Chapter 1
Configuring ATM

This chapter introduces basic Asynchronous Transfer Mode (ATM) concepts, describes features of the ATM interfaces, and provides information for configuring ATM on E-series routers.

This chapter contains the following sections:

Overview

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 Interfaces

An ATM port can have a major interface and one or more subinterfaces. An ATM subinterface is a mechanism that enables a single physical ATM interface to support multiple logical interfaces. Several logical interfaces can be associated with a single physical interface.

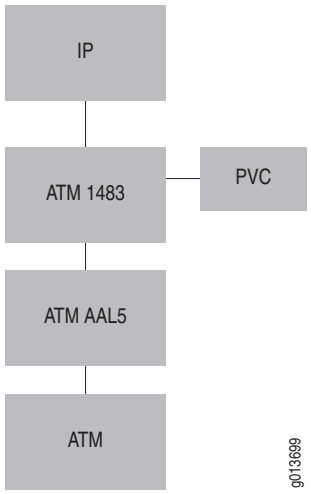
ATM subinterfaces meet the specifications in RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5 (September 1999), which replaces RFC 1483. All references to ATM subinterfaces in this chapter are still to ATM 1483 subinterfaces.

ATM 1483 subinterfaces are identified by user-defined numbers. To select a subinterface, you append a subinterface number to the port-level **interface atm** command.

When you create an ATM 1483 subinterface, you must configure a permanent virtual circuit (PVC). Protocols such as ATM require one or more virtual circuits over which data traffic is transmitted to higher layers in the protocol stack.

Figure 1 shows a typical point-to-point ATM interface column.

Figure 1: ATM Interface Column



ATM Physical Connections

ATM interfaces and subinterfaces support two types of connections—*point-to-point* and *multipoint*. The router defaults to point-to-point.

- Point-to-point—Indicates a standard connection; for example, connecting two ATM end stations
- Multipoint—Indicates a single-source end system connected to multiple destination end systems. Multipoint indicates a nonbroadcast multiaccess (NBMA) interface. See *ATM NBMA* on page 11.

Depending on the type of connection you choose, you can specify one or more PVCs on each interface. For a standard point-to-point ATM interface, you configure only one PVC. For NBMA ATM connections, you configure multiple circuits.

ATM Virtual Connections

A *virtual connection* (VC) defines a logical networking path between two endpoints in an ATM network. ATM *cells* travel from one point to the other over a virtual connection. An ATM cell is a package of information that is always 53 bytes in length, unlike a frame or packet, which has a variable length. An ATM cell has a cell header and a *payload*. The payload contains the user data.

The cell header includes an 8-bit virtual path identifier (VPI) and a 16-bit virtual channel identifier (VCI).

An ATM network can have two types of VCs, depending on the addressing used to switch the traffic:

- Virtual channel connection (VCC)
- Virtual path connection (VPC)

Virtual Channel Connection

A VCC uses all the addressing bits of the cell header to move traffic from one link to another. The VCC is formed by joining a series of virtual channels (VCs), which are logical circuits uniquely identified for each link of the network. On a VCC, switching is done based on the combined VPI and VCI values.

Virtual Path Connection

A VPC uses the higher-order addressing bits of the cell header to move traffic from one link to another. A VPC carries many VCCs within it. A VPC can be set up permanently between two points, and then switched.

VCCs can be assigned within the VPC easily and quickly. The VPC is formed by joining a series of virtual paths, which are the logical groups of circuits uniquely defined for each link of the network. On a VPC, switching is done based on the VPI value only.

ATM SVCs

JUNOSe software does not support configuration and monitoring of ATM switched virtual circuits (SVCs) on the router.

ATM Adaptation Layer

The ATM Adaptation Layer (AAL) defines the conversion of user information into cells by segmenting upper-layer information into cells at the transmitter and reassembling them at the receiver. AAL1 and AAL2 handle intermittent traffic, such as voice and video, and are not relevant to the router. AAL3/4 and AAL5 support data communications by segmenting and reassembling packets.

E-series routers support the following AAL5 encapsulation types as specified in RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5 (September 1999), which replaces RFC 1483:

- aal5snap—LLC/SNAP
- aal5mux ip—VC-based multiplexing
- aal5autoconfig—LLC/SNAP or VC-based multiplexing. (See *Chapter 15, Configuring Dynamic Interfaces*.)
- aal5all—Martini encapsulation

NOTE: The E120 router and the E320 router do not support Martini encapsulation (aal5all) in the current release.

Local ATM Passthrough

E-series routers support local ATM passthrough for ATM layer 2 services over Multiprotocol Label Switching (MPLS). Local ATM passthrough enables the router to emulate packet-based ATM switching. The ATM passthrough feature is useful for customers who run IP in most of their network but still have to carry a small amount of native ATM traffic.

Local ATM passthrough uses ATM Martini encapsulation to emulate ATM switch behavior. You can create pairs of cross-connected ATM VCs within the router. The router then passes AAL5 traffic between two VCs, regardless of the contents of the packets.

You can also use AAL0 encapsulation when you configure a local ATM passthrough connection. AAL0 encapsulation causes the router to receive raw ATM cells on this circuit and to forward the cells without performing AAL5 packet reassembly.

For more information, see *JUNOSe BGP and MPLS Configuration Guide, Chapter 5, Configuring Layer 2 Services over MPLS*.

VCC Cell Relay Encapsulation

E-series routers support virtual channel connection (VCC) cell relay encapsulation for ATM layer 2 services over MPLS. VCC cell relay encapsulation is useful for voice-over-ATM applications that use AAL2-encapsulated voice transmission.

VCC cell relay encapsulation enables the router to emulate ATM switch behavior by forwarding individual ATM cells over an MPLS pseudowire (also referred to as an MPLS tunnel) created between two ATM VCCs, or as part of a local ATM passthrough connection between two ATM 1483 subinterfaces on the same router. The E-series implementation conforms to the required N-to-1 cell mode encapsulation method described in the Martini draft, Encapsulation Methods for Transport of ATM Over MPLS Networks—draft-ietf-pwe3-atm-encap-07.txt (April 2005 expiration), with the provision that only a single ATM virtual circuit (VC) can be mapped to an MPLS tunnel.

For more information, see *JUNOSe BGP and MPLS Configuration Guide, Chapter 5, Configuring Layer 2 Services over MPLS.*

NOTE: The E120 router and the E320 router do not support ATM over MPLS with VCC cell relay encapsulation in the current release.

Traffic Management

The scheduling priority for traffic classes depends on the type of router that you have. Table 4 describes the scheduling priorities for each type of router.

Table 4: Scheduling Priorities for Traffic Classes

Scheduling Priority (from Highest to Lowest)	ERX-7xx Models, ERX-14xx Models, or the ERX-310 Router	E120 Router and E320 Router
1	The following traffic classes are prioritized equally: ■ CBR ■ VBR-RT	CBR
2	The following traffic classes are prioritized equally: ■ VBR-NRT ■ UBR with a peak cell rate (PCR)	VBR-RT
3	UBR without PCR	VBR-NRT
4	–	UBR with or without PCR

The level of support for traffic management depends on the specific I/O module or IOA. See *Supported Features* on page 10.

Connection Admission Control

ATM networks use connection admission control (CAC) to determine whether to accept a connection request, based on whether allocating the connection's requested bandwidth causes the network to violate the traffic contracts of existing connections. CAC is a set of actions that the network takes during connection setup or renegotiation.

The router supports CAC on PVCs on major ATM interfaces. This implementation of CAC determines available bandwidth based on port subscription bandwidth. The router maintains available bandwidth for each major ATM port. Bandwidth for VP tunnels is included in CAC computations.

Table 5 lists the traffic parameter that the router uses for each service category to compute the bandwidth that the connection requires. For example, the peak cell rate is used to calculate how much bandwidth is required for CBR connections.

Table 5: Traffic Parameters Used to Compute Bandwidth

Service Category	Traffic Parameter Used to Calculate Required Bandwidth
CBR	PCR
VBR-RT	SCR
VBR-NRT	SCR
UBR	UBR bandwidth configured on the ATM major interface
UBR with PCR	UBR bandwidth configured on the ATM major interface

How CAC Works

With no connections, the available bandwidth is equal to the subscription port bandwidth. While connections are requested, the required bandwidth, which is based on the service category and traffic parameters of the connection, is compared against the available port bandwidth. If sufficient bandwidth is available, the router accepts the connection and updates the available port bandwidth accordingly.

Similarly, when a connection is deleted, the available port bandwidth is updated accordingly.

Configuring CAC

You enable and configure CAC on an ATM major interface using the **atm cac** command. When you enable CAC on an ATM interface, you can optionally specify a subscription bandwidth and a UBR weight:

- The subscription bandwidth can be greater than the effective port bandwidth to allow oversubscription. The default value of the subscription bandwidth is the effective bandwidth of the ATM port.

- The UBR weight enables you to limit the number of UBR connections by assigning a bandwidth or weight to each UBR or VBR with a PCR connection

CAC and ATM Bulk Configuration

You cannot configure CAC on an ATM interface on which you have created a bulk-configured virtual circuit (VC) range for use by a dynamic ATM 1483 subinterface. Conversely, you cannot create a bulk-configured VC range on an ATM interface on which you have configured CAC. The router rejects these configurations, which causes them to fail.

If you are upgrading to the current JUNOSe software release from a lower-numbered release, configurations that use CAC and bulk configuration on the same ATM interface continue to work. However, we recommend that you disable CAC on these ATM interfaces to ensure continued compatibility with future JUNOSe releases.

For information about how to use the **atm cac** command to configure CAC, see *Setting Optional Parameters* on page 23. For information about how to use the **atm bulk-config** command to create a bulk-configured VC range, see *Bulk Configuration of VC Ranges* in *Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.

ILMI

ATM interfaces support the ATM Forum integrated local management interface (ILMI), versions 3.0, 3.1, and 4.0. An important feature of ILMI is the ability to poll or send keepalive messages across the UNI. ATM interfaces always respond to such messages, which are sent by an ATM peer device. Optionally, you can configure ATM major interfaces to generate keepalive messages, a process that enables a continuous ATM-layer connectivity verification; if the ATM peer stops responding to keepalive messages, the router disables the ATM interface.

The ATM interface is not reenabled until the keepalive message's responses are received (or until the keepalive feature is disabled on the ATM port). To enable ILMI and control the generation of keepalive messages, use the **atm ilmi-enable** and **atm ilmi-keepalive** commands.

VPI/VCI Address Ranges

The VPI/VCI address ranges allowed on ATM interfaces are module dependent. Certain modules on ERX-14xx models, ERX-7xx models, or the ERX-310 router have a fixed allocation scheme, whereas others have a configurable allocation scheme. In the configurable allocation scheme, a bit range is shared across the VPI and VCI fields.

