • **UAS-LFE**—Unavailable seconds (far-end line)	**extensive**

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
SONET path	Active alarms and defects, plus counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **BIP-B3**—Bit interleaved parity for SONET section overhead • **REI-P**—Remote error indication • **LOP-P**—Loss of pointer (path) • **AIS-P**—Path alarm indication signal • **RDI-P**—Path remote defect indication • **UNEQ-P**—Path unequipped • **PLM-P**—Path payload (signal) label mismatch • **ES-P**—Errored seconds (near-end STS path) • **SES-P**—Severely errored seconds (near-end STS path) • **UAS-P**—Unavailable seconds (near-end STS path) • **ES-PFE**—Errored seconds (far-end STS path) • **SES-PFE**—Severely errored seconds (far-end STS path) • **UAS-PFE**—Unavailable seconds (far-end STS path)	**extensive**
Received SONET overhead **Transmitted SONET overhead**	Values of the received and transmitted SONET overhead: • **C2**—Signal label. Allocated to identify the construction and content of the STS-level SPE and for PDI-P. • **F1**—Section user channel byte. This byte is set aside for the purposes of users. • **K1** and **K2**—These bytes are allocated for APS signaling for the protection of the multiplex section. • **J0**—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. • **S1**—Synchronization status. The S1 byte is located in the first STS-1 of an STS-*N*. • **Z3** and **Z4**—Allocated for future use.	**extensive**
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: **SDH PHY**, **SDH regenerator section**, **SDH multiplex section**, and **SDH path**.	All levels

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
SDH PHY	Active alarms and defects, plus counts of specific SDH errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **PLL Lock**—Phase-locked loop • **PHY Light**—Loss of optical signal	**extensive**
SDH regenerator section	Active alarms and defects, plus counts of specific SDH errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **RS-BIP8**—24-bit BIP for multiplex section overhead (B2 bytes) • **OOF**—Out of frame • **LOS**—Loss of signal • **LOF**—Loss of frame • **RS-ES**—Errored seconds (near-end regenerator section) • **RS-SES**—Severely errored seconds (near-end regenerator section) • **RS-SEFS**—Severely errored framing seconds (regenerator section)	**extensive**
SDH multiplex section	Active alarms and defects, plus counts of specific SDH errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **MS-BIP24**—8-bit BIP for high-order path overhead (B3 byte) • **MS-FEBE**—Far-end block error (multiplex section) • **MS-FERF**—Far-end remote fail (multiplex section) • **MS-AIS**—Alarm indication signal (multiplex section) • **BERR-SF**—Bit error rate fault (signal failure) • **BERR-SD**—Bit error rate defect (signal degradation) • **MS-ES**—Errored seconds (near-end multiplex section) • **MS-SES**—Severely errored seconds (near-end multiplex section) • **MS-UAS**—Unavailable seconds (near-end multiplex section) • **MS-ES-FE**—Errored seconds (far-end multiplex section) • **MS-SES-FE**—Severely errored seconds (far-end multiplex section) • **MS-UAS-FE**—Unavailable seconds (far-end multiplex section)	**extensive**

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
SDH path	Active alarms and defects, plus counts of specific SDH errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **HP-BIP8**—8-bit BIP for regenerator section overhead (B1 byte) • **HP-FEBE**—Far-end block error (high-order path) • **HP-LOP**—Loss of pointer (high-order path) • **HP-AIS**—High-order-path alarm indication signal • **HP-FERF**—Far-end remote fail (high-order path) • **HP-UNEQ**—Unequipped (high-order path) • **HP-PLM**—Payload label mismatch (high-order path) • **HP-ES**—Errored seconds (near-end high-order path) • **HP-SES**—Severely errored seconds (near-end high-order path) • **HP-UAS**—Unavailable seconds (near-end high-order path) • **HP-ES-FE**—Errored seconds (far-end high-order path) • **HP-SES-FE**—Severely errored seconds (far-end high-order path) • **HP-UAS-FE**—Unavailable seconds (far-end high-order path)	**extensive**
Received SDH overhead **Transmitted SDH overhead**	Values of the received and transmitted SONET overhead: • **C2**—Signal label. This byte is allocated to identify the construction and content of the STS-level SPE and for PDI-P. • **F1**—Section user channel byte. This byte is set aside for the purposes of users. • **K1** and **K2**—These bytes are allocated for APS signaling for the protection of the multiplex section. • **J0**—Section trace. This byte is defined for STS-1 number 1 of an STS-*N* signal. This bye 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. • **S1**—Synchronization status. The S1 byte is located in the first STS-1 of an STS-*N*. • **Z3** and **Z4**—These bytes are allocated for future use.	**extensive**
Received path trace **Transmitted path trace**	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.	**extensive**

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
ATM Status	ATM state information: • **HCS State**—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. • **LOC**—Current loss of cell (LOC) delineation state. **OK** means that no LOC is currently asserted.	**extensive**

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
ATM Statistics	ATM statistics for the interface: • **Uncorrectable HCS errors**—Number of cells dropped because the cell delineation failed. These errors most likely indicate that a SONET/SDH layer problem has occurred. • **Correctable HCS errors**—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 **present** to **sync** (for example, when a cable is plugged into the interface). The following error statistics are from the framer: • **Tx cell FIFO overruns**—Number of overruns in the transmit FIFO. • **Rx cell FIFO overruns**—Number of overruns in the receive FIFO. • **Rx cell FIFO underruns**—Number of underruns in the receive FIFO. • **Input cell count**—Number of ATM cells received by the interface (not including idle cells). • **Output cell count**—Number of ATM cells transmitted by the interface (including idle cells). • **Output idle cell count**—Number of idle cells sent by the port. When ATM has nothing to send, it sends idle cells to fill the time slot. • **Output VC queue drops**—Number of packets dropped by a port on the PIC. Packets are dropped because of queue limits on the VCs. The following error statistics are from the SAR: • **Input no buffers**—Number of AAL5 packets dropped because no channel blocks or buffers were available to handle them. • **Input length errors**—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. • **Input timeouts**—Number of AAL5 packets dropped because of a reassembly timeout. • **Input invalid VCs**—Number of AAL5 packets dropped because the header was unrecognized (because the VC was not correct or not configured). • **Input bad CRCs**—Number of AAL5 packets dropped because of frame check sequence errors. • **Input OAM cell no buffers**—Number of received OAM cells or raw cells dropped because no buffers were available to handle them. • **L2 circuit out-of-sequence packets**—(Layer 2 AAL5 mode) Number of AAL5 packets that are out of sequential order. • **Denied packets count**—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.	**extensive**
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number.	**extensive**

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
CoS information	Information about the CoS queue for the physical interface. • **CoS transmit queue**—Queue number and its associated user-configured forwarding class name. • **Bandwidth %**—Percentage of bandwidth allocated to the queue. • **Bandwidth bps**—Bandwidth allocated to the queue (in bps). • **Buffer %**—Percentage of buffer space allocated to the queue. • **Buffer usec**—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. • **Priority**—Queue priority: **low** or **high**. • **Limit**—Displayed if rate limiting is configured for the queue. Possible values are **none** and **exact**. If **exact** is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If **none** is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.	**extensive**

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output

VPI	(ATM2) Virtual path identifier information:
	• **Flags**—VPI flags can be one or more of the following:
	  ◦ **Active** (virtual path is up)
	  ◦ **OAM** (operation and maintenance is enabled)
	  ◦ **Shaping** (shaping is configured)
	• **CBR, Peak**
	• **OAM, Period**—Interval at which OAM F4 loopback cells are sent.
	• **Up count**—Number of F4 OAM cells required to consider the virtual path up; the range is **1** through **255**.
	• **Down count**—Number of F4 OAM cells required to consider the virtual path down; the range is **1** through **255**.
	• **Total down time**—Total number of seconds the VPI has been down since it was opened, using the format **Total down time:** ***hh:mm:ss*** or **Never.**
	• **Last down**—Time of last **Down** transition, using the format **Last down:** ***hh:mm:ss*** **ago** or **Never**.
	• **OAM F4 cell statistics**—(Nonpromiscuous mode) OAM F4 statistics:
	  ◦ **Total received**—Number of OAM F4 cells received.
	  ◦ **Total sent**—Number of OAM F4 cells sent.
	  ◦ **Loopback received**—Number of OAM F4 loopback cells received.
	  ◦ **Loopback sent**—Number of OAM F4 loopback cells sent.
	  ◦ **Last received**—Time at which the last OAM F4 cell was received.
	  ◦ **Last sent**—Time at which the last OAM F4 cell was sent.
	  ◦ **RDI received**—Number of OAM F4 cells received with the remote defect indication bit set.
	  ◦ **RDI sent**—Number of OAM F4 cells sent with the RDI bit set.
	  ◦ **AIS received**—Number of OAM F4 cells received with the alarm indication signal bit set.
	  ◦ **AIS sent**—Number of OAM F4 cells sent with the AIS bit set.
	Traffic statistics:
	• **Input bytes**—Number of bytes received on the VPI.
	• **Output bytes**—Number of bytes transmitted on the VPI.
	• **Input packets**—Number of packets received on the VPI.
	• **Output packets**—Number of packets transmitted on the VPI.
		detail extensive none

Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	Logical interface SNMP interface index number.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Flags	Information about the logical interface. Possible values are described in the “Logical Interface Flags” section under *Common Output Fields Description*.	All levels
Input packets	Number of packets received on the logical interface.	None specified
Output packets	Number of packets transmitted on the logical interface.	None specified
Encapsulation	Encapsulation on the logical interface.	All levels
Traffic statistics	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.	**detail extensive**
Local statistics	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.	**detail extensive**
Transit statistics	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.	**detail extensive**
Input packets	Number of packets received on the logical interface.	None specified
Output packets	Number of packets transmitted on the logical interface.	None specified
protocol-family	Protocol family configured on the logical interface. If the protocol is **inet**, the IP address of the interface is also displayed.	**brief**
Protocol	Protocol family configured on the logical interface.	**detail extensive** none
MTU	MTU size on the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Route table	Routing table in which the logical interface address is located. For example, **0** refers to the routing table inet.0.	**detail extensive**
Flags	Information about the protocol family flags. Possible values are described in the “Family Flags” section under *Common Output Fields Description*.	**detail extensive** none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under *Common Output Fields Description*.	**detail extensive** none
Destination	IP address of the remote side of the connection.	**detail extensive** none
Local	IP address of the logical interface.	**detail extensive** none

Table 11: ATM show interfaces Output Fields *(continued)*

<table>
<tr><th>Field Name</th><th>Field Description</th><th>Level of Output</th></tr>
<tr><td>Broadcast</td><td>Broadcast address.</td><td>detail extensive none</td></tr>
<tr><td>Generation</td><td>Unique number for use by Juniper Networks technical support only.</td><td>detail extensive</td></tr>
<tr><td>VCI</td><td>Virtual circuit identifier number and information:

Flags—VCI flags:

Active—VCI is up and in working condition.
CCC down—VCI CCC is not in working condition.
Closed—VCI is closed because the user disabled the logical or physical interface from the CLI.
Configured—VCI is configured.
Down—VCI is not in working condition. The VCI might have alarms, defects, F5 AIS/RDI, or no response to OAM loopback cells.
ILMI—VCI is up and in working condition.
OAM—OAM loopback is enabled.
Multicast—VCI is a multicast VCI or DLCI.
Multipoint destination—VCI is configured as a multipoint destination.
None—No VCI flags.
Passive-OAM—Passive OAM is enabled.
Shaping—Shaping is enabled.
Sustained—Shaping rate is set to Sustained.
Unconfigured—VCI is not configured.

Total down time—Total number of seconds the VCI has been down, using the format Total down time: hh:mm:ss orNever.
Last down—Time of last Down transition, using the format Last down: hh:mm:ss.
EPD threshold—(ATM2 only) Threshold at which a packet is dropped when the queue size (in number of cells) exceeds the early packet-discard (EPD) value.
</td><td>All levels</td></tr>
</table>

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output

VCI (continued)	• **Transmit weight cells**—(ATM2 only) Amount of bandwidth assigned to this queue.
	• **ATM per-VC transmit statistics**:
	  ◦ **Tail queue packet drops**—Number of packets dropped because of bandwidth constraints. This value indicates that packets are queued to send out at a rate faster than allowed.
	• **OAM F4 cell statistics**—(Nonpromiscuous mode) OAM F4 statistics:
	  ◦ **Total received**—Number of OAM F4 cells received.
	  ◦ **Total sent**—Number of OAM F4 cells sent.
	  ◦ **Loopback received**—Number of OAM F4 loopback cells received.
	  ◦ **Loopback sent**—Number of OAM F4 loopback cells sent.
	  ◦ **Last received**—Time at which the last OAM F4 cell was received.
	  ◦ **Last sent**—Time at which the last OAM F4 cell was sent.
	  ◦ **RDI received**—Number of OAM F4 cells received with the remote defect indication bit set.
	  ◦ **RDI sent**—Number of OAM F4 cells sent with the RDI bit set.
	  ◦ **AIS received**—Number of OAM F4 cells received with the alarm indication signal bit set.
	  ◦ **AIS sent**—Number of OAM F4 cells sent with the AIS bit set.
	• **Traffic statistics**—Number and rate of bytes and packets received and transmitted on the physical interface.
	  ◦ **Input bytes**—Number of bytes received on the interface.
	  ◦ **Output bytes**—Number of bytes transmitted on the interface.
	  ◦ **Input packets**—Number of packets received on the interface
	  ◦ **Output packets**—Number of packets transmitted on the interface.
		All levels

IMA group properties	• **Version**—The specified IMA specification version, either IMA 1.0 or IMA 1.1.
	• **Frame length**—The specified frame size, which can be 32, 64, 128, or 256.
	• **Differential delay**—Maximum differential delay among links in milliseconds.
	• **Symmetry**—Either Common Transmit Clock or Independent Transmit Clock timing mode.
	• **Transmit clock**—The specified IMA clock mode, either common or independent.
	• **Minimum links**—The number of minimum active links specified in both transmit and receive directions.
	  ◦ **Transmit**—The per-PIC limit on the number of minimum active links in the transmit direction.
	  ◦ **Receive**—The per-PIC limit on the number of minimum active links in the receive direction.
	• **Frame synchronization**—The specified IMA frame synchronization state transition variables (Alpha, Beta, and Gamma) and their specified values.
	  ◦ **Alpha**—The number of consecutive invalid ICP cells for IFSM.
	  ◦ **Beta**—The number of consecutive errored ICP cells for IFSM.
	  ◦ **Gamma**—The number of consecutive valid ICP cells for IFSM.
	• **Links**—The number of IMA links assigned to the IMA group.
		detail extensive none