For example, if an ATM interface has a bit range of 18, and 4 bits are allocated to the VPI space, then 14 bits are left for the VCI space. The resulting numeric range is 0 to 2^n-1, where n is the number of bits for each space. Completing the example, if 4 bits were allocated for the VPI space and 14 for the VCI space, the configurable range would be 0 to 15 for VPI and 0 to 16,383 for the VCI space. To configure the bit range, use the **atm vc-per-vp** command.

See *Supported Features* on page 10 for details on how various line module and I/O modules support configurable VPI/VCI address ranges.

NOTE: The E120 router and the E320 router support the full VPI/VCI address range; therefore, it has a fixed allocation scheme.

VP Tunneling

Virtual path (VP) tunneling enables traffic shaping to be applied to the aggregation of all VCs within a single VP. Thus, VP tunnels can be used to ensure that the total traffic transmitted on a VP does not exceed the specified PCR. VP tunneling uses a round-robin algorithm to guarantee fairness among all of the VCs within the tunnel.

You can change the PCR associated with a tunnel even when VCs have already been configured on the tunnel. The individual VCs within a tunnel must be specified as UBR VCs. In other words, they may not have their own traffic-shaping parameters.

The level of support for VP tunneling is dependent on the specific I/O module. See *Supported Features* on page 10 for details.

Platform Considerations

You can configure ATM interfaces on the following E-series routers:

- E120 router
- E320 router
- ERX-1440 router
- ERX-1410 router
- ERX-710 router
- ERX-705 router
- ERX-310 router

Module Requirements

For information about the modules that support ATM interfaces on ERX-14xx models, ERX-7xx models, and the ERX-310 router:

- See *ERX Module Guide, Table 1, Module Combinations* for detailed module specifications.
- See *ERX Module Guide, Appendix A, Module Protocol Support* for information about the modules that support ATM.

For information about the modules that support ATM interfaces on theE120 router and the E320 router:

- See *E120 and E320 Module Guide, Table 1, Modules and IOAs* for detailed module specifications.
- See *E120 and E320 Module Guide, Appendix A, IOA Protocol Support* for information about the modules that support MLPPP.

Interface Specifiers

The configuration task examples in this chapter use the *slot*/*port*[.*subinterface*] format to specify an ATM interface. However, the interface specifier format that you use depends on the router that you are using.

For ERX-7xx models, ERX-14xx models, and ERX-310 routers, use the *slot*/*port*[.*subinterface*] format. For example, the following command specifies ATM 1483 subinterface 10 on slot 0, port 1 of an ERX-7xx model, ERX-14xx model, or ERX-310 router.

```
host1(config)#interface atm 0/1.10
```

For E120 routers and E320 routers, use the *slot*/*adapter*/*port*[.*subinterface*] format, which includes an identifier for the bay in which the I/O adapter (IOA) resides. In the software, adapter 0 identifies the right IOA bay (E120 router) and the upper IOA bay (E320 router); adapter 1 identifies the left IOA bay (E120 router) and the lower IOA bay (E320 router). For example, the following command specifies ATM 1483 subinterface 20 on slot 5, adapter 0, port 0 of an E120 router or E320 router.

```
host1(config)#interface atm 5/0/0.20
```

For more information about supported interface types and specifiers on E-series routers, see *Interface Types and Specifiers* in *JUNOSe Command Reference Guide, About This Guide*.

References

For more information about ATM interfaces, consult the following resources:

- ATM Forum—ATM User-Network Interface Specification, Version 3.0 (September 1993)
- ATM Forum—ATM User-Network Interface Specification, Version 3.1 (September 1994)
- ATM Forum—Integrated Local Management Interface (ILMI) Specifications, Versions 3.0, 3.1, and 4.0 (September 1996)
- ATM Forum—Traffic Management Specification, Version 4.0 (April 1996)
- ITU-T Draft Recommendation I.363 (AAL5 support) (January 1993)
- RFC 2390—Inverse Address Resolution Protocol (September 1998)
- RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5 (September 1999) (RFC 2684 obsoletes RFC 1483)
- ITU-T Recommendation I.610—B-ISDN Operation and Maintenance Principles and Functions (February 1999)

- Encapsulation Methods for Transport of ATM Over MPLS Networks—draft-ietf-pwe3-atm-encap-07.txt (April 2005 expiration)
- *JUNOSe Release Notes*, *Appendix A*, *System Maximums*—See the Release Notes corresponding to your software release for information about maximum values

NOTE: IETF drafts are valid for only 6 months from the date of issuance. They must be considered as works in progress. Please refer to the IETF Web site at http://www.ietf.org for the latest drafts.

Supported Features

This section describes ATM feature support on E-series modules.

For more information about the physical layer characteristics of the modules described in this section, including the numbering schemes, see the *JUNOSe Physical Layer Configuration Guide*.

Module Capabilities

The level of support for certain ATM capabilities varies depending on the module. Table 6 lists the specific differences in the capabilities of the modules.

The number of VP tunnels varies with the number of ports in the associated line module. For information about the maximum number of ATM VP tunnels supported per port for all line modules, see *JUNOSe Release Notes*, *Appendix A*, *System Maximums*.

NOTE: Support for the OC3 (dual port) line module has been deprecated.

Table 6: ATM Capabilities on Line Modules and I/O Modules

Line Module	I/O Module or IOA	Number of VP Tunnels	VPI/VCI Address Range	Configurable Bit Range	Number of VCs on Each Port	ATM Circuit Traffic Management Types	VP Tunnel Traffic Management Types
OCx/STMx ATM	OC3-4 I/O 4xDS3 ATM I/O	1024	Configurable	20	8000 active 16,000 configured	CBR, UBR, UBR with PCR, VBR-NRT, VBR-RT	CBR, VBR-NRT
OCx/STMx ATM	OC12/STM4 I/O	256	Configurable	20	8000 active 16,000 configured	CBR, UBR, UBR with PCR, VBR-NRT, VBR-RT	CBR, VBR-NRT
OC3/STM1 GE/FE	OC3-2 GE APS I/O	1024	Configurable	20	8000 active 16,000 configured	CBR, UBR, UBR with PCR, VBR-NRT, VBR-RT	CBR, VBR-NRT

Table 6: ATM Capabilities on Line Modules and I/O Modules (continued)

Line Module	I/O Module or IOA	Number of VP Tunnels	VPI/VCI Address Range	Configurable Bit Range	Number of VCs on Each Port	ATM Circuit Traffic Management Types	VP Tunnel Traffic Management Types
ES2 4G LM	ES2-S1 OC3-8 STM1 ATM IOA	1 IOA per slot: 2048 2 IOAs per slot: 4096	Fixed VPI: 0–255 VCI: 0–65535	–	8000 active 16,000 configured	CBR, UBR, UBR with PCR, VBR-NRT, VBR-RT	CBR, VBR-NRT
ES2 4G LM	ES2-S1 OC12-2 STM4 ATM IOA	1 IOA per slot: 512 2 IOAs per slot: 1024	Fixed VPI: 0–255 VCI: 0–65535	–	8000 active 16,000 configured	CBR, UBR, UBR with PCR, VBR-NRT, VBR-RT	CBR, VBR-NRT

Virtual Channel Support

The number of virtual channels (VCs) that the router supports on each port varies depending on the E-series router and module you are using. For information about the maximum number of ATM VCs supported per chassis, per module, and per port, see *JUNOSe Release Notes*, *Appendix A*, *System Maximums*.

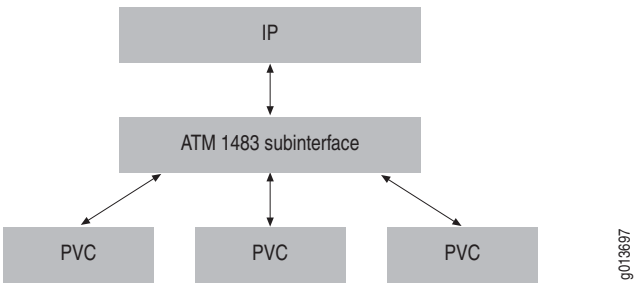
ATM NBMA

The software supports nonbroadcast multiaccess (NBMA) networks, which interconnect more than two routers and have no broadcast capabilities.

NOTE: The E120 router and the E320 router do not support ATM NBMA in the current release.

An ATM NBMA network can be thought of as an interface stack with a single IP interface at the top, eventually fanning out to multiple independent PVCs. See Figure 2.

Figure 2: NBMA Interface Stack



Unlike standard point-to-point ATM interfaces and broadcast-oriented Ethernet interfaces, NBMA interfaces form a point-to-multipoint connection. For example, you can use NBMA to connect a router to multiple stations.

An NBMA interface consists of a single ATM 1483 subinterface that has two or more VCs. You can add circuits to an existing ATM 1483 subinterface at any time. New circuits become usable after they have valid ARP table entries. NBMA circuits support only IP directly over ATM 1483.

The software restricts NBMA interfaces so that all circuits reside on the same physical interface. An NBMA interface can use as many PVCs as are available on a physical port.

ARP Table

To maintain the Address Resolution Protocol (ARP) table, you can use either static mapping via the CLI or Inverse ARP (InARP). InARP provides a way of determining the IP address of the device at the far end of a circuit. For NBMA interfaces, InARP enables automatic creation of ARP table entries for each circuit on the interface.

You must enable InARP when you create a PVC by using the **atm pvc** command. After you configure InARP, a protocol mapping between an ATM PVC and a network address is learned dynamically as a result of the exchange of InARP packets.

Static Map Versus Inverse ARP

If the device at the other end of a circuit does not support InARP, static mapping is required for that circuit. One of these two methods must be used to generate an ARP table entry for each circuit of the NBMA interface.

InARP and static mapping are complementary within an NBMA subinterface, but are not compatible with regard to individual circuits. If InARP is configured on a circuit, the corresponding virtual circuit descriptor (VCD) cannot be present in a static map applied to that interface.

Aging

ARP table entries, with the exception of those declared static, are aged out based on an aging interval defined on a subinterface basis. For the purposes of aging, entries produced via a static map are treated as static ARP table entries. InARP-generated entries are also treated as static; however, the InARP state machine automatically removes entries that cannot be successfully refreshed after three successive failed InARP requests.

Removing Circuits

If a circuit is removed, it is also removed from the ARP table, but not from the static map. If the circuit is reconfigured, a new ARP table entry is generated from the existing map entry. If the circuit uses InARP, the ARP table entry is immediately removed on removal of the circuit.

If a subinterface is removed, all associated circuits and their associated ARP table entries are removed.

Operations, Administration, and Management of ATM Interfaces

ATM interfaces support the OAM standards of the ITU, per recommendation I.610. OAM provides VC/VP integrity and fault and performance management. The E-series router supports F4 and F5 ATM OAM fault management, loopback, and continuity check (CC) cells. These cells perform fault detection and notification, loopback testing, and link integrity.

ATM uses F4 and F5 cell flows as follows:

- F4—Used in VPs
- F5—Used in VCs

ATM interfaces always generate and validate CRC-10 checksums on OAM cells.

For information about configuring OAM on the router, see the following sections:

- *Configuring OAM* on page 30
- *Configuring F5 OAM for Data PVCs* on page 48

End-to-End and Segment Endpoints

An ATM connection consists of a group of points. This OAM implementation provides management for the following points:

- Connection endpoint—The end of a VC/VP connection where the ATM cells are terminated
- Segment endpoint—The end of a connection segment

Fault Management

ATM uses two types of fault management cells to convey defect information to the endpoints of a VP/VC:

- Alarm indication signal (AIS) cells, which are used to indicate a fault to the downstream endpoint. AIS cells contain defect type and defect location fields, which optionally convey information about the type of defect detected and the location of the defect.
- Remote defect indication (RDI) cells, which are received from the remote endpoint of the VP/VC and indicate an interruption in the cell transfer capability of the VP/VC.

Connecting points in the VP/VC that detect a fault send AIS cells in the downstream direction to the endpoint of the VP/VC. Upon receipt of AIS cells, the downstream endpoint generates RDI cells in the upstream direction to alert all connecting points and the remote endpoint of an interruption in the cell transfer capability of the VP/VC.

If fault management detects a failure condition (because of arrival of AIS or RDI cells), the router disables the corresponding VC until the fault condition is no longer detected.

How the ATM Interface Handles AIS Cells

Nodes that detect a failure send AIS cells to the downstream endpoint. Because the ATM interface is an endpoint and there is no downstream neighbor to an ATM endpoint, the ATM interface never generates AIS cells. The ATM interface responds to the receipt of AIS cells as follows:

1. When an ATM interface receives a configurable number of F4 or F5 AIS cells, it enters the AIS state.

2. While in the AIS state, the ATM interface sends F4 or F5 RDI cells to the remote endpoint. It sends the RDI cells at the rate of one cell per second for as long as the AIS condition exists.

   For all RDI cells sent, the defect type and defect location fields contain the values from the received AIS cells.

3. RDI cell generation stops when one of the following conditions occurs:

   - The interface receives an F4 or F5 loopback cell or an F4 or F5 CC cell.
   - The interface does not receive an AIS cell for a configurable time period.
   - The OAM VC status field of the **show atm vc atm** command shows that the circuit is in AIS state.

How the ATM Interface Handles RDI Cells

RDI cells received from the remote endpoint of the VP/VC indicate an interruption in the cell transfer capability of the VP/VC. For example, the remote endpoint of a VC receives an F5 AIS cell, enters the AIS state, and transmits F5 RDI cells for the duration of the AIS condition. On receipt of a configurable number of F4 or F5 RDI cells, the ATM interface declares an RDI state but does not generate OAM fault management cells in response to the condition. The ATM interface leaves the RDI condition when no RDI cells have been received for a configurable time period.

The OAM VC status field of the **show atm vc atm** command shows whether the circuit is in RDI state.

Continuity Verification

CC cells provide continual monitoring of a connection on a segment or end-to-end basis. To verify the integrity of the link, you can set up a VP or VC to regularly send or receive CC cells at either the segment level or at the end-to-end level.

The CC cell source generates the CC cells, and the sink receives and processes the cells. You can set up a VP or VC as the source, the sink, or both the source and the sink. If you enable a VP or VC as a CC cell source, it generates CC cells. The VP or VC counts CC cells whether or not CC cell flow is enabled. You can enable CC cells only on data circuits, not on control circuits, such as ILMI or signaling circuits.

Activation and Deactivation Cells

To enable and disable CC cell flows, ATM OAM uses activation and deactivation cells:

- To enable a CC cell flow, the router sends activation OAM cells to the peer. The peer replies with a confirmation or denial. If the CC sink point is not activated, all received CC cells are dropped. (See *Activating CC Cell Flow* for more details.)
- To disable a CC cell flow, the router sends deactivation OAM cells to the peer. The peer replies with a confirmation or denial.

Activating CC Cell Flow

When the router sends a CC activation cell to the peer, one of the following occurs:

- If the router receives a positive response (Activation Confirmed), the VC or VP goes to CC active state, and CC is enabled on the VC or VP.
- If the router receives a negative response (Activation Req. Denied), the VC or VP goes to CC failed state, and CC is not enabled on the VC or VP.
- If the router does not receive a response within 5 seconds, it sends another activation cell. This process is repeated three times. If the router does not receive a response, it stops the activation process.

If the VC or VP is the source point, CC cell generation starts as soon as the router sends the activation request to the peer. CC cell generation stops if the CC fails, when the maximum number of retries is reached, or when the deactivation process is complete.

Deactivating CC Cell Flow

The process of sending a deactivation request is the same as for activation cells except that deactivation cells are sent instead.

Also, the **atm oam flush** command causes the router to send a deactivation request to the peer and suspend all CC operations. Therefore, we recommend that you disable CC cell generation and transmission on all VCs before issuing **atm oam flush**.

After CC Cell Flow Is Enabled

If the VC or VP is set up as the source point, the ATM interface sends one CC cell per second. CC cell generation stops if one of the following conditions occur:

- The ATM interface goes down.
- You disable OAM CC on the circuit by using the **atm pvc** command.
- The peer deactivates the OAM CC cell flow.
- You disable OAM cell reception and transmission on the ATM interface by using the **atm oam flush** command.

If the VP is set up as a CC sink point and no CC cell is received for 4 seconds, the VP goes to AIS state and sends one RDI cell per second.

To view the current state of the activation or deactivation process, including statistics, use the **show atm oam** command for VPs and the **show atm vc atm interface** command for VCs.

Loopback

You can use loopback cells to verify connectivity between VP/VC endpoints, as well as segment endpoints within the VP/VC. You can use these tests to perform fault isolation over the VP/VC.

The ATM interface supports VC integrity, which generates F5 end-to-end loopback cells. It also supports ATM ping, which generates F4 and F5 segment and end-to-end loopback cells to test the reachability of an endpoint or a segment endpoint.

VC Integrity

VC integrity is used to monitor the operational status of an individual VC. VC integrity provides continuous ATM VC-layer connectivity verification by periodically sending F5 end-to-end loopback cells on individual PVCs to verify end-to-end connectivity. You can set the frequency with which loopback cells are transmitted for an individual VC.

If VC integrity is enabled, the peer ATM host must respond to the router's loopback cells, or the circuit will be disabled. The ATM interface does not reenable the circuit until it receives loopback responses or until local VC integrity is disabled.

You can set the following VC integrity parameters for an individual VC with the **oam retry** command. For more information, see **oam retry** on page 51.

- The retry frequency with which loopback cells are transmitted when the router verifies the down status of the circuit; that is, when the peer ATM host does not respond to a loopback cell
- The retry frequency with which loopback cells are transmitted when the router verifies the up status of the circuit; that is, when the ATM host resumes responding to a loopback cell
- The number of successive loopback cell responses missed before the router determines that the circuit is down
- The number of successive loopback responses received before the router determines that the circuit is up

VC integrity is a best-effort mechanism that tries to adhere to the loopback cell transmission frequency and retry frequency values configured for each VC without consuming excessive processing time on the line module. When you configure VC integrity for a large number of circuits on the line module, delays in transmitting OAM loopback cells might occur so new subscribers can connect and to maintain existing subscriber connections.

To set up the ATM interface to transmit F5 end-to-end loopback cells over a VC, use the **oam** keyword and an optional frequency with the **atm pvc** command. To send F5 segment loopback cells, use the ATM ping mechanism, described in *ATM Ping*.

F5 loopback receive and transmit statistics are available with the **show atm vc atm** command.

F4 OAM Cells

You can generate F4 loopback cells using the **atm oam** command or the ATM ping mechanism. F4 loopback receive and transmit statistics are available with the **show atm oam** command and include statistics on incoming and outgoing F4 end-to-end and segment loopback cells.

ATM Ping

With ATM ping you can verify whether a connection endpoint or segment point can be reached on a VC or VP. ATM ping uses F4 and F5 loopback cells and is supported only for data circuits and not control circuits (ILMI, signaling circuits). To generate:

- F5 segment loopback cells or end-to-end loopback cells, issue the **ping atm** command on a VC.
- F4 segment loopback cells or end-to-end loopback cells, issue the **ping atm** command on a VP.

You can specify the number of loopback cells that are sent, the location ID, and the timer value. After the interface sends the loopback cells, the timer is started and the interface waits for a response. On receiving the loopback response (or when the timer expires) the ATM interface sends the next cell. This operation is repeated for the number of cells specified.

Because F4 and F5 are OAM cells, disabling receipt and transmission of OAM cells on the ATM interface (by using the **atm oam flush** command) stops all outstanding ping operations on the ATM interface. You need to manually restart the ping operation after you enable receipt and transmission of OAM cells for the interface.

How the ATM Interface Handles Loopback Cells Received

The ATM interface responds to received F4 and F5 loopback cells as indicated in Table 7.

Table 7: Handling of F4 and F5 Loopback Cells Received

Loopback Cell Received	ATM Interface Response
F4 and F5 end-to-end loopback cells and segment loopback cells with the loopback location field set to all 1s (ones) and the loopback indication set.	Clears the loopback indication (sets it to all zeros) and loops back the received cell.
F4 and F5 segment loopback cells with the loopback location field set to all 0s (zeros) and the loopback indication set.	Resets the loopback indication and the location ID to all 1s (ones) and loops back the received cells.

Table 7: Handling of F4 and F5 Loopback Cells Received (continued)

Loopback Cell Received	ATM Interface Response
F4 and F5 end-to-end loopback cells and segment loopback cells with the loopback location field set to the loopback location ID of the ATM interface and the loopback indication set.	Clears the loopback indication and loops back the received cell without resetting the location ID.
F5 end-to-end loopback cells with the loopback location field set to a value other than all 1s and the loopback location ID of the ATM interface.	Discards the cell.
F5 segment loopback cells with the loopback location field set to other than all 1s (ones), set to all 0s (zeros), or set to the loopback location ID of the ATM interface.	Discards the cell.

Automatic Disabling of F5 OAM Services

The router automatically disables all F5 OAM fault management and VC integrity services configured on a VC when you change the administrative status of the corresponding ATM interface, ATM AAL5 interface, or ATM 1483 subinterface from enabled to disabled.

To set the administrative status of an interface to disabled, use the **atm shutdown** command (for an ATM interface), the **atm aal5 shutdown** command (for an ATM AAL5 interface), or the **atm atm1483 shutdown** command (for an ATM 1483 subinterface). You can also use the **shutdown** command to disable the interface.