Table 11: ATM show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
IMA group alarms	• **Start-up-FE**—Far-end group alarm status • **Config-Aborted**—Near-end configuration aborted group alarm status • **Config-Aborted-FE**—Far-end configuration aborted group alarm status • **Insufficient-Links**—Near-end insufficient links group alarm status • **Insufficient-Links-FE**—Far-end insufficient links group alarm status • **Blocked-FE**—Far-end blocked group alarm status • **GR-Timing-Mismatch**—Group timing mismatch alarm status	**detail extensive** none
IMA group defects	• **Start-up-FE**—Far-end group defect status • **Config-Aborted**—Near-end configuration aborted group defect status • **Config-Aborted-FE**—Far-end configuration aborted group defect status • **Insufficient-Links**—Near-end insufficient links group defect status • **Insufficient-Links-FE**—Far-end insufficient links group defect status • **Blocked-FE**—Far-end blocked group defect status • **GR-Timing-Mismatch**—Group timing mismatch defect status	**detail extensive** none
IMA Group state	Near-end and far-end group status	**detail extensive** none
IMA group media	IMA group media status, including seconds, count and state for the following media parameters: • **FC** • **FC-FE** • **Addr-Mismatch** • **Running** • **UAS**	**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: 84:18:88:c0:33:0a
   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: 00:05:85:02:38:7e
  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: 00:05:85:02:38:7e
  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: 00:05:85:02:38:7e
  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: 00:05:85:8f:30:3f
  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: 00:05:85:8f:30:3f
  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: 00:05:85:8f:30:3f
  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: 00:14:f6:22:58:5e
  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: 00:14:f6:22:58:5e
  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: 00:14:f6:22:58:5e
  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
```


show interfaces (ATM-over-ADSL)

Syntax

show interfaces at-*pim/0/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Release Information Command introduced before Junos OS Release 7.4.

Description (J Series routers) Display status information about the specified ATM-over-asynchronous DSL (ADSL) interface.

Options

at-*pim/0/port*—Display standard information about the specified ADSL 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-over-ADSL) on page 236
show interfaces brief (ATM-over-ADSL) on page 236
show interfaces detail (ATM-over-ADSL) on page 237
show interfaces extensive (ATM-over-ADSL) on page 239

Output Fields Table 12 on page 234 lists only output fields that are specific to the **show interfaces** (ATM-over-ADSL) command. For information about all other output fields, see Table 92 under the show interfaces (ATM) command.

Table 12: ATM-over-ADSL show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
ADSL alarms	Number and type of ADSL alarms. See “ADSL media” for details.	**detail extensive** none
ADSL defects	Number and type of ADSL defects. See “ADSL media” for details.	**detail extensive** none

Table 12: ATM-over-ADSL show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
ADSL status	Operational information for ATM-over-ADSL interfaces. • **Modem status**—Status of the modem: **Down**, **Training**, or **Showtime**. • **DSL mode**—Configured line type of the digital subscriber line: **adsl2plus**, **ansi-dmt**, **auto**, **itu-dmt**, or **itu-dmt-bis**. • **Last fail code**—Reason for failure: **ATU-C not detected**, **incompatible line condition**, **protocol error**, **message error**, **spurious ATU detected**, **forced silence**, **unselectable operation mode**, or **none.** • **Subfunction**—Specified analog front-end chip and discrete front. • **Seconds in showtime**—Number of seconds the ADSL connection is in showtime.	**detail extensive** none
ADSL media	Information about ADSL media-specific defects that can prevent the interface from passing packets. The following information is displayed for each defect: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. A state other than **OK** indicates a problem. The possible defects are as follows: • **LOF**—Loss of frame. • **LOS**—Loss of signal. • **LOM**—Loss of multiframe. • **LOP**—Loss of pointer. • **LOCDI**—Loss of cell delineation for an interleaved channel. • **LOCDNI**—Loss of cell delineation for a noninterleaved channel.	**extensive**
ADSL Statistics	Information about the ADSL terminal unit-remote (ATU-R) at the far end of the connection and the ADSL terminal unit-central office (ATU-C) at the near end: • **Attenuation (dB)**—Attenuation in decibels. • **Capacity used (%)**—Percentage of capacity used. • **Noise margin (dB)**—Maximum extraneous signal allowed without causing the output to deviate from an allowable level, in decibels. • **Output power (dBm)**—Amount of power used by the ATM-over-ADSL interface. • **Bit rate (kbps)**—Speed of data transfer on the ATM-over-ADSL interface, in kilobits per second. • **CRC**—Number of cyclic redundancy check errors. • **FEC**—Number of forward error corrections. • **HEC**—Number of header error checksums. • **Received cells**—Number of cells received through the interface. • **Transmitted cells**—Number of cells sent through the interface.	**detail extensive**

Sample Output

show interfaces (ATM-over-ADSL)

```
user@host> show interfaces at-5/0/0
Physical interface: at-5/0/0, Enabled, Physical link is Down
  Interface index: 149, SNMP ifIndex: 68
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, ADSL mode,
  Speed: ADSL2+, Loopback: None
  Device flags   : Present Running Down
  Link flags     : None
  CoS queues     : 8 supported, 8 in use
  Current address: 00:05:85:c3:85:84
  Last flapped   : 2005-12-19 15:36:02 PST (12w0d 18:33 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL status:
    Modem status  : Training
    DSL mode      : Adsl2plus   Annex A
    Last fail code: ATU-C not detected
    Subfunction   : 0x00
    Seconds in showtime : 0

Logical interface at-5/0/0.0 (Index 70) (SNMP ifIndex 71)
    Flags: Device-Down Point-To-Multipoint SNMP-Traps 0x4000
    Encapsulation: Ether-over-ATM-LLC
  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 1500
      Flags: None
    VCI 0.128
      Flags: Active, Multicast
      Total down time: 0 sec, Last down: Never
      Input packets : 0
      Output packets: 0

Logical interface at-5/0/0.32767 (Index 71) (SNMP ifIndex 70)
    Flags: Device-Down 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
      Input packets : 0
      Output packets: 0
```

show interfaces brief (ATM-over-ADSL)

```
user@host> show interfaces at-5/0/0 brief
Physical interface: at-5/0/0, Enabled, Physical link is Down
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, ADSL mode,
  Speed: ADSL2+, Loopback: None
  Device flags   : Present Running Down
  Link flags     : None
  Logical interface at-5/0/0.0
    Flags: Device-Down Point-To-Multipoint SNMP-Traps 0x4000
    Encapsulation: Ether-over-ATM-LLC
    inet
```

```
    VCI 0.128
      Flags: Active, Multicast
      Total down time: 0 sec, Last down: Never

  Logical interface at-5/0/0.32767
    Flags: Device-Down Point-To-Multipoint No-Multicast SNMP-Traps 0x4000
    Encapsulation: ATM-VCMUX
    VCI 0.4
      Flags: Active
      Total down time: 0 sec, Last down: Never
```

show interfaces detail (ATM-over-ADSL)

```
user@host> show interfaces at-5/0/0 detail
Physical interface: at-5/0/0, Enabled, Physical link is Down
  Interface index: 149, SNMP ifIndex: 68, Generation: 30
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, ADSL mode,
  Speed: ADSL2+, Loopback: None
  Device flags   : Present Running Down
  Link flags     : None
  CoS queues     : 8 supported, 8 in use
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:c3:85:84
  Last flapped   : 2005-12-19 15:36:02 PST (12w0d 18:33 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
  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

    4 be-class                       0                    0                    0

    5 ef-class                       0                    0                    0

    6 af-class                       0                    0                    0

  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL status:
    Modem status  : Training
    DSL mode      : Adsl2plus   Annex A
    Last fail code: ATU-C not detected
    Subfunction   : 0x00
    Seconds in showtime : 0
  ADSL Statistics:                        ATU-R                 ATU-C
    Attenuation (dB)        :               0.0                   0.0
    Capacity used (%)       :                 0                     0
    Noise margin (dB)       :               0.0                   0.0
    Output power (dBm)      :               0.0                   0.0

                                  Interleave       Fast  Interleave       Fast
```

```
    Bit rate (kbps)   :                   0          0           0          0
    CRC               :                   0          0           0          0
    FEC               :                   0          0           0          0
    HEC               :                   0          0           0          0
    Received cells    :                   0          0
    Transmitted cells :                   0          0

Logical interface at-5/0/0.0 (Index 70) (SNMP ifIndex 71) (Generation 8)
    Flags: Device-Down Point-To-Multipoint SNMP-Traps 0x4000
    Encapsulation: Ether-over-ATM-LLC
    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: 1500, Generation: 12, Route table: 0
      Flags: None
    VCI 0.128
      Flags: Active, Multicast
      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-5/0/0.32767 (Index 71) (SNMP ifIndex 70) (Generation 9)
    Flags: Device-Down 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
      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 (ATM-over-ADSL)

```
user@host> show interfaces at-5/0/0 extensive
Physical interface: at-5/0/0, Enabled, Physical link is Down
  Interface index: 149, SNMP ifIndex: 68, Generation: 30
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, ADSL mode,
  Speed: ADSL2+, Loopback: None
  Device flags   : Present Running Down
  Link flags     : None
  CoS queues     : 8 supported, 8 in use
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:c3:85:84
  Last flapped   : 2005-12-19 15:36:02 PST (12w0d 18:34 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: 0, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
    Resource errors: 0
  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

    4 be-class                       0                    0                    0

    5 ef-class                       0                    0                    0

    6 af-class                       0                    0                    0

  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL media:            Seconds        Count  State
    LOF                        0            0  OK
    LOS                        0            0  OK
    LOM                        0            0  OK
    LOP                        0            0  OK
    LOCDI                      0            0  OK
    LOCDNI                     0            0  OK
  ADSL status:
    Modem status   : Training
    DSL mode       : Adsl2plus   Annex A
    Last fail code: ATU-C not detected
    Subfunction    : 0x00
    Seconds in showtime : 0
  ADSL Statistics:                        ATU-R                 ATU-C
```



```
    Attenuation (dB)        :             0.0                   0.0
    Capacity used (%)       :               0                     0
    Noise margin (dB)       :             0.0                   0.0
    Output power (dBm)      :             0.0                   0.0

                               Interleave       Fast  Interleave       Fast
    Bit rate (kbps)   :                 0          0           0          0
    CRC               :                 0          0           0          0
    FEC               :                 0          0           0          0
    HEC               :                 0          0           0          0
    Received cells    :                 0          0
    Transmitted cells :                 0          0
  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: 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: 5
  CoS information:
    CoS transmit queue       Bandwidth           Buffer    Priority   Limit
                        %          bps     %       usec
    0 best-effort      95      7600000    95          0         low    none
    3 network-control   5       400000     5          0         low    none

Logical interface at-5/0/0.0 (Index 70) (SNMP ifIndex 71) (Generation 8)
    Flags: Device-Down Point-To-Multipoint SNMP-Traps 0x4000
    Encapsulation: Ether-over-ATM-LLC
    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: 1500, Generation: 12, Route table: 0
      Flags: None
    VCI 0.128
      Flags: Active, Multicast
      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-5/0/0.32767 (Index 71) (SNMP ifIndex 70) (Generation 9)
```



```
Flags: Device-Down 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
  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 (ATM-over-SHDSL)

Syntax

show interfaces at-*pim/0/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced before Junos OS Release 7.4.

Description

(J Series routers) Display status information about the specified ATM-over-symmetric high-speed DSL (SHDSL) interface.

Options

at-*pim/0/port*—Display standard information about the specified SHDSL 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-over-SHDSL) on page 244
show interfaces brief (ATM-over-SHDSL) on page 245
show interfaces detail (ATM-over-SHDSL) on page 245
show interfaces extensive (ATM-over-SHDSL) on page 247

Output Fields

Table 13 on page 243 lists only output fields that are specific to the **show interfaces** (ATM-over-SHDSL) command. For information about all other output fields, see Table 92 under the show interfaces (ATM) command.

Table 13: ATM-over-SHDSL show interfaces Output Fields

Field Name	Field Description	Level of Output
SHDSL alarms	Number and type of SHDSL alarms. See "SHDSL media" for details.	**detail extensive** none
SHDSL defects	Number and type of SHDSL defects. See "SHDSL media" for details.	**detail extensive** none
SHDSL media	Information about the SHDSL media-specific defects that can prevent the interface from passing packets. The following information is displayed for each defect: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. A state other than **OK** indicates a problem. The possible defects are as follows: • **LOSD**—Loss of signal was detected at the remote application interface. • **LOSW**—Loss of sync word. A message ID was sent. • **ES**—Errored seconds. One or more cyclic redundancy check (CRC) anomalies were detected. • **SES**—Severely errored seconds. At least 50 CRC anomalies were detected. • **UAS**—Unavailable seconds. An interval occurred during which one or more LOSW defects were detected.	**extensive**
SHDSL status	Operational information for ATM-over-SHDSL interfaces. • **Line termination**—SHDLS transceiver unit- remote (STU-R) (Only customer premises equipment is supported.) • **Annex**—Either Annex A or Annex B. Annex A is supported in North America, and Annex B is supported in Europe. • **Line mode**—SHDSL mode configured on the G.SHDLS Physical Interface Module (PIM), either 2-wire or 4-wire. • **Modem status**—Data. • **Bit rate (kbps)**—Speed of data transfer on the ATM-over-G.SHDSL interface, in kilobits per second. • **Last fail mode**—Code for the last interface failure. • **Framer mode**—Framer mode of the underlying interface: ATM. • **Dying gasp**—Ability of a J Series router that has lost power to send a message informing the attached DSL access multiplexer (DSLAM) that it is about to go offline: **Enabled** or **Disabled**. • **Framer sync status**—Framer synchronization status: **In sync** or **Out of sync (OOS)**. • **Chipset version**—Version number of the chipset on the interface. • **Firmware version**—Version number of the firmware on the interface.	**detail extensive** none

Table 13: ATM-over-SHDSL show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
SHDSL statistics	• **Loop Attentuation (dB)**—Attenuation in decibels. • **Transmit power (dBm)**—Power of the transmitting interface. • **Receiver gain (db)**—Power increase of the receiving interface, in decibels. • **SNR sampling (dB)**—Signal-to-noise ratio at a receiver point, in decibels. • **CRC errors**—Number of cyclic redundancy check errors. • **SEGA errors**—Number of segment anomaly errors. A regenerator operating on a segment received corrupted data. • **LOSW errors**—Number of loss of signal defect errors. Three or more consecutively received frames contained one or more errors in the framing bits. • **Received cells**—Number of cells received through the interface. • **Transmitted cells**—Number of cells sent through the interface. • **HEC errors**—Number of header error checksum errors. • **Cell Drop**—Number of dropped cells on the interface.	**detail extensive**

Sample Output

show interfaces (ATM-over-SHDSL)