When F5 OAM is disabled, the OAM VC status field in the **show atm vc atm** command display indicates that the VC is not managed. The VC does not receive or transmit F5 OAM cells while F5 OAM is disabled. For examples of the **show atm vc atm** command display, see **show atm vc atm** on page 89.

When the corresponding ATM interface, ATM AAL5 interface, or ATM 1483 subinterface is reenabled, the router automatically restores F5 OAM services on the associated VCs.

Rate Limiting for F5 OAM Cells

The router implements rate limiting for ATM F5 OAM cells to protect the corresponding ATM interface from denial-of-service (DoS) attacks. The interface discards control packets when the rate of control packets received exceeds the rate limit for ATM interfaces.

An ATM interface has a rate limit control that is non-configurable and always in effect; the rate limit is the same for all ATM interfaces. In addition, each ATM VC maintains its own state and statistics counters for tracking the rate. The rate limit for ATM OAM cells is approximately 5 packets per second.

For an ATM VC, the router increments the InOamCellDiscards statistics counter in the **show atm vc atm** command display to track the number of OAM cells received on this circuit that were discarded. The InOamCellDiscards counter operates on a per-circuit basis, not on a per-interface basis.

For examples of the **show atm vc atm** command display, see **show atm vc atm** on page 89.

Before You Configure ATM

Before you configure an ATM interface, verify that you have installed the physical module (such as an OC3 module) correctly. For more information about preconfiguration procedures, see the *ERX Hardware Guide* or the *E120 and E320 Hardware Guide*.

Also have the following information available:

- Interface specifiers for the ATM interfaces that you want to create

  For more information about specifying ATM interfaces and subinterfaces on E-series routers, see *Interface Types and Specifiers* in *JUNOSe Command Reference Guide, About This Guide*.

- Virtual path and channel numbers for each virtual circuit you want to create

- IP addresses and subnet mask assignments for IP interfaces

You can configure the following types of dynamic interfaces over ATM:

- IP over static ATM 1483 (IPoA)

- IP over PPP over static ATM 1483

- IP over PPPoE over static ATM 1483

- IP over bridged Ethernet over static ATM 1483

- IP over MLPPP over static ATM 1483

- ATM 1483 over static ATM AAL5 over ATM

For information about creating these dynamic configurations, see *Chapter 15, Configuring Dynamic Interfaces*.

Configuration Tasks

The following sections describe how to perform these ATM configuration tasks:

Creating a Basic Configuration

To configure ATM, perform the following tasks. (Figure 3 on page 21 shows the relationship of Steps 1 through 3.)

1. Configure an ATM physical interface.

   host1(config)#**interface atm 0/1**

2. Configure an ATM 1483 subinterface.

   host1(config-if)#**interface atm 0/1.20**

3. Configure a PVC by specifying the VCD, the VPI, the VCI, and the encapsulation type.

   host1(config-subif)#**atm pvc 10 15 22 aal5snap**

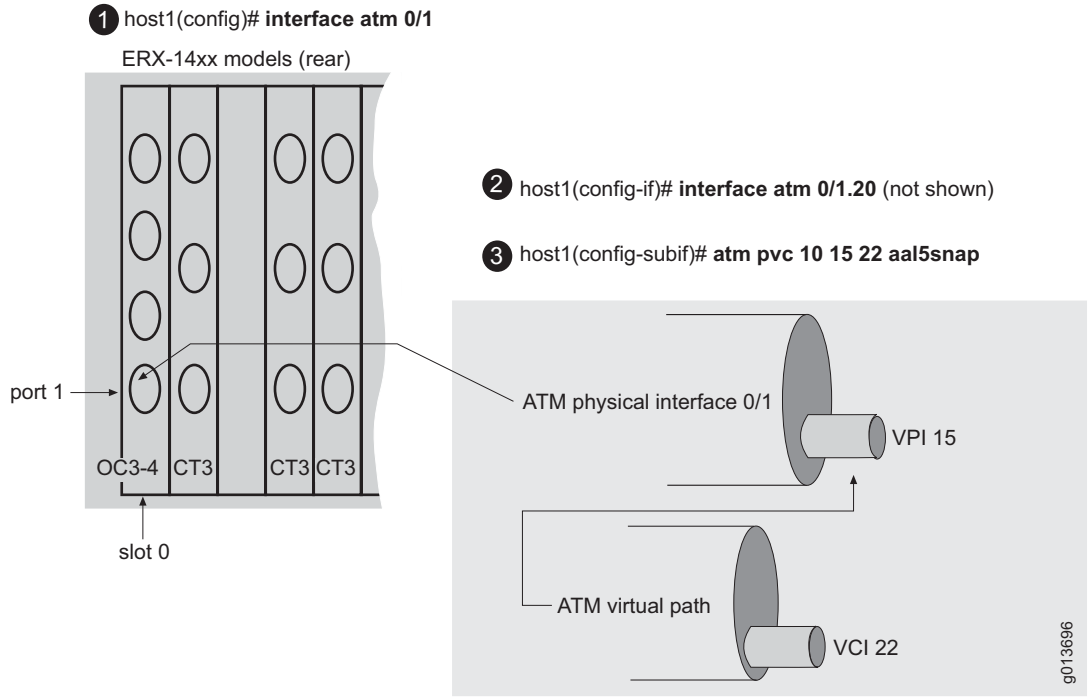
4. Assign an IP address and subnet mask to the PVC.

   host1(config-subif)#**ip address 192.32.10.20 255.255.255.0**

5. (Optional) Verify your configuration using the appropriate **show** commands.

   host1#**show atm interface atm 0/1**
   host1#**show atm vc atm 0/1 10**
   host1#**show atm subinterface atm 0/1.20**

Figure 3: Configuring an ATM Interface, Subinterface, and PVC



atm pvc

- Use to configure a PVC on an ATM interface.
- Specify one of the following encapsulation types:
  - **aal5snap**—Specifies an LLC encapsulated circuit; LLC/SNAP header precedes the protocol datagram.
  - **aal5mux ip**—Specifies a VC-based multiplexed circuit. This option is used for IP only.
  - **aal5autoconfig**—Enables autodetection of the 1483 encapsulation (LLC/SNAP or VC multiplexed) for dynamic interfaces. See *Chapter 15, Configuring Dynamic Interfaces*, for more explanation.
  - **ilmi**—Defines the PVC for ILMI keepalive messages. You can set this option only on major interfaces. After the PVC is set up for ILMI, use the **atm ilmi-keepalive** command to cause the router to generate ILMI keepalive messages on the interface.
- You can optionally set the *peak*, *average*, and *burst* sizes. To use VBR-RT or VBR-NRT as the service type, you must specify each of these options.
- The default service type is UBR. To set a different service type, specify one of the following keywords:
  - **rt**—Selects VBR-RT as the service type. You can select **rt** only if you set the *peak*, *average*, and *burst* parameters.
  - **cbr**—Selects CBR as the service type. You must set the CBR rate in Kbps.

- To enable VC integrity and generation of OAM F5 loopback cells on this circuit, use the **oam** keyword.
- Example

  host1(config-if)#**atm pvc 6 0 11 aal5snap cbr 10000**

- Use the **no** version to remove the specified PVC.

interface atm

- Use to configure an ATM interface or subinterface type.
- To specify an ATM interface for ERX-7xx models, ERX-14xx models, and ERX-310 routers, use the *slot*/*port*.[*subinterface*] format.
  - *slot*—Number of the chassis slot
  - *port*—Port number on the I/O module; on the OC3-2 GE APS I/O module, you can specify ATM interfaces only in ports 0 and 1; port 2 is reserved for a Gigabit Ethernet interface
  - *subinterface*—Number of the subinterface in the range 1–2147483647
- To specify an ATM interface for the E120 router or the E320 router, use the *slot*/*adapter*/*port*[.*subinterface*] format.
  - *slot*—Number of the chassis slot
  - *adapter*—Identifier for the IOA within the E320 chassis, either 0 or 1, where:
    - 0 indicates that the IOA is installed in the right IOA bay (E120 router) or the upper IOA bay (E320 router)
    - 1 indicates that the IOA is installed in the left IOA bay (E120 router) or the lower IOA bay (E320 router).
  - *port*—Port number on the IOA
  - *subinterface*—Number of the subinterface in the range 1–2147483647
- Specify the type of interface or subinterface: **point-to-point** or **multipoint**. Point-to-point is the default.
- Examples

  host1(config-if)#**interface atm 0/1.20**
  host1(config-if)#**interface atm 0/0/4.20**

- Use the **no** version to remove the subinterface or the logical interface.

Setting Optional Parameters

You can also set the following parameters:

- Set the administrative state of an ATM AAL5 interface to disabled.

  host1(config-if)#**atm aal5 shutdown**

- Enable CAC on the interface.

  host1(config-if)#**atm cac 3000000 ubr 3000**

- Configure the clock source.

  host1(config-if)#**atm clock internal**

- Configure framing on a T3/E3 physical interface.

  host1(config-if)#**atm framing g751adm**

- Enable ILMI on the interface.

  host1(config-if)#**atm ilmi-enable**

- Set the ILMI keepalive timer.

  host1(config-if)#**atm ilmi-keepalive 5**

- Specify the cable length (line build-out) for the ATM interface.

  host1(config-if)#**atm lbo long**

- Set the administrative state of the ATM interface to disabled.

  host1(config-if)#**atm shutdown**

- Configure SNMP link status traps on the interface.

  host1(config-if)#**atm snmp trap link-status**
  host1(config-if)#**atm aal5 snmp trap link-status**

- Set the operational mode of the physical interface to SDH STM1.

  host1(config-if)#**atm sonet stm-1**

- Configure the UNI version of ILMI using one of the following methods:

  - Enable auto configuration of ILMI.

    host1(config-if)#**atm auto-configuration**

  - Set the UNI version that the router uses when ILMI link autodetermination is unsuccessful or ILMI is disabled.

    host1(config-if)#**atm uni-version 4.0**

- Configure the number of virtual circuits for each virtual path.

  host1(config-if)#**atm vc-per-vp 128**

- Configure a virtual path tunnel and its traffic parameters.

  host1(config-if)#**atm vp-tunnel 2 128**

- Enable scrambling of the ATM cell payload on a T3 or an E3 interface.

  host1(config-if)#**ds3-scramble**

- Set the time interval at which the router records bit and packet rates.

  host1(config-if)#**load-interval 90**

- Place the interface into loopback mode for router-to-router testing.

  host1(config-if)#**loopback diagnostic**

- Disable an interface.

  host1(config-if)#**shutdown**

Optional Tasks on ATM 1483 Subinterfaces

You can perform the following optional tasks on ATM 1483 subinterfaces:

- Set the MTU.

  host1(config-subif)#**atm atm1483 mtu 7800**

- Configure SNMP link status traps.

  host1(config-subif)#**atm atm1483 snmp trap link-status**

- Set the administrative state of an ATM 1483 subinterface to disabled.

  host1(config-subif)#**atm atm1483 shutdown**

- Configure an advisory receive speed.

  host1(config-subif)#**atm atm1483 advisory-rx-speed 2000**

atm aal5 shutdown

- Use to set an ATM AAL5 interface administrative state to disabled.
- When you set the administrative state of the ATM AAL5 interface to disabled, the router automatically disables all F5 OAM services configured on the associated VC, and prevents the VC from receiving or transmitting F5 OAM cells.