```
user@host> show interfaces at-4/0/0
Physical interface: at-4/0/0, Enabled, Physical link is Down
  Interface index: 141, SNMP ifIndex: 41
  Link-level type: Ethernet-over-ATM, MTU: 4482, Clocking: Internal,
  Speed: SHDSL(2-wire), Loopback: None
  Device flags   : Present Running Down
  Link flags     : None
  CoS queues     : 8 supported, 8 in use
  Current address: 00:05:85:c2:44:60
  Last flapped   : 2006-03-21 15:07:11 PST (2w0d 00:59 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  SHDSL alarms   : LOSD
  SHDSL defects  : LOSD
  SHDSL status:
    Line  termination       : STU-R
    Annex                   : Unknown
    Line mode               : 2-wire
    Modem status            : Training
    Bit rate (kbps)         : 0
    Last fail mode          : No failure (0x00)
    Framer mode             : ATM
    Dying gasp              : Enabled
    Framer sync status      : Out of sync
    Chipset version         : 00
    Firmware version        : R3.0.1

  Logical interface at-4/0/0.0 (Index 68) (SNMP ifIndex 44)
    Flags: Device-Down Point-To-Point SNMP-Traps 0x4000
    Encapsulation: Ether-over-ATM-LLC
  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 1500
```



```
      Flags: None
    VCI 0.128
      Flags: Active
      Total down time: 0 sec, Last down: Never
      Input packets : 0
      Output packets: 0
  Logical interface at-4/0/0.32767 (Index 69) (SNMP ifIndex 43)
    Flags: Device-Down 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
      Input packets : 0
      Output packets: 0
```

show interfaces brief (ATM-over-SHDSL)

```
user@host> show interfaces at-4/0/0 brief
Physical interface: at-4/0/0, Enabled, Physical link is Down
  Link-level type: Ethernet-over-ATM, MTU: 4482, Clocking: Internal,
  Speed: SHDSL(2-wire), Loopback: None
  Device flags   : Present Running Down
  Link flags     : None

  Logical interface at-4/0/0.0
    Flags: Device-Down Point-To-Point SNMP-Traps 0x4000
    Encapsulation: Ether-over-ATM-LLC
    inet
    VCI 0.128
      Flags: Active
      Total down time: 0 sec, Last down: Never

  Logical interface at-4/0/0.32767
    Flags: Device-Down Point-To-Multipoint No-Multicast SNMP-Traps 0x4000
    Encapsulation: ATM-VCMUX
    VCI 0.4
      Flags: Active
      Total down time: 0 sec, Last down: Never
```

show interfaces detail (ATM-over-SHDSL)

```
user@host> show interfaces at-4/0/0 detail
Physical interface: at-4/0/0, Enabled, Physical link is Down
  Interface index: 141, SNMP ifIndex: 41, Generation: 22
  Link-level type: Ethernet-over-ATM, MTU: 4482, Clocking: Internal,
  Speed: SHDSL(2-wire), Loopback: None
  Device flags   : Present Running Down
  Link flags     : None
  CoS queues     : 8 supported, 8 in use
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:c2:44:60
  Last flapped   : 2006-03-21 15:07:11 PST (2w0d 01:00 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
  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

SHDSL alarms   : LOSD
SHDSL defects  : LOSD
SHDSL status:
  Line  termination      : STU-R
  Annex                  : Unknown
  Line mode              : 2-wire
  Modem status           : Training
  Bit rate (kbps)        : 0
  Last fail mode         : No failure (0x00)
  Framer mode            : ATM
  Dying gasp             : Enabled
  Framer sync status     : Out of sync
  Chipset version        : 00
  Firmware version       : R3.0.1
SHDSL statistics:
  Loop attenuation (dB)  : 2.3
  Transmit power (dBm)   : 0.0
  Receiver gain (dB)     : 20.412
  CRC errors             : 0
  SEGA errors            : 0
  LOSW errors            : 0
  Received cells         : 0
  Transmitted cells      : 0
  HEC errors             : 0
  Cell drop              : 0

Logical interface at-4/0/0.0 (Index 68) (SNMP ifIndex 44) (Generation 8)
  Flags: Device-Down Point-To-Point SNMP-Traps 0x4000
  Encapsulation: Ether-over-ATM-LLC
  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: 1500, Generation: 11, 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

  Logical interface at-4/0/0.32767 (Index 69) (SNMP ifIndex 43) (Generation 9)
    Flags: Device-Down 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
      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 (ATM-over-SHDSL)

```
user@host> show interfaces at-4/0/0 extensive
Physical interface: at-4/0/0, Enabled, Physical link is Down
  Interface index: 141, SNMP ifIndex: 41, Generation: 22
  Link-level type: Ethernet-over-ATM, MTU: 4482, Clocking: Internal,
  Speed: SHDSL(2-wire), Loopback: None
  Device flags   : Present Running Down
  Link flags     : None
  CoS queues     : 8 supported, 8 in use
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:c2:44:60
  Last flapped   : 2006-03-21 15:07:11 PST (2w0d 01:02 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: 0, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,

    Resource errors: 0
  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

SHDSL alarms   : LOSD
SHDSL defects  : LOSD
SHDSL media:            Seconds        Count  State
  LOSD                1228405            1  Defect Active
  LOSW                      0            0  OK
  ES                        0
  SES                       0
  UAS                 1228402
SHDSL status:
  Line  termination      : STU-R
  Annex                  : Unknown
  Line mode              : 2-wire
  Modem status           : Training
  Bit rate (kbps)        : 0
  Last fail mode         : No failure (0x00)
  Framer mode            : ATM
  Dying gasp             : Enabled
  Framer sync status     : Out of sync
  Chipset version        : 00
  Firmware version       : R3.0.1
SHDSL statistics:
  Loop attenuation (dB)  : 2.3
  Transmit power (dBm)   : 0.0
  Receiver gain (dB)     : 20.412
  CRC errors             : 0
  SEGA errors            : 0
  LOSW errors            : 0
  Received cells         : 0
  Transmitted cells      : 0
  HEC errors             : 0
  Cell drop              : 0
Packet Forwarding Engine configuration:
  Destination slot: 4
CoS information:
  CoS transmit queue           Bandwidth          Buffer   Priority   Limit
                         %           bps     %     usec
  0 best-effort         95       2196400    95       0         low    none
  3 network-control      5        115600     5       0         low    none

Logical interface at-4/0/0.0 (Index 68) (SNMP ifIndex 44) (Generation 8)
  Flags: Device-Down Point-To-Point SNMP-Traps 0x4000
  Encapsulation: Ether-over-ATM-LLC
  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: 1500, Generation: 11, 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

Logical interface at-4/0/0.32767 (Index 69) (SNMP ifIndex 43) (Generation 9)
  Flags: Device-Down 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
    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 queue

Syntax

show interfaces queue
<aggregate | remaining-traffic>
<both-ingress-egress>
<egress>
<forwarding-class *forwarding-class*>
<ingress>
<interface-name *interface-name*>
<l2-statistics>

Release Information

Command introduced before Junos OS Release 7.4.
both-ingress-egress, **egress**, and **ingress** options introduced in Junos OS Release 7.6.
Command introduced in Junos OS Release 11.1 for the QFX Series.
l2-statistics option introduced in Junos OS Release 12.1.

Description

Display class-of-service (CoS) queue information for physical interfaces.

Options

none—Show detailed CoS queue statistics for all physical interfaces.

aggregate—(Optional) Display the aggregated queuing statistics of all logical interfaces that have traffic-control profiles configured. (Not on the QFX Series.)

both-ingress-egress—(Optional) On Gigabit Ethernet Intelligent Queuing 2 (IQ2) PICs, display both ingress and egress queue statistics. (Not on the QFX Series.)

egress—(Optional) Display egress queue statistics.

forwarding-class *forwarding-class*—(Optional) Forwarding class name for this queue. Shows detailed CoS statistics for the queue associated with the specified forwarding class.

ingress—(Optional) On Gigabit Ethernet IQ2 PICs, display ingress queue statistics. (Not on the QFX Series.)

interface-name *interface-name*—(Optional) Show detailed CoS queue statistics for the specified interface.

l2-statistics—(Optional) Display Layer 2 statistics for MLPPP, FRF.15, and FRF.16 bundles

remaining-traffic—(Optional) Display the remaining-traffic queue statistics of all logical interfaces that have traffic-control profiles configured.

Overhead for Layer 2 Statistics

Transmitted packets and transmitted byte counts are displayed for the Layer 2 level with the addition of encapsulation overheads applied for fragmentation, as shown in Table 14 on page 251. Others counters, such as packets and bytes queued (input) and drop counters, are displayed at the Layer 3 level. In the case of link fragmentation and interleaving (LFI) for which fragmentation is not applied, corresponding Layer 2 overheads are added, as shown in Table 14 on page 251.

Table 14: Layer 2 Overhead, Transmitted Packets/Bytes

Protocol	Fragmentation		LFI
	First fragmentation	Second to n fragmentations	
	Bytes	Bytes	
MLPPP (Long)	13	12	8
MLPPP (short)	11	10	8
MLFR (FRF15)	12	10	8
MFR (FRF16)	10	8	-
MCMLPPP(Long)	13	12	-
MCMLPPP(Short)	11	10	-

Layer 2 Statistics - Fragmentation Overhead Calculation

```
MLPPP/MC-MLPPP Overhead details:
   ===============================
   Fragment 1:

    Outer PPP header                           : 4 bytes
    Long or short sequence MLPPP header        : 4 bytes or 2 bytes
    Inner PPP header                           : 1 byte
    HDLC flag and FCS bytes                    : 4 bytes

   Fragments 2 .. n :

    Outer PPP header                           : 4 bytes
    Long or short sequence MLPPP header        : 4 bytes or 2 bytes
    HDLC flag and FCS bytes                    : 4 bytes


   MLFR (FRF15) Overhead details:
   =============================
   Fragment 1:
       Framerelay header     :  2 bytes
       Control,NLPID         :  2 bytes
       Fragmentaion header   :  2 bytes
       Inner proto           :  2 bytes
       HDLC flag and  FCS    :  4 bytes

   Fragments 2 ...n :

       Framerelay header     :  2 bytes
       Control,NLPID         :  2 bytes
       Fragmentaion header   :  2 bytes
       HDLC flag and  FCS    :  4 bytes


   MFR (FRF16) Overhead details:
   ==============================
```



```
   Fragment 1:
      Fragmentaion header   :  2 bytes
      Framerelay header     :  2 bytes
      Inner proto           :  2 bytes
      HDLC flag and  FCS    :  4 bytes

   Fragments 2 ...n :
      Fragmentaion header   :  2 bytes
      Framerelay header     :  2 bytes
      HDLC flag and  FCS    :  4 bytes
```

Overhead with LFI

```
MLPPP(Long & short sequence):
   ============================
       Outer PPP header      :  4 bytes
       HDLC flag and  FCS    :  4 bytes

  MLFR (FRF15):
  =============
       Framerelay header     :  2 bytes
       Control,NLPID         :  2 bytes
       HDLC flag and  FCS    :  4 bytes
```

The following examples show overhead for different cases:

- A 1000-byte packet is sent to a mlppp bundle without any fragmentation. At the Layer 2 level, bytes transmitted is 1013 in 1 packet. This overhead is for MLPPP long sequence encap.
- A 1000-byte packet is sent to a mlppp bundle with a fragment threshold of 250byte. At the Layer 2 level, bytes transmitted is 1061 bytes in 5 packets.
- A 1000-byte LFI packet is sent to an mlppp bundle. At the Layer 2 level, bytes transmitted is 1008 in 1 packet.

remaining-traffic—(Optional) Display the queuing statistics of all logical interfaces that do not have traffic-control profiles configured. (Not on the QFX Series.)

Additional Information

For rate-limited interfaces hosted on Modular Interface Cards (MICs) or Modular Port Concentrators (MPCs), rate-limit packet-drop operations occur *before* packets are queued for transmission scheduling. For such interfaces, the statistics for queued traffic do not include the packets that have already been dropped due to rate limiting, and consequently the displayed statistics for queued traffic are the same as the displayed statistics for transmitted traffic.

NOTE: For rate-limited interfaces hosted on other types of hardware, rate-limit packet-drop operations occur *after* packets are queued for transmission scheduling. For these other interface types, the statistics for queued traffic include the packets that are later dropped due to rate limiting, and consequently the displayed statistics for queued traffic equals the sum of the statistics for transmitted and rate-limited traffic.

On M Series routers (except for the M320 and M120 routers), this command is valid only for a PIC installed on an enhanced Flexible PIC Concentrator (FPC).

Queue statistics for aggregated interfaces are supported on the M Series and T Series routers only. Statistics for an aggregated interface are the summation of the queue statistics of the child links of that aggregated interface. You can view the statistics for a child interface by using the **show interfaces statistics** command for that child interface.

When you configure tricolor marking on a 10-port 1-Gigabit Ethernet PIC, for queues 6 and 7 only, the output does not display the number of queued bytes and packets, or the number of bytes and packets dropped because of RED. If you do not configure tricolor marking on the interface, these statistics are available for all queues.

For the 4-port Channelized OC12 IQE PIC and 1-port Channelized OC48 IQE PIC, the **Packet Forwarding Engine Chassis Queues** field represents traffic bound for a particular physical interface on the PIC. For all other PICs, the **Packet Forwarding Engine Chassis Queues** field represents the total traffic bound for the PIC.

For Gigabit Ethernet IQ2 PICs, the **show interfaces queue** command output does not display the number of tail-dropped packets. This limitation does not apply to Packet Forwarding Engine chassis queues.

When fragmentation occurs on the egress interface, the first set of packet counters shows the postfragmentation values. The second set of packet counters (under the **Packet Forwarding Engine Chassis Queues** field) shows the prefragmentation values.

The behavior of the **egress** queues for the **Routing Engine-Generated Traffic** is not same as the configured queue for MLPPP and MFR configurations.

For information about how to configure CoS, see the *Junos OS Network Interfaces Library for Routing Devices*. For related CoS operational mode commands, see the *Junos OS Operational Mode Commands*.

Required Privilege Level view

List of Sample Output

show interfaces queue (Rate-Limited Interface on a Gigabit Ethernet MIC in an MPC) on page 258
show interfaces queue (Aggregated Ethernet on a T320 Router) on page 259
show interfaces queue (Fast Ethernet on a J4300 Router) on page 261
show interfaces queue (Gigabit Ethernet on a T640 Router) on page 261
show interfaces queue aggregate (Gigabit Ethernet Enhanced DPC) on page 262
show interfaces queue (Gigabit Ethernet IQ2 PIC) on page 266
show interfaces queue both-ingress-egress (Gigabit Ethernet IQ2 PIC) on page 269
show interfaces queue ingress (Gigabit Ethernet IQ2 PIC) on page 271
show interfaces queue egress (Gigabit Ethernet IQ2 PIC) on page 272
show interfaces queue remaining-traffic (Gigabit Ethernet Enhanced DPC) on page 273
show interfaces queue (Channelized OC12 IQE Type 3 PIC in SONET Mode) on page 276
show interfaces queue (QFX Series) on page 286
show interfaces queue l2-statistics (lsq interface) on page 287

Output Fields Table 15 on page 254 lists the output fields for the **show interfaces queue** command. Output fields are listed in the approximate order in which they appear.

Table 15: show interfaces queue Output Fields

Field Name	Field Description
Physical interface	Name of the physical interface.
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under *Common Output Fields Description*.
Interface index	Physical interface's index number, which reflects its initialization sequence.
SNMP ifIndex	SNMP index number for the interface.
Forwarding classes supported	Total number of forwarding classes supported on the specified interface.
Forwarding classes in use	Total number of forwarding classes in use on the specified interface.
Ingress queues supported	On Gigabit Ethernet IQ2 PICs only, total number of ingress queues supported on the specified interface.
Ingress queues in use	On Gigabit Ethernet IQ2 PICs only, total number of ingress queues in use on the specified interface.
Output queues supported	Total number of output queues supported on the specified interface.
Output queues in use	Total number of output queues in use on the specified interface.
Egress queues supported	Total number of egress queues supported on the specified interface.
Egress queues in use	Total number of egress queues in use on the specified interface.
Queue counters (Ingress)	CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.
Burst size	(Logical interfaces on IQ PICs only) Maximum number of bytes up to which the logical interface can burst. The burst size is based on the shaping rate applied to the interface.
The following output fields are applicable to both interface component and Packet Forwarding component in the **show interfaces queue** command:	
Queue	Queue number.
Forwarding classes	Forwarding class name.

Table 15: show interfaces queue Output Fields *(continued)*

Field Name	Field Description
Queued Packets	Number of packets queued to this queue. NOTE: For Gigabit Ethernet IQ2 interfaces, the Queued Packets count is calculated by the Junos OS interpreting one frame buffer as one packet. If the queued packets are very large or very small, the calculation might not be completely accurate for transit traffic. The count is completely accurate for traffic terminated on the router. For rate-limited interfaces hosted on MICs or MPCs only, this statistic does not include traffic dropped due to rate limiting. For more information, see "Additional Information" on page 252.
Queued Bytes	Number of bytes queued to this queue. The byte counts vary by interface hardware. For more information, see Table 16 on page 257. For rate-limited interfaces hosted on MICs or MPCs only, this statistic does not include traffic dropped due to rate limiting. For more information, see "Additional Information" on page 252.
Transmitted Packets	Number of packets transmitted by this queue. When fragmentation occurs on the egress interface, the first set of packet counters shows the postfragmentation values. The second set of packet counters (displayed under the **Packet Forwarding Engine Chassis Queues** field) shows the prefragmentation values. NOTE: For Layer 2 statistics, see "Overhead for Layer 2 Statistics" on page 250
Transmitted Bytes	Number of bytes transmitted by this queue. The byte counts vary by interface hardware. For more information, see Table 16 on page 257. NOTE: On MX Series routers, this number can be inaccurate when you issue the command for a physical interface repeatedly and in quick succession, because the statistics for the child nodes are collected infrequently. Wait ten seconds between successive iterations to avoid this situation. NOTE: For Layer 2 statistics, see "Overhead for Layer 2 Statistics" on page 250
Tail-dropped packets	Number of packets dropped because of tail drop.
RL-dropped packets	Number of packets dropped due to rate limiting. For rate-limited interfaces hosted on MICs or MPCs only, this statistic is not included in the queued traffic statistics. For more information, see "Additional Information" on page 252.
RL-dropped bytes	Number of bytes dropped due to rate limiting. For rate-limited interfaces hosted on MICs or MPCs only, this statistic is not included in the queued traffic statistics. For more information, see "Additional Information" on page 252.

Table 15: show interfaces queue Output Fields *(continued)*

Field Name	Field Description

RED-dropped packets	Number of packets dropped because of random early detection (RED).
	• (M Series and T Series routers only) On M320 and M120 routers and the T Series routers, the total number of dropped packets is displayed. On all other M Series routers, the output classifies dropped packets into the following categories:
	  • **Low, non-TCP**—Number of low-loss priority non-TCP packets dropped because of RED.
	  • **Low, TCP**—Number of low-loss priority TCP packets dropped because of RED.
	  • **High, non-TCP**—Number of high-loss priority non-TCP packets dropped because of RED.
	  • **High, TCP**—Number of high-loss priority TCP packets dropped because of RED.
	• (J Series routers and MX Series routers with enhanced DPCs, and T Series routers with enhanced FPCs only) The output classifies dropped packets into the following categories:
	  • **Low**—Number of low-loss priority packets dropped because of RED.
	  • **Medium-low**—Number of medium-low loss priority packets dropped because of RED.
	  • **Medium-high**—Number of medium-high loss priority packets dropped because of RED.
	  • **High**—Number of high-loss priority packets dropped because of RED.
	NOTE: Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), this field does not always display the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.

RED-dropped bytes	Number of bytes dropped because of RED. The byte counts vary by interface hardware. For more information, see Table 16 on page 257.
	• (M Series and T Series routers only) On M320 and M120 routers and the T Series routers, only the total number of dropped bytes is displayed. On all other M Series routers, the output classifies dropped bytes into the following categories:
	  • **Low, non-TCP**—Number of low-loss priority non-TCP bytes dropped because of RED.
	  • **Low, TCP**—Number of low-loss priority TCP bytes dropped because of RED.
	  • **High, non-TCP**—Number of high-loss priority non-TCP bytes dropped because of RED.
	  • **High, TCP**—Number of high-loss priority TCP bytes dropped because of RED.
	• (J Series routers only) The output classifies dropped bytes into the following categories:
	  • **Low**—Number of low-loss priority bytes dropped because of RED.
	  • **Medium-low**—Number of medium-low loss priority bytes dropped because of RED.
	  • **Medium-high**—Number of medium-high loss priority bytes dropped because of RED.
	  • **High**—Number of high-loss priority bytes dropped because of RED.
	NOTE: Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), this field does not always display the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.

Byte counts vary by interface hardware. Table 16 on page 257 shows how the byte counts on the outbound interfaces vary depending on the interface hardware. Table 16 on page 257 is based on the assumption that outbound interfaces are sending IP traffic with 478 bytes per packet.

Table 16: Byte Count by Interface Hardware

Interface Hardware	Output Level	Byte Count Includes	Comments
Gigabit Ethernet IQ and IQE PICs	Interface	Queued: 490 bytes per packet, representing 478 bytes of Layer 3 packet + 12 bytes Transmitted: 490 bytes per packet, representing 478 bytes of Layer 3 packet + 12 bytes RED dropped: 496 bytes per packet representing 478 bytes of Layer 3 packet + 18 bytes	The 12 additional bytes include 6 bytes for the destination MAC address + 4 bytes for the VLAN + 2 bytes for the Ethernet type. For RED dropped, 6 bytes are added for the source MAC address.
	Packet forwarding component	Queued: 478 bytes per packet, representing 478 bytes of Layer 3 packet Transmitted: 478 bytes per packet, representing 478 bytes of Layer 3 packet	–
Non-IQ PIC	Interface	T Series, TX Series, T1600, and MX Series routers: • Queued: 478 bytes of Layer 3 packet. • Transmitted: 478 bytes of Layer 3 packet. T4000 routers with Type 5 FPCs : • Queued: 478 bytes of Layer 3 packet + the full Layer 2 overhead including 4 bytes CRC + the full Layer 1 overhead 8 bytes preamble + 12 bytes Inter frame Gap. • Transmitted: 478 bytes of Layer 3 packet + the full Layer 2 overhead including 4 bytes CRC + the full Layer 1 overhead 8 bytes preamble + 12 bytes Interframe Gap. M Series routers: • Queued: 478 bytes of Layer 3 packet. • Transmitted: 478 bytes of Layer 3 packet + the full Layer 2 overhead. PTX Series Packet Transport Routers: • Queued: 478 bytes of Layer 3 packet + the full Layer 2 overhead including 4 bytes FCS + the full Layer 1 overhead of the MAC header DA + SA + EtherType (non-VLAN). • Transmitted: 478 bytes of Layer 3 packet + the full Layer 2 overhead including 4 bytes CRC + the full Layer 1 overhead of the MAC header DA + SA + EtherType (non-VLAN). • RED dropped: 478 bytes of Layer 3 packet + 22 bytes special header. To the TQ, this packet has 4 bytes more than queued or transmitted.	The Layer 2 overhead is 14 bytes for non-VLAN traffic and 18 bytes for VLAN traffic.

Table 16: Byte Count by Interface Hardware *(continued)*

Interface Hardware	Output Level	Byte Count Includes	Comments
IQ and IQE PICs with a SONET/SDH interface	Interface	Queued: 482 bytes per packet, representing 478 bytes of Layer 3 packet + 4 bytes Transmitted: 482 bytes per packet, representing 478 bytes of Layer 3 packet + 4 bytes RED dropped: 482 bytes per packet, representing 478 bytes of Layer 3 packet + 4 bytes	The additional 4 bytes are for the Layer 2 Point-to-Point Protocol (PPP) header.
	Packet forwarding component	Queued: 478 bytes per packet, representing 478 bytes of Layer 3 packet Transmitted: 486 bytes per packet, representing 478 bytes of Layer 3 packet + 8 bytes	For transmitted packets, the additional 8 bytes includes 4 bytes for the PPP header and 4 bytes for a cookie.
Non-IQ PIC with a SONET/SDH interface	Interface	T Series, TX Series, T1600, and MX Series routers: • Queued: 478 bytes of Layer 3 packet. • Transmitted: 478 bytes of Layer 3 packet. M Series routers: • Queued: 478 bytes of Layer 3 packet. • Transmitted: 483 bytes per packet, representing 478 bytes of Layer 3 packet + 5 bytes • RED dropped: 478 bytes per packet, representing 478 bytes of Layer 3 packet	For transmitted packets, the additional 5 bytes includes 4 bytes for the PPP header and 1 byte for the packet loss priority (PLP).
Interfaces configured with Frame Relay Encapsulation	Interface	The default Frame Relay overhead is 7 bytes. If you configure the Frame Check Sequence (FCS) to 4 bytes, then the overhead increases to 10 bytes.	
1-port 10-Gigabit Ethernet IQ2 and IQ2–E PICs 4-port 1G IQ2 and IQ2-E PICs 8-port 1G IQ2 and IQ2-E PICs	Interface	Queued: 478 bytes of Layer 3 packet + the full Layer 2 overhead including CRC. Transmitted: 478 bytes of Layer 3 packet + the full Layer 2 overhead including CRC.	The Layer 2 overhead is 18 bytes for non-VLAN traffic and 22 bytes for VLAN traffic.
	Packet forwarding component	Queued: 478 bytes of Layer 3 packet. Transmitted: 478 bytes of Layer 3 packet.	–

Sample Output

show interfaces queue (Rate-Limited Interface on a Gigabit Ethernet MIC in an MPC)

The following example shows queue information for the rate-limited interface ge-4/2/0 on a Gigabit Ethernet MIC in an MPC. For rate-limited queues for interfaces hosted on MICs or MPCs, rate-limit packet drops occur prior to packet output queuing. In the command output, the nonzero statistics displayed in the **RL-dropped packets** and **RL-dropped bytes** fields quantify the traffic dropped to rate-limit queue 0 output to 10 percent of 1 gigabyte (100 megabits) per second. Because the RL-dropped traffic is not included in the **Queued** statistics, the statistics displayed for queued traffic are the same as the statistics for transmitted traffic.

```
user@host> show interfaces queue ge-4/2/0
Physical interface: ge-4/2/0, Enabled, Physical link is Up
  Interface index: 203, SNMP ifIndex: 1054
Forwarding classes: 16 supported, 4 in use
Egress queues: 8 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :            131300649                141751 pps
    Bytes                :          11287964840              99793248 bps
  Transmitted:
    Packets              :            131300649                141751 pps
    Bytes                :          11287964840              99793248 bps
    Tail-dropped packets :                    0                     0 pps
    RL-dropped packets   :            205050862                602295 pps
    RL-dropped bytes     :          13595326612             327648832 bps
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
```

show interfaces queue (Aggregated Ethernet on a T320 Router)

The following example shows that the aggregated Ethernet interface, **ae1**, has traffic on queues **af1** and **af12**:

```
user@host> show interfaces queue ae1
Physical interface: ae1, Enabled, Physical link is Up
Interface index: 158, SNMP ifIndex: 33 Forwarding classes: 8 supported, 8 in use
Output queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: be
  Queued:
    Packets              :                    5                     0 pps
    Bytes                :                  242                     0 bps
  Transmitted:
    Packets              :                    5                     0 pps
    Bytes                :                  242                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
Queue: 1, Forwarding classes: af1
  Queued:
    Packets              :             42603765                595484 pps
```



```
    Bytes               :          5453281920            609776496 bps
  Transmitted:
    Packets             :            42603765               595484 pps
    Bytes               :          5453281920            609776496 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 2, Forwarding classes: ef1
  Queued:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 3, Forwarding classes: nc
  Queued:
    Packets             :                  45                    0 pps
    Bytes               :                3930                    0 bps
  Transmitted:
    Packets             :                  45                    0 pps
    Bytes               :                3930                    0 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 4, Forwarding classes: af11
  Queued:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 5, Forwarding classes: ef11
  Queued:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 6, Forwarding classes: af12
  Queued:
    Packets             :            31296413               437436 pps
    Bytes               :          4005940864            447935200 bps
  Transmitted:
    Packets             :            31296413               437436 pps
    Bytes               :          4005940864            447935200 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 7, Forwarding classes: nc2
  Queued:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
```



```
  Transmitted:
    Packets             :                    0                    0 pps
    Bytes               :                    0                    0 bps
    Tail-dropped packets :                   0                    0 pps
    RED-dropped packets  :                   0                    0 pps
    RED-dropped bytes    :                   0                    0 bps
```

show interfaces queue (Fast Ethernet on a J4300 Router)