- Example

  host1(config-if)#**atm aal5 shutdown**

- Use the **no** version to enable a disabled interface.

atm aal5 snmp trap link-status

- Use to enable SNMP link status traps on the AAL5 layer interface.
- Example

  host1(config-if)#**atm aal5 snmp trap link-status**

- Use the **no** version to disable the traps.

atm atm1483 advisory-rx-speed

- Use to set an advisory receive speed for an ATM 1483 subinterface. This setting has no effect on data forwarding. You can use it to indicate the speed of the client interface. When traffic is tunneled with L2TP, the advisory receive speed is sent from the LAC to the LNS. See *JUNOSe Broadband Access Configuration Guide, Chapter 12, Configuring an L2TP LAC* for additional information about the advisory receive speed.

NOTE: If you specify an advisory receive speed greater than 4294967 kbps, the speed is not accurately represented in the L2TP AVP, which is in bits per second (bps).

- The range is 0–2147483647 kbps.
- Example

  host1(config-subif)#**atm atm1483 advisory-rx-speed 2000**

- Use the **no** version to restore the default behavior—the RX speed is not sent to the LNS.

atm atm1483 mtu

- Use to set the MTU size for an ATM 1483 subinterface.
- The range is 256–9180.
- Example

  host1(config-subif)#**atm atm1483 mtu 7800**

- Use the **no** version to restore the default size of 9180.

atm atm1483 shutdown

- Use to set an ATM 1483 subinterface administrative state to disabled.
- When you set the administrative state of the ATM 1483 subinterface to disabled, the router automatically disables all F5 OAM services configured on the associated VC, and prevents the VC from receiving or transmitting F5 OAM cells.

- Example

  host1(config-subif)#**atm atm1483 shutdown**

- Use the **no** version to enable a disabled subinterface.

atm atm1483 snmp trap link-status

- Use to enable SNMP link status traps on an ATM 1483 layer subinterface.
- Example

  host1(config-subif)#**atm atm1483 snmp trap link-status**

- Use the **no** version to disable the traps.

atm auto-configuration

- Use to enable autoconfiguration of ILMI. Entering the **atm auto-configuration** command overrides any previous configuration of the **atm uni-version** command.
- Autoconfiguration is enabled by default.
- Example

  host1(config-if)#**atm auto-configuration**

- Use the **no** version to disable autoconfiguration and set the ILMI parameters to the UNI version configured using the **atm uni-version** command, which has a default value of UNI 4.0.

atm cac

- Use to enable CAC on the interface. You can set a subscription limit, so you can oversubscribe the port, and the UBR weight, so you can limit the number of UBR connections.
- You cannot configure CAC on an ATM interface on which you have created a bulk-configured VC range for use by a dynamic ATM 1483 subinterface. Conversely, you cannot create a bulk-configured VC range on an ATM interface on which you have configured CAC. For information about creating bulk-configured VC ranges, see *Bulk Configuration of VC Ranges* in *Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.
- Example

  host1(config-if)#**atm cac 3000000 ubr 3000**

- Use the **no** version to disable CAC on the interface.

atm clock internal

- Use to cause the ATM interface to generate the transmit clock internally.
- You must specify one of the following:
  - **module**—Internal clock is from the line module (the default)
  - **chassis**—Internal clock is from the configured system clock

- Example

  host1(config-if)#**atm clock internal**

- Use the **no** version to cause ATM interfaces to recover the clock from the received signal.

atm framing

- Use to configure T3 or E3 framing on an ATM interface.
- Specify one of the following framing types for a T3 (DS3) interface:
  - **cbitadm**—c-bit with ATM direct mapping
  - **cbitplcp**—c-bit with PLCP framing (default)
  - **m23adm**—M23 ATM direct mapping
  - **m23plcp**—M23 with PLCP framing
- Specify one of the following framing types for an E3 interface:
  - **g832adm**—G.832 ATM direct mapping
  - **g751adm**—G.751 ATM direct mapping
  - **g751plcp**—G.751 PLCP mapping (default)
- Example

  host1(config-if)#**atm framing g751adm**

- Use the **no** version to return framing to the default:
  - For a T3 interface, the default is **cbitplcp**
  - For an E3 interface, the default is **g751plcp**

atm ilmi-enable

- Use to enable ILMI on the interface.
- Example

  host1(config-if)#**atm ilmi-enable**

- Use the **no** version to disable ILMI on the interface.

atm ilmi-keepalive

- Use to generate ILMI keepalive messages. This value sets the time interval in seconds between poll PDU transmissions if no sequence data PDUs are pending.
- Example

  host1(config-if)#**atm ilmi-keepalive 5**

- Use the **no** version to disable the generation of keepalive messages.

atm lbo

- Use to specify the cable length (line build-out) for the ATM T3 or E3 interface. The length of cable determines power requirements.
- Specify one of the following keywords:
  - **long**—A cable length in the range 0–225 feet
  - **short**—A cable length in the range 226–450 feet (the default)
- Example

  host1(config-if)#**atm lbo long**

- Use the **no** version to restore the default value, **short**.

atm shutdown

- Use to set an ATM interface administrative state to disabled.
- When you set the administrative state of the ATM interface to disabled, the router automatically disables all F5 OAM services configured on the associated VC, and prevents the VC from receiving or transmitting F5 OAM cells.
- Example

  host1(config-if)#**atm shutdown**

- Use the **no** version to enable a disabled interface.

atm snmp trap link-status

- Use to enable SNMP link status traps on the ATM layer interface.
- Example

  host1(config-if)#**atm snmp trap link-status**

- Use the **no** version to disable the traps.

atm sonet stm-1

- Use to set the mode of operation on the physical interface to Synchronous Digital Hierarchy (SDH) Synchronous Transport Mode (STM).

  host1(config-if)#**atm sonet stm-1**

- Use the **no** version to restore the default value, SONET STS-3c operation.

atm uni-version

- Use to specify the UNI version for the interface to use.
- Valid values are 3.0, 3.1, or 4.0.
- Example

  host1(config-if)#**atm uni-version 4.0**

- There is no **no** version.

atm vc-per-vp

- Use to configure the number of VCs for each VP. The router does not execute this command when any VCs are open on the interface.
- VCs and VP tunnels must not exist when you issue this command. If they do, you must delete the VC and VP tunnel configuration before you issue this command.
- The specified value must be a power of 2, or an error message is returned.
- The minimum number of VCs per VP is 4096 for OCx/STMx ATM line modules. If you enter a value that is below the minimum, the router uses the minimum value.
- The E120 router and the E320 router support the entire VPI/VCI range; therefore, it does not support this command.
- Example

  host1(config-if)#**atm vc-per-vp 128**

- Use the **no** version to restore the default value.

atm vp-tunnel

- Use to define a VP tunnel and configure the rate of traffic flow within the tunnel.
- You specify a tunnel rate in Kbps. All circuits in the VP are restricted to the rate that you set.
- If any virtual circuits are open within the VPI before the tunnel is created, the router does not execute this command.
- For more information about configuring a shapeless VP tunnel for QoS, see *JUNOSe Quality of Service Configuration Guide, Chapter 19, Configuring an Integrated Scheduler to Provide QoS for ATM*.
- Example

  host1(config-if)#**atm vp-tunnel 2 128**

- Use the **no** version to remove the VP tunnel. When circuits are open within the tunnel, the router does not remove the tunnel.

ds3-scramble
e3-scramble

- Use to scramble the ATM cell payload on a T3 or an E3 interface. DS3 (T3) and E3 scrambling assists clock recovery on the receiving end of the interface.
- Example

  host1(config-if)#**ds3-scramble**

- Use the **no** version to disable scrambling.

load-interval

- Use to set the time interval at which the router calculates bit and packet rate counters for the ATM interface.
- You can choose a multiple of 30 seconds, in the range 30–300 seconds.
- Example

  host1(config-if)#**load-interval 90**

- Use the **no** version to return to the default setting, 300 seconds.

loopback

- Use to place the interface into loopback mode.
- Specify either:
  - **diagnostic**—Places the interface into internal loopback.
  - **line**—Places the interface into external loopback.
- Example

  host1(config-if)#**loopback diagnostic**

- Use the **no** version to remove any loopback.

Configuring OAM

This section explains:

- Configuring F4 OAM on page 30
- Configuring F5 OAM on page 32
- Setting a Loopback Location ID on page 34
- Enabling OAM Flush on page 34
- Running ATM Ping on page 35

Configuring F4 OAM

The ATM interface does not support sending F4 segment loopback cells, but it does respond to F4 segment loopback cells that it receives.

F4 OAM flows need their own channel, and they are identified by the VCI on which they are sent or received. The following VCIs are reserved for F4 OAM flows for each virtual path, and you cannot open PVCs on them:

- VCI 3—For segment F4 flows
- VCI 4—For end-to-end F4 flows

NOTE: You cannot enable both loopback cells and CC cells at the same time.

To set up F4 OAM:

1. Enable F4 OAM on an interface or VP. The router enables F4 OAM at the interface level unless you specify a VPI. This example opens both segment and end-to-end F4 OAM circuits on VPI 10.

   host1(config-if)#**atm oam 10**

2. (Optional) Enable only segment or end-to-end loopback.

   host1(config-if)#**atm oam 10 seg-loopback**
   host1(config-if)#**atm oam 10 end-loopback**

3. (Optional) To cause the interface to generate end-to-end loopback cells in addition to receiving and responding to them, set the loopback timer.

   host1(config-if)#**atm oam 10 end-loopback loopback-timer 20**

4. (Optional) Enable CC cell flows.

   host1(config-if)#**atm oam 10 seg-loopback cc source**

atm oam

- Use to configure F4 OAM on an interface or circuit. F4 OAM is configured at the interface level unless you specify a VPI.
- To open F4 OAM on either a segment or end-to-end basis, use the following keywords:
  - **seg-loopback**—Enables F4 segment OAM
  - **end-loopback**—Enables F4 end-to-end OAM

NOTE: If you do not specify either segment or end-to-end loopback, the command applies to both end-to-end and segment F4 OAM circuits.