```
user@host> show interfaces queue fe-4/0/0.0
Logical interface fe-4/0/0.0 (Index 71) (SNMP ifIndex 42)
Forwarding classes: 8 supported, 8 in use
Output queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: be
  Queued:
    Packets             :              5240762                 3404 pps
    Bytes               :           3020710354             15934544 bps
  Transmitted:
    Packets             :              5240762                 3404 pps
    Bytes               :           3020710354             15934544 bps
    Tail-dropped packets :                   0                    0 pps
    RED-dropped packets  :                   0                    0 pps
     Low                :                    0                    0 pps
     Medium-low         :                    0                    0 pps
     Medium-high        :                    0                    0 pps
     High               :                    0                    0 pps
    RED-dropped bytes    :                   0                    0 bps
     Low                :                    0                    0 pps
     Medium-low         :                    0                    0 pps
     Medium-high        :                    0                    0 pps
     High               :                    0                    0 pps
Queue: 1, Forwarding classes: af1
  Queued:
    Packets             :              2480391                 1650 pps
    Bytes               :           1304685666              6945704 bps
  Transmitted:
    Packets             :              2478740                 1650 pps
    Bytes               :           1303817240              6945704 bps
    Tail-dropped packets :                   0                    0 pps
    RED-dropped packets  :                1651                    0 pps
     Low                :                    0                    0 pps
     Medium-low         :                    0                    0 pps
     Medium-high        :                    0                    0 pps
     High               :                 1651                    0 pps
    RED-dropped bytes    :              868426                    0 bps
     Low                :                    0                    0 pps
     Medium-low         :                    0                    0 pps
     Medium-high        :                    0                    0 pps
     High               :               868426                    0 pps
```

show interfaces queue (Gigabit Ethernet on a T640 Router)

```
user@host> show interfaces queue
Physical interface: ge-7/0/1, Enabled, Physical link is Up
   Interface index: 150, SNMP ifIndex: 42
 Forwarding classes: 8 supported, 8 in use
 Output queues: 8 supported, 8 in use
 Queue: 0, Forwarding classes: be
   Queued:
```

```
      Packets            :               13                 0 pps
      Bytes              :              622                 0 bps
    Transmitted:
      Packets            :               13                 0 pps
      Bytes              :              622                 0 bps
      Tail-dropped packets :              0                 0 pps
      RED-dropped packets  :              0                 0 pps
      RED-dropped bytes    :              0                 0 bps
  Queue: 1, Forwarding classes: af1
    Queued:
      Packets            :       1725947945            372178 pps
      Bytes              :     220921336960         381110432 bps
    Transmitted:
      Packets            :       1725947945            372178 pps
      Bytes              :     220921336960         381110432 bps
      Tail-dropped packets :              0                 0 pps
      RED-dropped packets  :              0                 0 pps
      RED-dropped bytes    :              0                 0 bps
  Queue: 2, Forwarding classes: ef1
    Queued:
      Packets            :                0                 0 pps
      Bytes              :                0                 0 bps
    Transmitted:
      Packets            :                0                 0 pps
      Bytes              :                0                 0 bps
      Tail-dropped packets :              0                 0 pps
      RED-dropped packets  :              0                 0 pps
      RED-dropped bytes    :              0                 0 bps
  Queue: 3, Forwarding classes: nc
    Queued:
      Packets            :              571                 0 pps
      Bytes              :            49318               336 bps
    Transmitted:
      Packets            :              571                 0 pps
      Bytes              :            49318               336 bps
      Tail-dropped packets :              0                 0 pps
      RED-dropped packets  :              0                 0 pps
      RED-dropped bytes    :              0                 0 bps
```

show interfaces queue aggregate (Gigabit Ethernet Enhanced DPC)

```
user@host> show interfaces queue ge-2/2/9 aggregate
Physical interface: ge-2/2/9, Enabled, Physical link is Up
  Interface index: 238, SNMP ifIndex: 71
Forwarding classes: 16 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets            :        148450735            947295 pps
    Bytes              :       8016344944         409228848 bps
  Transmitted:
    Packets            :         76397439            487512 pps
    Bytes              :       4125461868         210602376 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :       72053285            459783 pps
     Low               :         72053285            459783 pps
     Medium-low        :                0                 0 pps
     Medium-high       :                0                 0 pps
     High              :                0                 0 pps
    RED-dropped bytes    :     3890877444         198626472 bps
```



```
     Low              :          3890877444           198626472 bps
     Medium-low       :                   0                   0 bps
     Medium-high      :                   0                   0 bps
     High             :                   0                   0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets           :                   0                   0 pps
    Bytes             :                   0                   0 bps
  Transmitted:
    Packets           :                   0                   0 pps
    Bytes             :                   0                   0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                0                   0 pps
     Low              :                   0                   0 pps
     Medium-low       :                   0                   0 pps
     Medium-high      :                   0                   0 pps
     High             :                   0                   0 pps
    RED-dropped bytes :                   0                   0 bps
     Low              :                   0                   0 bps
     Medium-low       :                   0                   0 bps
     Medium-high      :                   0                   0 bps
     High             :                   0                   0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets           :           410278257              473940 pps
    Bytes             :         22156199518           204742296 bps
  Transmitted:
    Packets           :             4850003                4033 pps
    Bytes             :           261900162             1742256 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :        405425693              469907 pps
     Low              :           405425693              469907 pps
     Medium-low       :                   0                   0 pps
     Medium-high      :                   0                   0 pps
     High             :                   0                   0 pps
    RED-dropped bytes :         21892988124           203000040 bps
     Low              :         21892988124           203000040 bps
     Medium-low       :                   0                   0 bps
     Medium-high      :                   0                   0 bps
     High             :                   0                   0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets           :                   0                   0 pps
    Bytes             :                   0                   0 bps
  Transmitted:
    Packets           :                   0                   0 pps
    Bytes             :                   0                   0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                0                   0 pps
     Low              :                   0                   0 pps
     Medium-low       :                   0                   0 pps
     Medium-high      :                   0                   0 pps
     High             :                   0                   0 pps
    RED-dropped bytes :                   0                   0 bps
     Low              :                   0                   0 bps
     Medium-low       :                   0                   0 bps
     Medium-high      :                   0                   0 bps
     High             :                   0                   0 bps
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
```



```
  Queued:
    Packets             :              76605230                485376 pps
    Bytes               :            5209211400             264044560 bps
  Transmitted:
    Packets             :              76444631                484336 pps
    Bytes               :            5198235612             263478800 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :               160475                  1040 pps
     Low                :               160475                  1040 pps
     Medium-low         :                    0                     0 pps
     Medium-high        :                    0                     0 pps
     High               :                    0                     0 pps
    RED-dropped bytes   :              10912300                565760 bps
     Low                :              10912300                565760 bps
     Medium-low         :                    0                     0 bps
     Medium-high        :                    0                     0 bps
     High               :                    0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
  Transmitted:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                     0 pps
     Low                :                    0                     0 pps
     Medium-low         :                    0                     0 pps
     Medium-high        :                    0                     0 pps
     High               :                    0                     0 pps
    RED-dropped bytes   :                     0                     0 bps
     Low                :                    0                     0 bps
     Medium-low         :                    0                     0 bps
     Medium-high        :                    0                     0 bps
     High               :                    0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets             :               4836136                  3912 pps
    Bytes               :             333402032               2139056 bps
  Transmitted:
    Packets             :               3600866                  1459 pps
    Bytes               :             244858888                793696 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :              1225034                  2450 pps
     Low                :              1225034                  2450 pps
     Medium-low         :                    0                     0 pps
     Medium-high        :                    0                     0 pps
     High               :                    0                     0 pps
    RED-dropped bytes   :              83302312               1333072 bps
     Low                :              83302312               1333072 bps
     Medium-low         :                    0                     0 bps
     Medium-high        :                    0                     0 bps
     High               :                    0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
  Transmitted:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
    Tail-dropped packets : Not Available
```



```
      RED-dropped packets  :                    0                     0 pps
       Low                 :                    0                     0 pps
       Medium-low          :                    0                     0 pps
       Medium-high         :                    0                     0 pps
       High                :                    0                     0 pps
      RED-dropped bytes    :                    0                     0 bps
       Low                 :                    0                     0 bps
       Medium-low          :                    0                     0 bps
       Medium-high         :                    0                     0 bps
       High                :                    0                     0 bps

  Packet Forwarding Engine Chassis Queues:
  Queues: 4 supported, 4 in use
  Queue: 0, Forwarding classes: best-effort
    Queued:
      Packets              :             77059796                486384 pps
      Bytes                :           3544750624             178989576 bps
    Transmitted:
      Packets              :             77059797                486381 pps
      Bytes                :           3544750670             178988248 bps
      Tail-dropped packets :                    0                     0 pps
      RED-dropped packets  :                    0                     0 pps
       Low                 :                    0                     0 pps
       Medium-low          :                    0                     0 pps
       Medium-high         :                    0                     0 pps
       High                :                    0                     0 pps
      RED-dropped bytes    :                    0                     0 bps
       Low                 :                    0                     0 bps
       Medium-low          :                    0                     0 bps
       Medium-high         :                    0                     0 bps
       High                :                    0                     0 bps
  Queue: 1, Forwarding classes: expedited-forwarding
    Queued:
      Packets              :                    0                     0 pps
      Bytes                :                    0                     0 bps
    Transmitted:
      Packets              :                    0                     0 pps
      Bytes                :                    0                     0 bps
      Tail-dropped packets :                    0                     0 pps
      RED-dropped packets  :                    0                     0 pps
       Low                 :                    0                     0 pps
       Medium-low          :                    0                     0 pps
       Medium-high         :                    0                     0 pps
       High                :                    0                     0 pps
      RED-dropped bytes    :                    0                     0 bps
       Low                 :                    0                     0 bps
       Medium-low          :                    0                     0 bps
       Medium-high         :                    0                     0 bps
       High                :                    0                     0 bps
  Queue: 2, Forwarding classes: assured-forwarding
    Queued:
      Packets              :              4846580                  3934 pps
      Bytes                :            222942680               1447768 bps
    Transmitted:
      Packets              :              4846580                  3934 pps
      Bytes                :            222942680               1447768 bps
      Tail-dropped packets :                    0                     0 pps
      RED-dropped packets  :                    0                     0 pps
       Low                 :                    0                     0 pps
       Medium-low          :                    0                     0 pps
       Medium-high         :                    0                     0 pps
```

```
     High               :                    0                     0 pps
    RED-dropped bytes   :                    0                     0 bps
     Low                :                    0                     0 bps
     Medium-low         :                    0                     0 bps
     Medium-high        :                    0                     0 bps
     High               :                    0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets             :                    0                     0 pps
    Bytes               :                    0                     0 bps
  Transmitted:
    Packets             :                    0                     0 pps
    Bytes               :                    0                     0 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                   0                     0 pps
     Low                :                    0                     0 pps
     Medium-low         :                    0                     0 pps
     Medium-high        :                    0                     0 pps
     High               :                    0                     0 pps
    RED-dropped bytes   :                    0                     0 bps
     Low                :                    0                     0 bps
     Medium-low         :                    0                     0 bps
     Medium-high        :                    0                     0 bps
     High               :                    0                     0 bps
```

show interfaces queue (Gigabit Ethernet IQ2 PIC)

```
user@host> show interfaces queue ge-7/1/3
Physical interface: ge-7/1/3, Enabled, Physical link is Up
  Interface index: 170, SNMP ifIndex: 70 Forwarding classes: 16 supported, 4 in
use Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets             :            418390039                    10 pps
    Bytes               :          38910269752                  7440 bps
  Transmitted:
    Packets             :            418390039                    10 pps
    Bytes               :          38910269752                  7440 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                   0                     0 pps
    RED-dropped bytes   :                    0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets             :                    0                     0 pps
    Bytes               :                    0                     0 bps
  Transmitted:
    Packets             :                    0                     0 pps
    Bytes               :                    0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                   0                     0 pps
    RED-dropped bytes   :                    0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets             :                    0                     0 pps
    Bytes               :                    0                     0 bps
  Transmitted:
    Packets             :                    0                     0 pps
    Bytes               :                    0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                   0                     0 pps
```



```
    RED-dropped bytes    :                   0                   0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                7055                   1 pps
    Bytes                :              451552                 512 bps
  Transmitted:
    Packets              :                7055                   1 pps
    Bytes                :              451552                 512 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                   0                   0 pps
    RED-dropped bytes    :                   0                   0 bps
Forwarding classes: 16 supported, 4 in use Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :                1031                   0 pps
    Bytes                :              143292                   0 bps
  Transmitted:
    Packets              :                1031                   0 pps
    Bytes                :              143292                   0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                   0                   0 pps
    RL-dropped bytes     :                   0                   0 bps
    RED-dropped packets  :                   0                   0 pps
    RED-dropped bytes    :                   0                   0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                   0                   0 pps
    Bytes                :                   0                   0 bps
  Transmitted:
    Packets              :                   0                   0 pps
    Bytes                :                   0                   0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                   0                   0 pps
    RL-dropped bytes     :                   0                   0 bps
    RED-dropped packets  :                   0                   0 pps
    RED-dropped bytes    :                   0                   0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                   0                   0 pps
    Bytes                :                   0                   0 bps
  Transmitted:
    Packets              :                   0                   0 pps
    Bytes                :                   0                   0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                   0                   0 pps
    RL-dropped bytes     :                   0                   0 bps
    RED-dropped packets  :                   0                   0 pps
    RED-dropped bytes    :                   0                   0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :               77009                  11 pps
    Bytes                :             6894286                7888 bps
  Transmitted:
    Packets              :               77009                  11 pps
    Bytes                :             6894286                7888 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                   0                   0 pps
    RL-dropped bytes     :                   0                   0 bps
    RED-dropped packets  :                   0                   0 pps
    RED-dropped bytes    :                   0                   0 bps
```

```
Packet Forwarding Engine Chassis Queues:
Queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :                  1031                     0 pps
    Bytes                :                147328                     0 bps
  Transmitted:
    Packets              :                  1031                     0 pps
    Bytes                :                147328                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low, non-TCP        :                     0                     0 pps
     Low, TCP            :                     0                     0 pps
     High, non-TCP       :                     0                     0 pps
     High, TCP           :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low, non-TCP        :                     0                     0 bps
     Low, TCP            :                     0                     0 bps
     High, non-TCP       :                     0                     0 bps
     High, TCP           :                     0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low, non-TCP        :                     0                     0 pps
     Low, TCP            :                     0                     0 pps
     High, non-TCP       :                     0                     0 pps
     High, TCP           :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low, non-TCP        :                     0                     0 bps
     Low, TCP            :                     0                     0 bps
     High, non-TCP       :                     0                     0 bps
     High, TCP           :                     0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low, non-TCP        :                     0                     0 pps
     Low, TCP            :                     0                     0 pps
     High, non-TCP       :                     0                     0 pps
     High, TCP           :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low, non-TCP        :                     0                     0 bps
     Low, TCP            :                     0                     0 bps
     High, non-TCP       :                     0                     0 bps
     High, TCP           :                     0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                 94386                    12 pps
    Bytes                :              13756799                  9568 bps
  Transmitted:
```