- To configure CC cell flow on the PVC, use the following keywords:
  - **both**—Enables the PVC as both the source and the sink endpoints.
  - **sink**—Enables the PVC as the sink endpoint.
  - **source**—Enables the PVC as the source endpoint.
  - **loopback-timer**—When F4 OAM is enabled, the interface or circuit accepts and responds to F4 OAM cells. However, to generate F4 loopback cells, you must configure the loopback timer in the range 1–600 seconds. This timer represents the frequency with which F4 loopback cells are transmitted. You can set the loopback timer only for end-to-end loopback.
- Example 1—Opens both F4 end-to-end and segment OAM circuits for VPI 8

  host1(config-if)#**atm oam 8**

- Example 2—Opens the F4 end-to-end OAM circuit for VPI 10 and enables sending F4 end-to-end loopback cells on the circuit at a frequency of 20 seconds

  host1(config-if)#**atm oam 10 end-loopback loopback-timer 20**

- Example 3—Opens both F4 end-to-end and segment OAM circuits on all VPs on this interface

  host1(config-if)#**atm oam**

- Example 4—Opens F4 segment OAM circuits on all VPs on this interface

  host1(config-if)#**atm oam seg-loopback**

- Example 5—Opens F4 end-to-end loopback on VPI 12

  host1(config-if)#**atm oam 12 end-loopback**

- Example 6—Opens an F4 segment OAM circuit for VPI 8 and enables CC cell generation on the segment

  host1(config-if)#**atm oam 8 seg-loopback cc source**

- Use the **no** version to delete F4 OAM circuits. Using the options, you can delete all F4 OAM circuits on the interface, segment or end-to-end F4 OAM circuits, or F4 OAM circuits on a specific VPI.

  - Example 1—Deletes all F4 OAM circuits on the interface

    host1(config-if)#**no atm oam**

  - Example 2—Deletes all F4 segment OAM circuits on the interface

    host1(config-if)#**no atm oam segment**

  - Example 3—Deletes the F4 end-to-end OAM circuit on VPI 8

    host1(config-if)#**no atm oam 8 end-loopback**

Configuring F5 OAM

F5 OAM flows run over existing PVCs. The ATM interface does not support sending F5 segment loopback cells, but it does respond to F5 segment loopback cells that it receives.

NOTE: You cannot enable both loopback cells and CC cells at the same time.

To set up F5 OAM:

1. To enable VC integrity, which causes the ATM interface to periodically send F5 end-to-end loopback cells over a VC, use the **oam** keyword with the **atm pvc** command.

   You can include the frequency (in seconds) with which the router sends F5 end-to-end loopback cells.

   host1(config-if)#**atm pvc 98 38 22 aal5snap oam 300**

2. (Optional) To enable CC cell flows on a circuit, use the **cc** keyword with the **atm pvc** command. You can enable cell flows on a segment or end-to-end basis, and you can enable the PVC as a sink, source, or both a sink and a source.

   host1(config-if)#**atm pvc 50 0 50 aal5snap oam cc end-to-end sink**

When you issue the appropriate **shutdown** command to change the administrative status of the corresponding ATM interface, ATM AAL5 interface, or ATM 1483 subinterface from enabled to disabled, the router automatically disables all F5 OAM services configured on the associated VC. For more information, see *Automatic Disabling of F5 OAM Services* on page 18.

atm pvc

- Use the **atm pvc** command with the **oam** keyword to set up the PVC to periodically transmit F5 end-to-end loopback cells over a VC.
- You can use the **oam** keyword only if you specify one of the following encapsulation types:
  - **aal5snap**
  - **aal5mux ip**
  - **aal5autoconfig**
- The **oam** keyword is not available with the **aal5all**, **aal0**, or **ilmi**
- Optionally, you can configure the time interval in the range 1–600 seconds between transmissions of OAM F5 end-to-end loopback cells.
- Use the following keywords to enable and configure CC cell flows:
  - **end-to-end**—Opens an end-to-end CC cell flow
  - **segment**—Opens a segment CC cell flow
  - **sink**—Enables this VC as a sink point (cell receiver)
  - **source**—Enables this VC as the source point (cell generator)
  - **both**—Enables this VC as both a sink point and a source point
- Example 1—Enables F5 end-to-end loopback cells

  host1(config-if)#**atm pvc 20 20 20 aal5snap oam**

- Example 2—Enables end-to-end CC cell flow and enables the PVC as the sink

  host1(config-if)#**atm pvc 5 0 5 aal5autoconfig oam cc end-to-end sink**

- Use the **no** version of the **atm pvc** command *without* the **oam** keyword to disable F5 OAM on the PVC and *without* the **cc** keyword to disable CC cell flows on the PVC. For example, the following command disables CC cell flow configured in Example 2.

  host1(config-if)#**no atm pvc 5 0 5 aal5autoconfig**

Setting a Loopback Location ID

To enable other nodes to specifically send OAM loopback cells to the ATM interface, set the location ID of the ATM interface or circuit.

host1(config-if)#**atm oam loopback-location 01090708**

NOTE: Because the router is a connection endpoint, the default loopback location ID is all 1s (ones). This command enables you to specify a nondefault value.

atm oam loopback-location

- Use to set the location ID of the ATM interface. The location ID is a 4-octet field, and the default value is all 1s (ones).
  - You can set a specific value to identify this ATM interface as the intended recipient of OAM loopback cells.
  - You can also set the location ID to all 0s (zeros).

  For information about how the router handles loopback cells based on location ID, see Table 7 on page 17.

- Example

  host1(config-if)#**atm oam loopback-location 01090708**

- Use the **no** version to return the loopback location ID to the default value, all 1s (ones).

Enabling OAM Flush

You can use the **atm oam flush** command to enable the OAM flush feature for an ATM interface. When OAM flush is enabled, the router ignores all OAM cells received on the interface, and stops sending OAM cells on this interface.

You can also issue the **atm oam flush** command with the optional **alarm-cells** keyword to cause the router to ignore only AIS and RDI cells and to accept all other OAM cells. This is useful in diagnostic situations when you might want to exclude alarm conditions.

NOTE: The OAM flush feature is supported on all E-series ATM module combinations.

atm oam flush

- Use to configure the router to ignore all OAM cells received on an ATM interface, and to stop sending OAM cells on this interface.
- To cause the router to ignore only AIS and RDI cells and to accept all other OAM cells, use the **alarm-cells** keyword.
- Example

  host1(config-if)#**atm oam flush**

- Use the **no** version to disable OAM flush on the interface.

Running ATM Ping

Keep in mind the following when you use ATM ping:

- Before you can run ATM ping, you need to add a PVC for the VPI and VCI over which you run the ping.
- Because ATM ping requires the receipt of OAM cells, make sure that the receipt and transmission of OAM cells is not disabled (using the **atm oam flush** command). To reenable the receipt and transmission of OAM cells, enter **no atm oam flush**.
- Disabling receipt of OAM cells during a ping operation stops all outstanding ping operations. You need to manually restart the ping operation after receipt of OAM cells for the interface is enabled.
- Because ATM ping is a dynamic (on-demand) operation, none of the configuration related to ATM ping is saved. To avoid acquiring excessive bandwidth for OAM, the number of outstanding ping operations on each interface is limited to 12.

ping atm interface atm

- Use to send loopback cells from an ATM interface or circuit.
- The VPI and VCI fields determine the type of loopback cells used for the ping operation. By default F5 end-to-end loopback OAM cells are used.
  - To send F4 segment loopback cells, set the VCI to 3.
  - To send F4 end-to-end loopback cells, set the VCI to 4.
- Use the **end-loopback** keyword to send the ping to the connection endpoint.
- Use the **seg-loopback** keyword to send the ping to the first segment point (for example, the next neighbor switch).

- Use the *destination* option to specify the value of the location ID included in the loopback cell. The location ID is a 16-octet field, and the destination portion is 4 octets. You can set the location ID to a specific destination or to 0s (zeros) or 1s (ones).
  - If you set the destination to 0, the loopback location ID in the loopback cell is initialized to all 0s, and each segment point in the network responds to the ping.
  - If you set the destination to 1s, the loopback location ID in the loopback cell is initialized to all 1s, and only the connection endpoint responds to the ping.
  - If you use the default value of 0xFFFFFFFF, the loopback location ID in the loopback cell is initialized to all 1s.

  For information about how the router handles loopback cells based on location ID, see Table 7 on page 17.
- The **count** keyword sets the number of OAM loopback cells to send to the destination. The default value is 5. The maximum is 32.
- The **timeout** keyword sets the amount of time to wait for a response to the sent OAM loopback cell. The default value is 5 seconds.
- The following characters can appear in the display after the **ping** command has been issued:
  - !—Each exclamation point indicates that a reply was received
  - .—Each period indicates that the ping timed out while waiting for a reply
- Example 1—This example generates end-to-end loopback cells for VPI = 0 and VCI = 105 on ATM interface 2/0. The count value is 5 OAM loopback cells, and the timeout value is 2 seconds.

  ```
  host1#ping atm interface atm 2/0 0 105 end-loopback count 5 timeout 2
  Sending 5 53-byte OAM end-to-end loopback Echoes timeout is 2 secs
  Press Ctrl+c to stop
  !!!!!
  Success rate = 100% (5/5), round-trip min/avg/max = 0/4/10 ms
  ```

- Example 2—This example generates segment loopback cells for VPI = 0 and VCI = 105 on ATM interface 2/0. The destination is set to 0xFFFFFFFF, the count value is 3 OAM loopback cells, and the timeout value is 1 second.

  ```
  host1#ping atm interface atm 2/0 0 105 seg-loopback 0xFFFFFFFF count 3
  timeout 1
  Sending 3 53-byte OAM segment loopback Echoes timeout is 1 secs
  Press Ctrl+c to stop
  !!!
  Success rate = 100% (3/3), round-trip min/avg/max = 0/3/10 ms
  ```

- There is no **no** version.

Configuring an NBMA Interface

You configure an ATM NBMA 1483 subinterface in a manner similar to configuring a standard ATM 1483 subinterface. When you specify a subinterface, however, you must select the multipoint option if you plan to add multiple circuits to form an NBMA interface. If you do not select multipoint, the subinterface defaults to point-to-point, and only a single circuit can be affiliated with that subinterface.

You can configure one or more PVCs and associate them with the subinterface you create. Also, you can enable InARP and identify a refresh rate on each specific circuit. For each NMBA interface, either InARP must be enabled, or a static map entry must be provided for each circuit owned by the interface; otherwise, transmitting over that circuit is impossible.

NOTE: NBMA interfaces support only the aal5snap encapsulation.