```
    Packets             :            94386                 12 pps
    Bytes               :         13756799               9568 bps
    Tail-dropped packets :               0                  0 pps
    RED-dropped packets  :               0                  0 pps
     Low, non-TCP       :               0                  0 pps
     Low, TCP           :               0                  0 pps
     High, non-TCP      :               0                  0 pps
     High, TCP          :               0                  0 pps
    RED-dropped bytes   :               0                  0 bps
     Low, non-TCP       :               0                  0 bps
     Low, TCP           :               0                  0 bps
     High, non-TCP      :               0                  0 bps
     High, TCP          :               0                  0 bps
```

show interfaces queue both-ingress-egress (Gigabit Ethernet IQ2 PIC)

```
user@host> show interfaces queue ge-6/2/0 both-ingress-egress
Physical interface: ge-6/2/0, Enabled, Physical link is Up
  Interface index: 175, SNMP ifIndex: 121
Forwarding classes: 8 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              : Not Available
    Bytes                :               0                  0 bps
  Transmitted:
    Packets              :             254                  0 pps
    Bytes                :           16274                  0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :               0                  0 pps
    RED-dropped bytes    :               0                  0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :               0                  0 bps
  Transmitted:
    Packets              :               0                  0 pps
    Bytes                :               0                  0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :               0                  0 pps
    RED-dropped bytes    :               0                  0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :               0                  0 bps
  Transmitted:
    Packets              :               0                  0 pps
    Bytes                :               0                  0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :               0                  0 pps
    RED-dropped bytes    :               0                  0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              : Not Available
    Bytes                :               0                  0 bps
  Transmitted:
    Packets              :               0                  0 pps
    Bytes                :               0                  0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :               0                  0 pps
```



```
    RED-dropped bytes    :                    0                    0 bps
Forwarding classes: 8 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    3                    0 pps
    Bytes                :                  126                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Packet Forwarding Engine Chassis Queues:
Queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :             80564692                    0 pps
    Bytes                :           3383717100                    0 bps
  Transmitted:
    Packets              :             80564692                    0 pps
    Bytes                :           3383717100                    0 bps
    Tail-dropped packets :                    0                    0 pps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :             80564685                    0 pps
    Bytes                :           3383716770                    0 bps
  Transmitted:
    Packets              :             80564685                    0 pps
```



```
    Bytes               :          3383716770                    0 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets             :                9397                    0 pps
    Bytes               :             3809052                  232 bps
  Transmitted:
    Packets             :                9397                    0 pps
    Bytes               :             3809052                  232 bps
    Tail-dropped packets :                  0                    0 pps
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
```

show interfaces queue ingress (Gigabit Ethernet IQ2 PIC)

```
user@host> show interfaces queue ge-6/2/0 ingress
Physical interface: ge-6/2/0, Enabled, Physical link is Up
  Interface index: 175, SNMP ifIndex: 121
Forwarding classes: 8 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets             : Not Available
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                 288                    0 pps
    Bytes               :               18450                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets             : Not Available
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                  0                    0 pps
    RED-dropped bytes    :                  0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets             : Not Available
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
    Tail-dropped packets : Not Available
```



```
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
```

show interfaces queue egress (Gigabit Ethernet IQ2 PIC)

```
user@host> show interfaces queue ge-6/2/0 egress
Physical interface: ge-6/2/0, Enabled, Physical link is Up
  Interface index: 175, SNMP ifIndex: 121
Forwarding classes: 8 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    3                    0 pps
    Bytes                :                  126                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
```

```
Packet Forwarding Engine Chassis Queues:
Queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :            80564692                     0 pps
    Bytes                :          3383717100                     0 bps
  Transmitted:
    Packets              :            80564692                     0 pps
    Bytes                :          3383717100                     0 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                   0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :            80564685                     0 pps
    Bytes                :          3383716770                     0 bps
  Transmitted:
    Packets              :            80564685                     0 pps
    Bytes                :          3383716770                     0 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                   0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                   0                     0 pps
    Bytes                :                   0                     0 bps
  Transmitted:
    Packets              :                   0                     0 pps
    Bytes                :                   0                     0 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                   0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                9538                     0 pps
    Bytes                :             3819840                     0 bps
  Transmitted:
    Packets              :                9538                     0 pps
    Bytes                :             3819840                     0 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                   0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
```

show interfaces queue remaining-traffic (Gigabit Ethernet Enhanced DPC)

```
user@host> show interfaces queue ge-2/2/9 remaining-traffic
Physical interface: ge-2/2/9, Enabled, Physical link is Up
  Interface index: 238, SNMP ifIndex: 71
Forwarding classes: 16 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :           110208969                472875 pps
    Bytes                :          5951284434             204282000 bps
  Transmitted:
    Packets              :           110208969                472875 pps
    Bytes                :          5951284434             204282000 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                   0                     0 pps
     Low                 :                   0                     0 pps
```



```
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
```



```
     High               :                 0                    0 bps
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets             :         109355853               471736 pps
    Bytes               :        7436199152            256627968 bps
  Transmitted:
    Packets             :         109355852               471736 pps
    Bytes               :        7436198640            256627968 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                 0                    0 pps
     Low                :                 0                    0 pps
     Medium-low         :                 0                    0 pps
     Medium-high        :                 0                    0 pps
     High               :                 0                    0 pps
    RED-dropped bytes   :                 0                    0 bps
     Low                :                 0                    0 bps
     Medium-low         :                 0                    0 bps
     Medium-high        :                 0                    0 bps
     High               :                 0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets             :                 0                    0 pps
    Bytes               :                 0                    0 bps
  Transmitted:
    Packets             :                 0                    0 pps
    Bytes               :                 0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                 0                    0 pps
     Low                :                 0                    0 pps
     Medium-low         :                 0                    0 pps
     Medium-high        :                 0                    0 pps
     High               :                 0                    0 pps
    RED-dropped bytes   :                 0                    0 bps
     Low                :                 0                    0 bps
     Medium-low         :                 0                    0 bps
     Medium-high        :                 0                    0 bps
     High               :                 0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets             :                 0                    0 pps
    Bytes               :                 0                    0 bps
  Transmitted:
    Packets             :                 0                    0 pps
    Bytes               :                 0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                 0                    0 pps
     Low                :                 0                    0 pps
     Medium-low         :                 0                    0 pps
     Medium-high        :                 0                    0 pps
     High               :                 0                    0 pps
    RED-dropped bytes   :                 0                    0 bps
     Low                :                 0                    0 bps
     Medium-low         :                 0                    0 bps
     Medium-high        :                 0                    0 bps
     High               :                 0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets             :                 0                    0 pps
    Bytes               :                 0                    0 bps
```



```
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
```

show interfaces queue (Channelized OC12 IQE Type 3 PIC in SONET Mode)

```
user@host> show interfaces queue t3-1/1/0:7
 Physical interface: t3-1/1/0:7, Enabled, Physical link is Up

   Interface index: 192, SNMP ifIndex: 1948

   Description: full T3 interface connect to 6ce13 t3-3/1/0:7 for FR testing -
Lam

 Forwarding classes: 16 supported, 9 in use

 Egress queues: 8 supported, 8 in use

 Queue: 0, Forwarding classes: DEFAULT

   Queued:

     Packets              :               214886                 13449 pps

     Bytes                :              9884756               5164536 bps

   Transmitted:

     Packets              :               214886                 13449 pps

     Bytes                :              9884756               5164536 bps

     Tail-dropped packets :                    0                     0 pps

     RED-dropped packets  :                    0                     0 pps

      Low                 :                    0                     0 pps

      Medium-low          :                    0                     0 pps

      Medium-high         :                    0                     0 pps

      High                :                    0                     0 pps

     RED-dropped bytes    :                    0                     0 bps

      Low                 :                    0                     0 bps

      Medium-low          :                    0                     0 bps
```



```
     Medium-high        :                  0                    0 bps
     High               :                  0                    0 bps
Queue: 1, Forwarding classes: REALTIME
  Queued:
    Packets             :                  0                    0 pps
    Bytes               :                  0                    0 bps
  Transmitted:
    Packets             :                  0                    0 pps
    Bytes               :                  0                    0 bps
    Tail-dropped packets :                 0                    0 pps
    RED-dropped packets :                  0                    0 pps
     Low                :                  0                    0 pps
     Medium-low         :                  0                    0 pps
     Medium-high        :                  0                    0 pps
     High               :                  0                    0 pps
    RED-dropped bytes   :                  0                    0 bps
     Low                :                  0                    0 bps
     Medium-low         :                  0                    0 bps
     Medium-high        :                  0                    0 bps
     High               :                  0                    0 bps
Queue: 2, Forwarding classes: PRIVATE
  Queued:
    Packets             :                  0                    0 pps
    Bytes               :                  0                    0 bps
  Transmitted:
    Packets             :                  0                    0 pps
    Bytes               :                  0                    0 bps
    Tail-dropped packets :                 0                    0 pps
    RED-dropped packets :                  0                    0 pps
     Low                :                  0                    0 pps
```



```
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
Queue: 3, Forwarding classes: CONTROL
  Queued:
    Packets              :                   60                     0 pps
    Bytes                :                 4560                     0 bps
  Transmitted:
    Packets              :                   60                     0 pps
    Bytes                :                 4560                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
Queue: 4, Forwarding classes: CLASS_B_OUTPUT
  Queued:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
  Transmitted:
```



```
    Packets             :                     0                    0 pps
    Bytes               :                     0                    0 bps
    Tail-dropped packets :                    0                    0 pps
    RED-dropped packets  :                    0                    0 pps
     Low                :                     0                    0 pps
     Medium-low         :                     0                    0 pps
     Medium-high        :                     0                    0 pps
     High               :                     0                    0 pps
    RED-dropped bytes   :                     0                    0 bps
     Low                :                     0                    0 bps
     Medium-low         :                     0                    0 bps
     Medium-high        :                     0                    0 bps
     High               :                     0                    0 bps
Queue: 5, Forwarding classes: CLASS_C_OUTPUT
  Queued:
    Packets             :                     0                    0 pps
    Bytes               :                     0                    0 bps
  Transmitted:
    Packets             :                     0                    0 pps
    Bytes               :                     0                    0 bps
    Tail-dropped packets :                    0                    0 pps
    RED-dropped packets  :                    0                    0 pps
     Low                :                     0                    0 pps
     Medium-low         :                     0                    0 pps
     Medium-high        :                     0                    0 pps
     High               :                     0                    0 pps
    RED-dropped bytes   :                     0                    0 bps
     Low                :                     0                    0 bps
     Medium-low         :                     0                    0 bps
     Medium-high        :                     0                    0 bps
```



```
     High               :                  0                   0 bps
Queue: 6, Forwarding classes: CLASS_V_OUTPUT
  Queued:
    Packets             :                  0                   0 pps
    Bytes               :                  0                   0 bps
  Transmitted:
    Packets             :                  0                   0 pps
    Bytes               :                  0                   0 bps
    Tail-dropped packets :                 0                   0 pps
    RED-dropped packets  :                 0                   0 pps
     Low                :                  0                   0 pps
     Medium-low         :                  0                   0 pps
     Medium-high        :                  0                   0 pps
     High               :                  0                   0 pps
    RED-dropped bytes   :                  0                   0 bps
     Low                :                  0                   0 bps
     Medium-low         :                  0                   0 bps
     Medium-high        :                  0                   0 bps
     High               :                  0                   0 bps
Queue: 7, Forwarding classes: CLASS_S_OUTPUT, GETS
  Queued:
    Packets             :                  0                   0 pps
    Bytes               :                  0                   0 bps
  Transmitted:
    Packets             :                  0                   0 pps
    Bytes               :                  0                   0 bps
    Tail-dropped packets :                 0                   0 pps
    RED-dropped packets  :                 0                   0 pps
     Low                :                  0                   0 pps
     Medium-low         :                  0                   0 pps
     Medium-high        :                  0                   0 pps
```



```
     High               :                    0                    0 pps
    RED-dropped bytes   :                    0                    0 bps
     Low                :                    0                    0 bps
     Medium-low         :                    0                    0 bps
     Medium-high        :                    0                    0 bps
     High               :                    0                    0 bps

Packet Forwarding Engine Chassis Queues:
Queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: DEFAULT
  Queued:
    Packets             :               371365                23620 pps
    Bytes               :             15597330              7936368 bps
  Transmitted:
    Packets             :               371365                23620 pps
    Bytes               :             15597330              7936368 bps
    Tail-dropped packets :                   0                    0 pps
    RED-dropped packets  :                   0                    0 pps
     Low                :                    0                    0 pps
     Medium-low         :                    0                    0 pps
     Medium-high        :                    0                    0 pps
     High               :                    0                    0 pps
    RED-dropped bytes   :                    0                    0 bps
     Low                :                    0                    0 bps
     Medium-low         :                    0                    0 bps
     Medium-high        :                    0                    0 bps
     High               :                    0                    0 bps
Queue: 1, Forwarding classes: REALTIME
  Queued:
    Packets             :                    0                    0 pps
```



```
      Bytes                :                    0                    0 bps
    Transmitted:
      Packets              :                    0                    0 pps
      Bytes                :                    0                    0 bps
      Tail-dropped packets :                    0                    0 pps
      RED-dropped packets  :                    0                    0 pps
       Low                 :                    0                    0 pps
       Medium-low          :                    0                    0 pps
       Medium-high         :                    0                    0 pps
       High                :                    0                    0 pps
      RED-dropped bytes    :                    0                    0 bps
       Low                 :                    0                    0 bps
       Medium-low          :                    0                    0 bps
       Medium-high         :                    0                    0 bps
       High                :                    0                    0 bps
  Queue: 2, Forwarding classes: PRIVATE
    Queued:
      Packets              :                    0                    0 pps
      Bytes                :                    0                    0 bps
    Transmitted:
      Packets              :                    0                    0 pps
      Bytes                :                    0                    0 bps
      Tail-dropped packets :                    0                    0 pps
      RED-dropped packets  :                    0                    0 pps
       Low                 :                    0                    0 pps
       Medium-low          :                    0                    0 pps
       Medium-high         :                    0                    0 pps
       High                :                    0                    0 pps
      RED-dropped bytes    :                    0                    0 bps
       Low                 :                    0                    0 bps
       Medium-low          :                    0                    0 bps
```