To configure an NBMA interface:

1. Configure a physical interface.

   host1(config)#**interface atm 2/0**

2. Configure an ATM 1483 subinterface.

   host1(config-if)#**interface atm 2/0.2 multipoint**

3. Configure PVCs by specifying the VCD, VPI, VCI, and encapsulation type.

   host1(config-subif)#**atm pvc 1 1 1 aal5snap inarp 10**
   host1(config-subif)#**atm pvc 2 2 2 aal5snap**

4. (Optional) Specify InARP and a refresh rate (also optional).

   host1(config-subif)#**atm pvc 3 3 3 aal5snap inarp 5**
   host1(config-subif)#**atm pvc 4 4 4 aal5snap inarp**

5. Assign an IP address and subnet mask to the PVC.

   host1(config-subif)#**ip address 192.32.10.20 255.255.255.0**

6. (Optional) Use the appropriate **show** commands to verify your configuration.

   host1#**show atm interface atm 2/0**
   host1#**show atm map**
   host1#**show nbma arp atm 2/0**
   host1#**show atm vc atm 2/0 2**
   host1#**show atm subinterface atm 2/0.2**

Creating an NBMA Static Map

Static mapping creates an association between IP address–ATM PVC pairs for one or more member circuits of an ATM 1483 NBMA interface. Not every circuit necessarily gets the required association from a static map.

In the following procedure, you can repeat Step 2 for each circuit you want to map. You can associate with an interface a map group name that you have not already established. When you define the map list, the name is associated with that interface. You can perform Steps 3 and 4 before Steps 1 and 2 without affecting the results.

To set up a static map:

1. Create a map list by naming it.

   host1(config)#**map-list charlie**

2. Associate a protocol and an address with a specific virtual circuit.

   host1(config-map-list)#**ip 192.168.13.13 atm-vc 1 broadcast**

3. Specify an ATM interface.

   host1(config-if)#**interface atm 2/0**

4. Associate the map list with the interface.

   host1(config-if)#**map-group charlie**

atm pvc

- Use to configure a PVC on an ATM interface.
- InARP and refresh rate are optional parameters.
- InARP determines whether InARP requests are used and is specified on a per-circuit basis. If you disable InARP, you must use a static map table entry. Transmission over the circuit cannot occur unless you use either InARP or static map table entries.
- The default refresh rate is 15 minutes.
- You can configure InARP only if you specify the **aal5snap** encapsulation type.
- Example

  host1(config-if)#**atm pvc 6 0 11 aal5snap inarp 10**

- Use the **no** version to remove the specified PVC.

interface atm

- Use to configure an ATM interface or subinterface type.
- For information about specifying the ATM interface or subinterface, see **interface atm** on page 22.
- Specify **multipoint** to identify the subinterface as NBMA.

- Examples

  host1(config-if)#**interface atm 0/1.20**
  host1(config-if)#**interface atm 0/0/4.20**

- Use the **no** version to remove the subinterface or the logical interface.

ip atm-vc

- Use to associate a protocol and address with a specific virtual circuit.
- Use this command repeatedly for each circuit to be mapped.
- This command is available in Map List Configuration mode only.
- Example

  host1(config-map-list)#**ip 192.168.13.13 atm-vc 1 broadcast**

- Use the **no** version to remove the association.

map-group

- Use to associate the map list with an NBMA interface when configuring static mapping.
- You can issue this command before or after the **map-list** command without changing anything.
- This command is available in Interface Configuration mode only.
- See the **map-list** command.
- Example

  host1(config-if)#**map-group charlie**

- Use the **no** version to remove the association.

map-list

- Use to create a map list when configuring static mapped NBMA interfaces.
- Limit the name of the map list to no more than 31 characters.
- You can create multiple map lists; however, you can associate only one map list with each physical interface.
- If a map list contains an entry for a VCD that was previously configured to run InARP, the **map-group** command fails. If this is the case, either reconfigure the circuit with InARP disabled, or remove the entry for that circuit from the map list.
- Example

  host1(config)#**map-list charlie**

- Use the **no** version to remove the map list.

Assigning Descriptions to Interfaces

You can use the **description** commands to assign a text description or an alias to an interface, so that other **show** commands can display that information.

atm aal5 description

- Use to assign a text description or alias to an ATM AAL5 interface.
- Use the **show atm aal5 interface** command to display the text description.
- Example

  host1(config-if)#**atm aal5 description boston01**

- Use the **no** version to remove the text description or alias.

atm atm1483 description

- Use to assign a text description or alias to an ATM 1483 subinterface.
- The description can be a maximum of 255 characters.
- Use the **show atm subinterface** command to display the text description.
- Example

  host1(config-subif)#**atm atm1483 description nyc33**

- Use the **no** version to remove the text description or alias.

atm description

- Use to assign a text description or alias to the ATM interface.
- The description can be a maximum of 255 characters and can include the # (pound sign) character.
- The first 32 characters of the ATM description are pushed out to RADIUS during authentication and accounting.
- Use the **show atm interface** command to display the description.
- Example

  host1(config-if)#**atm description myAtm**

- Use the **no** version to remove the description or alias.

Sending Interface Descriptions to AAA

During authentication the router sends ATM interface descriptions to AAA. AAA passes the descriptions to RADIUS, and they can appear in the Calling-Station-Id attribute [31]. (For information about RADIUS and the Calling-Station-ID attribute, see *JUNOSe Broadband Access Configuration Guide, Chapter 3, Configuring RADIUS Attributes*.)

By default, the router sends the major interface descriptions to AAA on the SRP. You can configure the router to send VP interface descriptions in place of the major interface descriptions, or to send ATM 1483 subinterface descriptions to AAA on the line module. As a result, the VP or ATM 1483 subinterface descriptions can provide a convenient way to identify or group broadband access subscribers.

If you set up multiple interface descriptions, they have the following precedence:

1. ATM 1483 subinterface description
2. VP interface description
3. Major interface description

Assigning Descriptions to Virtual Paths

To assign a description to an individual VP on an ATM interface, use the **atm vp-description** command. The VP description does not affect existing descriptions configured for the ATM interface or ATM 1483 subinterface on which the VP resides. However, if you delete the ATM interface, the descriptions of all VPs residing on that interface are also deleted. In addition, if you decrease the VPI range by issuing the **atm vc-per-vp** command, the router deletes the descriptions of any VPs that are removed.

To display the VP description, use the **show atm vp-description** command, as described in *Using ATM show Commands* on page 71. Although you need not configure a VP tunnel to specify a VP description, the router also displays the VP description in the output of the **show atm vp-tunnel** command.

Exporting ATM 1483 Subinterface Descriptions

To assign a description to an ATM 1483 subinterface and configure the router to send the ATM 1483 VC interface descriptions to the line module:

1. Configure a text description for ATM 1483 subinterfaces with the **atm atm1483 description** command. This description is included in the interface identifier that is sent to AAA.

   To configure this feature for ATM 1483 subinterfaces, enter this command in Profile Configuration mode. See *Configuring ATM 1483 Dynamic Subinterfaces* in *Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.

   host1(config-subif)#**atm atm1483 description VC_atm1**

2. Set up the router to export ATM 1483 VC interface descriptions to the line module.

   host1(config)#**atm atm1483 export-subinterface-description**

3. (Optional) Display the configuration of the export ATM 1483 VC interface descriptions feature with the **show atm atm1483** command.

   ```
   host1#show atm atm1483
   ATM1483 IF Descriptions exported
   ```

4. (Optional) Display the interface descriptions with the **show atm subinterface atm** command.

atm atm1483 description

- Use to assign a text description or alias to an ATM 1483 subinterface.
- The description can be a maximum of 255 characters.
- Example

  host1(config-subif)#**atm atm1483 description nyc33**

- Use the **no** version to remove the text description or alias.

atm atm1483 export-subinterface-description

- Use to export ATM 1483 VC interface descriptions to the line module. Descriptions for ATM 1483 subinterfaces are configured with the **atm atm1483 description** command.
- The description can have up to 255 characters; however, when the description is sent to the line module, it is truncated to 32 characters.
- Example

  host1(config)#**atm atm1483 export-subinterface-description**

- Use the **no** version to restore the default behavior, in which ATM 1483 interface descriptions are not exported to the line module.

atm vp-description

- Use to assign a text description to an individual VP on an ATM interface or subinterface.
- You must specify the VPI of the VP to which you want to assign the description.
- The description string can be a maximum of 32 characters.
- The VP description is stored in NVS and persists after a reboot.
- Use the **show atm vp-description** command to display the text description.
- Example

  host1(config-if)#**atm vp-description 2 vpi2Subscribers**

- Use the **no** version to restore the default value, a null string.

Configuring Individual ATM PVC Parameters

As an alternative to using the **atm pvc** command to configure ATM PVC parameters with a single command, you can access ATM VC Configuration mode to configure individual ATM PVC parameters with separate commands, one parameter at a time. You can configure parameters for the service category, encapsulation method, F5 OAM options, and Inverse ARP.

This section explains the benefits of using ATM VC Configuration mode and describes how to perform the following tasks:

Benefits

Using commands in ATM VC Configuration mode to configure individual ATM PVC parameters provides the following benefits:

- Commands in ATM VC Configuration mode are less complex and easier to use.

  With the **atm pvc** command and keywords, you configure multiple PVC attributes on a single command line. In addition, configuration attributes available only for control (ILMI and signaling) PVCs or only for data PVCs are not mutually exclusive.

  By contrast, ATM VC Configuration mode provides commands to configure each parameter individually, and makes a clearer distinction between configuration of control PVCs and configuration of data PVCs.

- ATM VC Configuration mode interoperates with the **atm pvc** command.

  You can configure all of the parameters currently supported by the **atm pvc** command from within ATM VC Configuration mode. In addition, you can create a PVC with the **atm pvc** command and modify or delete the same PVC by using ATM VC Configuration mode. Conversely, you can modify (with certain restrictions) or delete a PVC created in ATM VC Configuration mode by using the **atm pvc** command.

- ATM VC Configuration mode supports additional F5 OAM alarm surveillance and VC integrity options.

  In most cases, you can use either an ATM VC Configuration mode command or the **atm pvc** command to configure ATM PVC parameters. However, to configure F5 OAM alarm surveillance parameters (by using the **oam ais-rdi** command) or VC integrity parameters (by using the **oam retry** command), you *must* use only ATM VC Configuration mode. There are no equivalent **atm pvc** commands to configure these parameters.

  You can, however, continue to use the **atm pvc** command to enable VC integrity and modify the loopback frequency of an ATM data PVC.

NOTE: If you have existing configuration scripts that use the **atm pvc** command, we recommend that you continue to use the **atm pvc** command to configure all ATM PVC parameters except those that require you to use the **oam ais-rdi** command or **oam retry** command in ATM VC Configuration mode.

Creating Control PVCs

A control PVC, also referred to as a control circuit, supports services such as ILMI to manage and control ATM networks. You must create a control PVC on an ATM major interface, and not on an ATM 1483 subinterface that is stacked above an ATM major interface.