```
     Medium-high        :                     0                     0 bps
     High               :                     0                     0 bps
Queue: 3, Forwarding classes: CONTROL
  Queued:
    Packets             :                 32843                     0 pps
    Bytes               :               2641754                    56 bps
  Transmitted:
    Packets             :                 32843                     0 pps
    Bytes               :               2641754                    56 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
     Low                :                     0                     0 pps
     Medium-low         :                     0                     0 pps
     Medium-high        :                     0                     0 pps
     High               :                     0                     0 pps
    RED-dropped bytes   :                     0                     0 bps
     Low                :                     0                     0 bps
     Medium-low         :                     0                     0 bps
     Medium-high        :                     0                     0 bps
     High               :                     0                     0 bps
Queue: 4, Forwarding classes: CLASS_B_OUTPUT
  Queued:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
  Transmitted:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
     Low                :                     0                     0 pps
```



```
     Medium-low         :                     0                     0 pps
     Medium-high        :                     0                     0 pps
     High               :                     0                     0 pps
    RED-dropped bytes   :                     0                     0 bps
     Low                :                     0                     0 bps
     Medium-low         :                     0                     0 bps
     Medium-high        :                     0                     0 bps
     High               :                     0                     0 bps
Queue: 5, Forwarding classes: CLASS_C_OUTPUT
  Queued:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
  Transmitted:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
     Low                :                     0                     0 pps
     Medium-low         :                     0                     0 pps
     Medium-high        :                     0                     0 pps
     High               :                     0                     0 pps
    RED-dropped bytes   :                     0                     0 bps
     Low                :                     0                     0 bps
     Medium-low         :                     0                     0 bps
     Medium-high        :                     0                     0 bps
     High               :                     0                     0 bps
Queue: 6, Forwarding classes: CLASS_V_OUTPUT
  Queued:
    Packets             :                     0                     0 pps
    Bytes               :                     0                     0 bps
  Transmitted:
```



```
    Packets              :                0                    0 pps
    Bytes                :                0                    0 bps
    Tail-dropped packets :                0                    0 pps
    RED-dropped packets  :                0                    0 pps
     Low                 :                0                    0 pps
     Medium-low          :                0                    0 pps
     Medium-high         :                0                    0 pps
     High                :                0                    0 pps
    RED-dropped bytes    :                0                    0 bps
     Low                 :                0                    0 bps
     Medium-low          :                0                    0 bps
     Medium-high         :                0                    0 bps
     High                :                0                    0 bps
Queue: 7, Forwarding classes: CLASS_S_OUTPUT, GETS
  Queued:
    Packets              :                0                    0 pps
    Bytes                :                0                    0 bps
  Transmitted:
    Packets              :                0                    0 pps
    Bytes                :                0                    0 bps
    Tail-dropped packets :                0                    0 pps
    RED-dropped packets  :                0                    0 pps
     Low                 :                0                    0 pps
     Medium-low          :                0                    0 pps
     Medium-high         :                0                    0 pps
     High                :                0                    0 pps
    RED-dropped bytes    :                0                    0 bps
     Low                 :                0                    0 bps
     Medium-low          :                0                    0 bps
     Medium-high         :                0                    0 bps
```



```
            High                :                    0                     0 bps
```

show interfaces queue (QFX Series)

```
user@switch> show interfaces queue xe-0/0/15
   Physical interface: xe-0/0/15, Enabled, Physical link is Up
     Interface index: 49165, SNMP ifIndex: 539
   Forwarding classes: 12 supported, 8 in use
   Egress queues: 12 supported, 8 in use
   Queue: 0, Forwarding classes: best-effort
     Queued:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
     Transmitted:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
       Tail-dropped packets : Not Available
       Total-dropped packets:                    0                     0 pps
       Total-dropped bytes  :                    0                     0 bps
   Queue: 3, Forwarding classes: fcoe
     Queued:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
     Transmitted:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
       Tail-dropped packets : Not Available
       Total-dropped packets:                    0                     0 pps
       Total-dropped bytes  :                    0                     0 bps
0 bps
   Queue: 4, Forwarding classes: no-loss
     Queued:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
     Transmitted:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
       Tail-dropped packets : Not Available
       Total-dropped packets:                    0                     0 pps
       Total-dropped bytes  :                    0                     0 bps
   Queue: 7, Forwarding classes: network-control
     Queued:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
     Transmitted:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
       Tail-dropped packets : Not Available
       Total-dropped packets:                    0                     0 pps
       Total-dropped bytes  :                    0                     0 bps
   Queue: 8, Forwarding classes: mcast
     Queued:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
     Transmitted:
       Packets              :                    0                     0 pps
       Bytes                :                    0                     0 bps
       Tail-dropped packets : Not Available
```



```
Total-dropped packets:              0                    0 pps
Total-dropped bytes  :              0                    0 bps
```

show interfaces queue l2-statistics (lsq interface)

```
user@switch> show interfaces queue lsq-2/2/0.2 l2-statistics
Logical interface lsq-2/2/0.2 (Index 69) (SNMP ifIndex 1598)
Forwarding classes: 16 supported, 4 in use
Egress queues: 8 supported, 4 in use
Burst size: 0
Queue: 0, Forwarding classes: be
  Queued:
    Packets              :                    1                    0 pps
    Bytes                :                 1001                    0 bps
  Transmitted:
    Packets              :                    5                     0 pps
    Bytes                :                 1062                    0 bps
    Tail-dropped packets :                    0                    0 pps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: ef
  Queued:
    Packets              :                    1                    0 pps
    Bytes                :                 1500                    0 bps
  Transmitted:
    Packets              :                    6                     0 pps
    Bytes                :                 1573                    0 bps
    Tail-dropped packets :                    0                    0 pps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: af
  Queued:
    Packets              :                    1                    0 pps
    Bytes                :                  512                    0 bps
  Transmitted:
    Packets              :                    3                     0 pps
    Bytes                :                  549                    0 bps
    Tail-dropped packets :                    0                    0 pps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: nc
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets :                    0                    0 pps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
=========
```

CHAPTER 6

Command Summary

PART 4

Troubleshooting

CHAPTER 7

Interface Diagnostics

Interface Diagnostics

You can use two diagnostic tools to test the physical layer connections of interfaces: loopback testing and bit error rate test (BERT) testing. Loopback testing enables you to verify the connectivity of a circuit. BERT testing enables you to identify poor signal quality on a circuit. This section contains the following topics:

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, *N*xDS0, 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 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.

There are several types of loopback testing supported by the Junos OS, as follows:

- DCE local—Loops packets back on the local 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 17 on page 294 shows the loopback modes supported on the various interface types.

Table 17: Loopback Modes by Interface Type

Interface	Loopback Modes	Usage Guidelines
Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet	Local	*Configuring Ethernet Loopback Capability*
Circuit Emulation E1	Local and remote	*Configuring E1 Loopback Capability*
Circuit Emulation T1	Local and remote	*Configuring T1 Loopback Capability*
E1 and E3	Local and remote	*Configuring E1 Loopback Capability* and *Configuring E3 Loopback Capability*
*N*xDS0	Payload	*Configuring Channelized E1 IQ and IQE Interfaces*, *Configuring T1 and NxDS0 Interfaces*, *Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode)*, *Configuring Channelized STM1 IQ and IQE Interfaces*, and *Configuring Channelized T3 IQ Interfaces*
Serial (V.35 and X.21)	Local and remote	*Configuring Serial Loopback Capability*
Serial (EIA-530)	DCE local, DCE remote, local, and remote	*Configuring Serial Loopback Capability*
SONET/SDH	Local and remote	*Configuring SONET/SDH Loopback Capability*

Table 17: Loopback Modes by Interface Type *(continued)*

Interface	Loopback Modes	Usage Guidelines
T1 and T3	Local, payload, and remote	*Configuring T1 Loopback Capability* and *Configuring T3 Loopback Capability* See also *Configuring the T1 Remote Loopback Response*

To configure loopback testing, include the **loopback** statement:

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]**

Interface Diagnostics

BERT allows you to troubleshoot problems by checking the quality of links. You can configure any of the following interfaces to execute a BERT when the interface receives a request to run this test: E1, E3, T1, T3; the channelized DS3, OC3, OC12, and STM1 interfaces; and the channelized DS3 IQ, E1 IQ, and OC12 IQ interfaces.

A BERT test requires a line loop to be in place on either the transmission devices or the far-end router. The local router generates a known bit pattern and sends it out the transmit path. The received pattern is then verified against the sent pattern. The higher the bit error rate of the received pattern, the worse the noise is on the physical circuit. As you move the position of the line loop increasingly downstream toward the far-end router, you can isolate the troubled portion of the link.

To configure BERT, you must configure the duration of the test, the bit pattern to send on the transmit path, and the error rate to monitor when the inbound pattern is received.

To configure the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream, include the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements, respectively, at the **[edit interfaces *interface-name* *interface-type*-options]** hierarchy level:

[edit interfaces *interface-name interface-type*-options]
bert-algorithm *algorithm*;
bert-error-rate *rate*;
bert-period *seconds*;

By default, the BERT period is 10 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.

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).

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 4-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 18 on page 298 shows the BERT capabilities for various interface types.

Table 18: BERT Capabilities by Interface Type

Interface	T1 BERT	T3 BERT	Comments
12-port T1/E1 Circuit Emulation	Yes (ports 0–11)		• Limited algorithms
4-port Channelized OC3/STM1 Circuit Emulation	Yes (port 0–3)		• Limited algorithms
E1 or T1	Yes (port 0–3)	Yes (port 0–3)	• Single port at a time • Limited algorithms
E3 or T3	Yes (port 0–3)	Yes (port 0–3)	• Single port at a time
Channelized OC12	N/A	Yes (channel 0–11)	• Single channel at a time • Limited algorithms • No bit count
Channelized STM1	Yes (channel 0–62)	N/A	• Multiple channels • Only one algorithm • No error insert • No bit count
Channelized T3 and Multichannel T3	Yes (channel 0–27)	Yes (port 0–3 on channel 0)	• Multiple ports and channels • Limited algorithms for T1 • No error insert for T1 • No bit count for T1

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 wish 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 *Junos OS Operational Mode Commands*.

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.

Example: Configuring Bit Error Rate Testing

Configure a BERT test on a T3 interface. In this example, the run duration lasts for 120 seconds. The configured error rate is 0, which corresponds to a bit error rate of 10^{-0} (1 error per bit). The configured bit pattern of **all-ones-repeating** means that every bit the interface sends is a set to a value of 1.

```
[edit interfaces]
t3-1/2/0 {
  t3-options {
    bert algorithm all-ones-repeating;
    bert-error-rate 0;
    bert-period 120;
```

```
  }
}
```


CHAPTER 8

Troubleshooting ATM Interfaces

Investigating Interface Steps and Commands

This section includes the following information to assist you when troubleshooting ATM interfaces:

Investigating Interface Steps and Commands Overview

The “Monitoring Interfaces” on page 301 section helps you determine the nature of the interface problem. The “Performing a Loopback Test on an Interface” on page 302 section provides information to help you isolate the source of the problem. The “Locating Interface Alarms” on page 304 section explains some of the alarms and errors for the media.

Monitoring Interfaces

Problem The following steps are a general outline of how you monitor interfaces to determine the nature of interface problems. For more detailed information on a specific interface, see the corresponding monitor interfaces section.

Solution To monitor interfaces, follow these steps:

1. Display the status of an interface.
2. Display the status of a specific interface.
3. Display extensive status information for a specific interface.
4. Monitor statistics for an interface.

The Table 19 on page 302 lists and describes the operational mode commands you use to monitor interfaces.

Table 19: Commands Used to Monitor Interfaces

CLI Command	Description
show interfaces terse *interface-name* For example: **show interfaces terse t1***	Displays summary information about the named interfaces.
show interfaces *interface-name* For example: **show interfaces t1-***x/y/z*	Displays static status information about a specific interface.
show interfaces *interface-name* **extensive** For example: **show interfaces t1-***x/y/z* **extensive**	Displays very detailed interface information about a specific interface.
monitor interface *interface-name* For example: **monitor interface t1-***x/y/z*	Displays real-time statistics about a physical interface, updated every second.

Performing a Loopback Test on an Interface

Problem The following steps are a general outline of how you use loopback testing to isolate the source of the interface problem. For more detailed information on a specific interface, see the corresponding loopback section.

Solution To use loopback testing for interfaces, follow these steps:

1. To diagnose a suspected hardware problem:
   a. Create a loopback.
   b. Set clocking to internal. (Not for Fast Ethernet/Gigabit Ethernet or Multichannel DS3 interfaces.)
   c. Verify that the status of the interface is up.
   d. Configure a static address resolution protocol table entry. (Fast Ethernet/Gigabit Ethernet interfaces only)
   e. Clear the interface statistics.
   f. Force the link layer to stay up.

g. Verify the status of the logical interface.

h. Ping the interface.

i. Check for interface error statistics.

2. To diagnose a suspected connection problem:

   a. Create a loop from the router to the network.

   b. Create a loop to the router from various points in the network.

The Table 20 on page 303 lists and describes the operational and configuration mode commands you use to perform loopback testing on interfaces (the commands are shown in the order in which you perform them).

Table 20: Commands Used to Perform Loopback Testing on Interfaces

CLI Statement or Command	Interface Type	Description
[edit interfaces *interface-name* interface-options] **set loopback (local | remote)**	All interfaces	The **loopback** statement at the hierarchy level configures a loopback on the interface. Packets can be looped on either the local router or the remote channel service unit (CSU). To turn off loopback, remove the **loopback** statement from the configuration.
show	All interfaces	Verify the configuration before you commit it.
commit	All interfaces	Save the set of changes to the database and cause the changes to take operational effect. Use after you have verified a configuration in all configuration steps.
[edit interfaces *interface-name*] **set clocking internal**	T1, T3, ATM, and SONET interfaces	The **clocking** statement at this hierarchy level configures the clock source of the interface to internal.
show interfaces *interface-name*	Used for all interfaces	Display static status information about a specific interface.
[edit interfaces *interface-name* unit *logical-unit-number* family inet address *ip-address*] **set arp *ip-address mac mac-address***	Fast Ethernet and Gigabit Ethernet interfaces	The **arp** statement at this hierarchy level defines mappings between IP and Media Access Control (MAC) addresses.
show arp no-resolve	Fast Ethernet and Gigabit Ethernet interfaces	Display the entries in the ARP table without attempting to determine the hostname that corresponds to the IP address (the **no-resolve** option).
clear interfaces statistics *interface-name*	All interfaces	Reset the statistics for an interface to zero.

Table 20: Commands Used to Perform Loopback Testing on Interfaces *(continued)*

CLI Statement or Command	Interface Type	Description
[edit interfaces *interface-name*] **set encapsulation cisco-hdlc**	T1, T3, SONET, and Multichannel DS3 interfaces	The **encapsulation** statement at this hierarchy level sets the encapsulation to the Cisco High-level Data-Link Control (HDLC) transport protocol on the physical interface.
[edit interfaces *interface-name*] **set no-keepalives**	T1, T3, SONET, and Multichannel DS3 interfaces	The **no-keepalives** statement at this level disables the sending of keepalives on the physical interface.
show interfaces *interface-name* terse	T1, T3, and SONET interfaces	Display summary information about interfaces. (Use to display the status of the logical interfaces for these interfaces.)
ping interface t1-*x/y/z local-ip-address* **bypass-routing count 1000 rapid**	All interfaces	Check the reachability of network hosts by sending **ICMP ECHO_REQUEST** messages to elicit **ICMP ECHO_RESPONSE** messages from the specified host. Use the **bypass-routing** option to ping a local system through an interface that has no route through it. The **count** option sends 1000 ping requests through the system. Type **Ctrl+C** to interrupt a **ping** command.
show interfaces *interface-name* extensive	All interfaces	Display very detailed interface information about a specific interface.

Locating Interface Alarms

Problem Locating alarms and errors for the media can be a simple process.

Solution To locate interface alarms and errors, use the **show interfaces *interface-name* extensive** command and examine the output for active alarms and defects.

Determining ATM Interface Type

Checklist for Determining ATM Interface Type

Purpose To determine the type of Asynchronous Transfer Mode (ATM) interface on your router.

Action Table 21 on page 305 provides the links and commands for determining the type of ATM interface on your router.

Table 21: Checklist for Determining ATM Interface Type

Tasks	Command or Action
"Determining the ATM Interface Type and Configuration" on page 306	
1. Determining the ATM Interface Type on page 306	**show chassis hardware** NOTE: For ATM1 and ATM2 interfaces.
2. Identifying the ATM Interface Type on page 307	**show chassis hardware** NOTE: For ATM MIC interfaces.
3. Verifying the ATM Configuration on page 308	
a. Verifying the Configuration of an ATM1 Interface on page 308	**show configuration interfaces at-*fpc/pic/port***
b. Verifying the Configuration of an ATM2 IQ Interface on page 309	**show configuration interfaces at-*fpc/pic/port***
c. Verifying the Configuration of an ATM MIC Interface on page 310	**show configuration interfaces at-*fpc/pic/port***
"Examples of Incorrect Configurations of ATM Options" on page 311	
1. Verifying the Configuration of the VCI on an ATM1 Interface on page 311	**show configuration interfaces at-*fpc/pic/port*** **show interfaces terse at-*fpc/pic/port*** **edit** **edit interfaces *interface-name* atm-options vpi *vpi-identifier* maximum-vcs *maximum-vcs*** **show** **commit** **show configuration interfaces at-*fpc/pic/port*** **run show interfaces terse at-*fpc/pic/port***
2. Verifying the Configuration of the VCI on an ATM2 IQ Interface on page 312	**show configuration interfaces at-*fpc/pic/port*** **show interfaces terse at-*fpc/pic/port*** **edit** **edit interfaces *interface-name* atm-options vpi *vpi-identifier*** **delete maximum-vcs** **show** **commit** **show configuration interfaces at-*fpc/pic/port*** **run show interfaces terse at-*fpc/pic/port***

Table 21: Checklist for Determining ATM Interface Type *(continued)*

Tasks	Command or Action
3. Verifying the Configuration of Promiscuous Mode on an ATM2 IQ Interface on page 313	**show configuration interfaces at-*fpc/pic/port*** **show interfaces terse at-*fpc/pic/port*** **edit** **set interfaces *interface-name* atm-options pic-type atm 2** **show** **commit** **show configuration interfaces at-*fpc/pic/port*** **run show interfaces terse at-*fpc/pic/port***

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 306
2. Verifying the ATM Configuration on page 308

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.**

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 22 on page 308 lists the **show chassis hardware** command output fields.

Table 22: 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.

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.

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.

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.

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.

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:

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.

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.

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.

Related Documentation

- Investigating Interface Steps and Commands on page 301
- Monitoring ATM Interfaces on page 315
- Using Loopback Testing for ATM Interfaces on page 336
- Locating ATM Alarms and Errors on page 348

Monitoring ATM Interfaces

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 23 on page 315 provides the links and commands for monitoring ATM interfaces.

Table 23: Checklist for Monitoring ATM Interfaces

Tasks	Command or Action
“Monitoring ATM Interfaces” on page 316	**show interfaces terse at***
“Monitoring ATM1 Interfaces” on page 317	
1. Displaying the Status of a Specific ATM1 Interface on page 317	**show interfaces at-*fpc/pic/port***
2. Displaying Extensive Status Information for a Specific ATM1 Interface on page 317	**show interfaces at-*fpc/pic/port* extensive**
3. “Monitoring Statistics for an ATM1 Interface” on page 319	**monitor interface at-*fpc/pic/port***
“Monitoring ATM2 IQ Interfaces” on page 321	
1. Displaying the Status of a Specific ATM2 IQ Interface on page 321	**show interfaces terse at-*fpc/pic/port*** **show interfaces at-*fpc/pic/port***
2. Displaying Extensive Information for a Specific ATM2 Interface on page 323	**show interfaces at-*fpc/pic/port* extensive**
3. Monitoring Statistics for an ATM2 Interface on page 328	**monitor interface at-*fpc/pic/port***
“Monitoring ATM MIC Interfaces” on page 329	
1. Displaying the Status of a Specific ATM MIC Interface on page 329	**show interfaces terse at-*fpc/pic/port*** **show interfaces at-*fpc/pic/port***
2. Displaying Extensive Information for a Specific ATM MIC Interface on page 331	**show interfaces at-*fpc/pic/port* extensive**
3. Monitoring Traffic and Error Statistics for an ATM MIC Interface on page 334	**monitor interface at-*fpc/pic/port***

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 305 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 24 on page 316 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 305 for information on how to determine the ATM interface type.

Table 24: Status of ATM Interfaces

Physical Interface	Logical Interface	Status Description
at-2/0/0 **Admin Up** **Link Up**	**at-2/0/0.100** **Admin Up** **Link Up**	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.
at-2/0/1 **Admin Up** **Link Down**	**at-2/0/1.10** **Admin Up** **Link Down**	The physical link is down on this interface and therefore the logical interface is down also.

Monitoring ATM1 Interfaces

To monitor an ATM1 interface, follow these steps:

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 317 to display more extensive information about the ATM interface and the physical interface that is down.

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:
```

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 348 for an explanation of ATM alarms.

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.

Monitoring ATM2 IQ Interfaces

To monitor an ATM2 interface, follow these steps:

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 323 to display more extensive information about the ATM interface and the physical interface that is down.

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 348 for an explanation of ATM alarms.

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.

Monitoring ATM MIC Interfaces

To monitor the status of ATM MIC interfaces, perform the following tasks:

- Displaying the Status of a Specific ATM MIC Interface on page 329
- Displaying Extensive Information for a Specific ATM MIC Interface on page 331
- Monitoring Traffic and Error Statistics for an ATM MIC Interface on page 334

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: 2048, 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: Sendbcast-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 331 to display more extensive information about the ATM interface and the physical interface that is down.

Table 25 on page 331 lists the **show interfaces terse** command output fields.

Table 25: 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: 2048, 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: Sendbcast-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 348 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*.

Related Documentation

- Investigating Interface Steps and Commands on page 301
- Determining ATM Interface Type on page 304
- Using Loopback Testing for ATM Interfaces on page 336
- Locating ATM Alarms and Errors on page 348

Using Loopback Testing for ATM Interfaces

Checklist for Using Loopback Testing for ATM Interfaces

Purpose To use loopback testing for ATM interfaces.

Action Table 26 on page 336 provides links and commands for using loopback testing for ATM interfaces.

Table 26: Checklist for Using Loopback Testing for ATM Interfaces

Tasks	Command or Action
"Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface" on page 337	
1. Creating a Loopback on page 338	
a. Creating a Physical Loopback on page 338	Connect the transmit port to the receive port.
b. Configuring a Local Loopback on page 338	**[edit interfaces *interface-name* (sonet-options | t3-options)]** **set loopback local** **show** **commit**

Table 26: Checklist for Using Loopback Testing for ATM Interfaces *(continued)*

Tasks	Command or Action
2. Setting Clocking to Internal on page 339	**[edit interfaces *interface-name*]** **set clocking internal** **show** **commit**
3. Verifying That the ATM Interface Is Up on page 340	**show interfaces at-*fpc/port/pic***
4. Clearing ATM Interface Statistics on page 342	**clear interfaces statistics at-*fpc/port/pic***
5. Pinging the ATM Interface on page 342	**ping interface at-*fpc/port/pic local-IP-address* bypass-routing count 1000 rapid**
6. Checking for ATM Interface Error Statistics on page 343	**show interfaces at-*fpc/port/pic* extensive**
"Diagnosing a Suspected Circuit Problem" on page 346	
1. Creating a Loop from the Router to the Network on page 347	**[edit interfaces *interface-name* (sonet-options | t3-options)]** **set loopback remote** **show** **commit**
2. Creating a Loop to the Router from Various Points in the Network on page 348	Perform Steps 2 through 6 from "Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface" on page 337.

Diagnosing a Suspected Hardware Problem with an ATM1 or ATM2 IQ Interface

Problem 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 338
2. Setting Clocking to Internal on page 339
3. Verifying That the ATM Interface Is Up on page 340
4. Clearing ATM Interface Statistics on page 342
5. Pinging the ATM Interface on page 342
6. Checking for ATM Interface Error Statistics on page 343

Creating a Loopback

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.

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 3 on page 338 illustrates a local loopback configured for an ATM interface.

Figure 3: 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.**

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.

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 27 on page 342.

Table 27: 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.

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 This command clears the interface statistics counters for interface **at-4/0/2** only.

Pinging the ATM Interface

Purpose After you have put the port in a local loopback, run the ping test using the following Junos OS CLI operational mode command:

Action user@host> **ping interface at-*fpc/pic/port-IP-address* bypass-routing count 1000 rapid**

Sample Output

```
user@host> ping interface at-2/0/0.0 192.168.1.1 bypass-routing count 1000 rapid
PING 192.168.1.1 (192.168.1.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 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**, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

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**, or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

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 on page 347
2. Creating a Loop to the Router from Various Points in the Network on page 348

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 4 on page 347 illustrates a loop from a router to the network.

Figure 4: 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

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 337. 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.

Related Documentation

- Investigating Interface Steps and Commands on page 301
- Determining ATM Interface Type on page 304
- Monitoring ATM Interfaces on page 315
- Locating ATM Alarms and Errors on page 348

Locating ATM Alarms and Errors

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 28 on page 348 provides links and commands for checking ATM alarms and errors.

Table 28: List of Common ATM Alarms and Error

Tasks	Command or Action
"Displaying ATM1 and ATM2 Alarms and Errors" on page 348	**show interfaces at-*fpc/pic/port* extensive** See *List of Common SONET Alarms and Errors*. See *Checklist of Common T3 Alarms and Errors*.

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 305.

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:
    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
```

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 29 on page 353 describes the input and output errors that appear in the extensive output for an ATM interface.

Table 29: ATM Interface Input and Output Errors

Error	Description	Reason for Error
Input Errors		
Errors	Sum of the incoming frame aborts and frame check sequence (FCS) errors.	
Drops	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.
Invalid VCs	Number of cells that arrived for a nonexistent virtual circuit (VC).	
Framing errors	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.	
Policed discards	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.
L3 incompletes	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.
L2 channel errors	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.
L2 mismatch timeouts	Count of malformed or short packets.	Count of malformed or short packets that cause the incoming packet handler to discard the frame as unreadable.
Output Errors		
Carrier transitions	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.

Table 29: ATM Interface Input and Output Errors *(continued)*

Error	Description	Reason for Error
Errors	Sum of the outgoing frame aborts and FCS errors.	
Drops	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.
Aged packets	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 30 on page 354 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 30: ATM Active Alarms and Defects

Alarm	Description
AIS	Alarm indication signal
AIS-L	Alarm indication signal (line)
AIS-P	Alarm indication signal (path)
BERR	Bit error rate
BERR-SD	Bit error rate defect–signal degrade
BERR-SF	Bit error rate fault–signal fail
EXZ	Excessive zeros
FERF	Far end receive failures
IDLE	Idle code detected
LCD	Loss of cell delineation
LCV	Line code violation
LOC	Loss of cell delineation
LOF	Loss of frame

Table 30: ATM Active Alarms and Defects *(continued)*

Alarm	Description
LOL	Loss of light
LOP	Loss of pointer
LOS	Loss of signal
PLL	Phase-locked loop out of lock
PLCP_LOF	Loss of PLCP frame alarm
PLCP_YLW PLCP	Alarm at the remote end
PLM-P	Payload label mismatch
RDI	Remote defect indication
RDI-L	Remote defect indication (line)
RDI-P	Remote defect indication (path)
REI	Remote error indication
SEF	Severely errored frame
UNEQ	Unequipped
YLW	Remote defect indication (yellow alarm)

Related Documentation

- Investigating Interface Steps and Commands on page 301
- Determining ATM Interface Type on page 304
- Monitoring ATM Interfaces on page 315
- Using Loopback Testing for ATM Interfaces on page 336

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 22 on page 308 lists the **show chassis hardware** command output fields.

Table 31: 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.

Related Documentation

- Verifying the Configuration of an ATM MIC Interface on page 310
- Monitoring ATM MIC Interfaces on page 329
- Monitoring Traffic and Error Statistics for an ATM MIC Interface on page 334
- *show chassis hardware*

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.

Monitoring ATM MIC Interfaces

To monitor the status of ATM MIC interfaces, perform the following tasks:

- Displaying the Status of a Specific ATM MIC Interface on page 357
- Displaying Extensive Information for a Specific ATM MIC Interface on page 359
- Monitoring Traffic and Error Statistics for an ATM MIC Interface on page 362

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: 2048, 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: Sendbcast-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 331 to display more extensive information about the ATM interface and the physical interface that is down.

Table 25 on page 331 lists the **show interfaces terse** command output fields.

Table 32: 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: 2048, 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: Sendbcast-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 348 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*.

Related Documentation

- Verifying the Configuration of an ATM MIC Interface on page 310
- Identifying the ATM Interface Type on page 307

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: 2048, 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: Sendbcast-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 331 to display more extensive information about the ATM interface and the physical interface that is down.

Table 25 on page 331 lists the **show interfaces terse** command output fields.

Table 33: 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: 2048, 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: Sendbcast-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 348 for an explanation of ATM alarms.

For information about the output fields of the **show interfaces extensive** command, see **show interfaces (ATM)**.

PART 5

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