To create a control PVC, you issue the **pvc** command from Interface Configuration mode. However, unlike the other tasks in this section, configuring a control PVC with the **pvc** command does not access ATM VC Configuration mode.

For example, the following commands create a control PVC with VCD 10, VPI 0, VCI 16, and ILMI encapsulation.

```
host1(config)#interface atm 3/0
host1(config-if)#pvc 10 0/16 ilmi
host1(config-if)#
```

Regardless of whether you use the **pvc** command or the **atm pvc** command to create a control PVC, you cannot modify the VCD, VPI, or VCI values after they have been configured.

pvc

- Use from Interface Configuration mode to create a control PVC for Integrated Local Management Interface (ILMI).
- To create a control PVC, specify the VCD, VPI and VCI (in the format *vpi*/*vci*), and the **ilmi** keyword.
- Example

  host1(config-if)#**pvc 5 0/5 ilmi**

- Use the **no** version to remove the specified control PVC from the router.

Creating Data PVCs

A data PVC, also referred to as a data circuit, is an ATM PVC that carries data. You must create a data PVC on an ATM 1483 subinterface that is stacked above an ATM major interface, and not on the ATM major interface itself.

To create a data PVC, you issue the **pvc** command from Subinterface Configuration mode to access ATM VC Configuration mode. From ATM VC Configuration mode, you can then do either of the following:

- Issue the **exit** command, which creates a data PVC that uses default values for service category (unspecified bit rate without a peak cell rate), encapsulation type (**aal5snap**), F5 OAM (disabled), and Inverse ARP (disabled).
- Issue commands to configure or modify data PVC attributes including the service category, encapsulation type, F5 OAM, and Inverse ARP.

For example, the following commands create a data PVC with VCD 32, VPI 0, VCI 100 and default values for the other attributes. Issuing the **exit** command causes the configuration to take effect.

```
host1(config)#interface atm 3/2.2
host1(config-subif)#pvc 32 0/100
host1(config-subif-atm-vc)#exit
host1(config-subif)#
```

Regardless of whether you use the **pvc** command or the **atm pvc** command to create a data PVC, you cannot modify the VCD, VPI, or VCI values after they have been configured.

pvc

- Use from Subinterface Configuration mode to create a data PVC and access ATM VC Configuration mode, from which you can configure and modify individual PVC attributes one at a time.
- To create a basic data PVC with default values for service category, encapsulation type, F5 OAM, and Inverse ARP, specify the VCD and the VPI and VCI (in the format *vpi*/*vci*).
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example

  ```
  host1(config-subif)#pvc 10 15/50
  host1(config-subif-atm-vc)#exit
  ```

- Use the **no** version to remove the specified data PVC from the router.

Configuring the Service Category for Data PVCs

You can use individual commands in ATM VC Configuration mode to configure each supported service category on a data PVC, or to restore the default service category, unspecified bit rate (UBR) without a peak cell rate (PCR).

For example, the following commands configure a data PVC that uses the constant bit rate (CBR) service category with a nondefault PCR (10,000 Kbps). Issuing the **exit** command causes the configuration to take effect.

```
host1(config)#interface atm 3/0.3
host1(config-subif)#pvc 6 0/100
host1(config-subif-atm-vc)#cbr 10000
host1(config-subif-atm-vc)#exit
host1(config-subif)#
```

cbr

- Use to configure the CBR service category on an ATM data PVC.
- You must specify a PCR, in Kbps, in the range 1–149760 (for OC3 ATM modules) or 1–599040 (for OC12 ATM modules).
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example

  ```
  host1(config-subif-atm-vc)#cbr 15000
  host1(config-subif-atm-vc)#exit
  ```

- Use the **no** version to restore the default service category, UBR without a PCR.

ubr

- Use to configure the UBR service category on an ATM data PVC.
- You can optionally specify a PCR, in Kbps, in the range 0–149760 (for OC3 ATM modules) or 0–599040 (for OC12 ATM modules).
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example

  ```
  host1(config-subif-atm-vc)#ubr 5000
  host1(config-subif-atm-vc)#exit
  ```

- Use the **no** version to restore the default service category, UBR without a PCR.

vbr-nrt

- Use to configure the variable bit rate, nonreal time (VBR-NRT) service category on an ATM data PVC.
- You must specify all of the following parameters:
  - PCR, in Kbps, in the range 0–149760 (for OC3 ATM modules) or 0–599040 (for OC12 ATM modules)
  - SCR, in Kbps, in the range 0–149760 (for OC3 ATM modules) or 0–599040 (for OC12 ATM modules)
  - Maximum burst size (MBS), in cells, in the range 0–16777215
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example

  host1(config-subif-atm-vc)#**vbr-nrt 50000 10000 150**
  host1(config-subif-atm-vc)#**exit**

- Use the **no** version to restore the default service category, UBR without a PCR.

vbr-rt

- Use to configure the variable bit rate, real time (VBR-RT) service category on an ATM data PVC.
- You must specify all of the following parameters:
  - PCR, in Kbps, in the range 0–149760 (for OC3 ATM modules) or 0–599040 (for OC12 ATM modules)
  - SCR, in Kbps, in the range 0–149760 (for OC3 ATM modules) or 0–599040 (for OC12 ATM modules)
  - Maximum burst size (MBS), in cells, in the range 0–16777215
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example

  host1(config-subif-atm-vc)#**vbr-rt 200000 30000 400**
  host1(config-subif-atm-vc)#**exit**

- Use the **no** version to restore the default service category, UBR without a PCR.

Configuring Encapsulation for Data PVCs

The encapsulation method on a data PVC represents the format of the data units that traverse the circuit. You can use the **encapsulation** command in ATM VC Configuration mode to configure the encapsulation method for a data PVC, or to restore the default encapsulation method, **aal5snap**.

For example, the following commands configure a data PVC that uses **aal5all** encapsulation. Issuing the **exit** command causes the configuration to take effect.

```
host1(config)#interface atm 3/0.3
host1(config-subif)#pvc 6 0/250
host1(config-subif-atm-vc)#encapsulation aal5all
host1(config-subif-atm-vc)#exit
host1(config-subif)#
```

encapsulation

- Use to configure the encapsulation method on an ATM data PVC.
- Specify one of the following encapsulation types:
  - **aal0**—Causes the router to receive raw ATM cells on this PVC and forward the cells without performing AAL5 packet reassembly
  - **aal5all**—Configures ATM over MPLS passthrough connections; the router passes through all ATM AAL5 traffic without interpreting it
  - **aal5autoconfig**—Enables autodetection of the 1483 encapsulation (LLC/SNAP or VC multiplexed)
  - **aal5mux ip**—Configures a VC-based multiplexed circuit used for IP only
  - **aal5snap**—Configures an LLC encapsulated circuit; an LLC/SNAP header precedes the protocol datagram; this is the default encapsulation method
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example

  ```
  host1(config-subif-atm-vc)#encapsulation aal5mux ip
  host1(config-subif-atm-vc)#exit
  ```

- Use the **no** version to restore the default encapsulation method, **aal5snap**.

Configuring F5 OAM for Data PVCs

In ATM VC Configuration mode, you can use the individual commands listed in Table 8 to configure nondefault values for F5 OAM services.

Table 8: F5 OAM Configuration Tasks and Associated Commands

To Configure	Use This Command
Surveillance parameters for alarm indication signal (AIS) and remote defect indication (RDI) fault management cells	**oam ais-rdi**
Continuity check (CC) verification	**oam cc**
Generation of F5 loopback cells and enabling of VC integrity	**oam-pvc**
Parameters for VC integrity	**oam retry**

For more information about OAM parameters, see *Operations, Administration, and Management of ATM Interfaces* on page 13.

NOTE: The **oam-ais rdi** command and the **oam retry** command are available only in ATM VC Configuration mode. There is no equivalent **atm pvc** command to configure these F5 OAM alarm surveillance and VC integrity parameters.

For example, the following commands enable VC integrity on a data PVC with a nondefault loopback frequency (30 seconds). Issuing the **exit** command causes the configuration to take effect.

```
host1(config)#interface atm 3/0.0
host1(config-subif)#pvc 32 0/32
host1(config-subif-atm-vc)#oam-pvc manage 30
host1(config-subif-atm-vc)#exit
host1(config-subif)#
```

The following commands, which are available only in ATM VC Configuration mode, configure nondefault VC integrity and alarm surveillance parameters on a data PVC. In this example, the VC integrity parameters configured with the **oam retry** command include the up retry count (4), down retry count (6), and retry frequency (2). The alarm surveillance parameters configured with the **oam ais-rdi** command include the alarm down count (2) and alarm clear timeout duration (4 seconds). Issuing the **exit** command causes the configuration to take effect.

```
host1(config)#interface atm 3/0.0
host1(config-subif)#pvc 32 0/32
host1(config-subif-atm-vc)#oam retry 4 6 2
host1(config-subif-atm-vc)#oam ais-rdi 2 4
host1(config-subif-atm-vc)#exit
host1(config-subif)#
```

oam ais-rdi

- Use to configure surveillance parameters for AIS and RDI F5 OAM fault management cells on an ATM data PVC.
- You can optionally specify the following values:
  - *alarmDownCount*—Number of successive alarm cells, in the range 1–60, for the router to receive before reporting that a PVC is down; the default value is 1
  - *alarmClearTimeout*—Number of seconds, in the range 3–60, for the router to wait before reporting that a PVC is up after the PVC has stopped receiving alarm cells; the default value is 3
- To configure these alarm surveillance parameters, you must use the **oam ais-rdi** command in ATM VC Configuration mode. There is no equivalent **atm pvc** command to configure these parameters.
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.

- Example

  ```
  host1(config-subif-atm-vc)#oam ais-rdi 5 10
  host1(config-subif-atm-vc)#exit
  ```

- Use the **no** version to restore the default values for the alarm down count and alarm clear timeout duration.

oam cc

- Use to enable F5 OAM CC verification on an ATM data PVC.
- You can optionally specify one of the following values to configure CC cell flows:
  - **segment**—Opens an F5 OAM CC segment cell flow
  - **end-to-end**—Opens an F5 OAM CC end-to-end cell flow
- You must specify one of the following values to enable CC verification:
  - **source**—Enables this VC as the source point (cell generator)
  - **sink**—Enables this VC as a sink point (cell receiver)
  - **both**—Enables this VC as both a sink point and a source point
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example 1—Enables CC verification with a source endpoint

  ```
  host1(config-subif-atm-vc)#oam cc source
  host1(config-subif-atm-vc)#exit
  ```

- Example 2—Opens an F5 OAM CC segment cell flow and enables CC verification with a sink endpoint

  ```
  host1(config-subif-atm-vc)#oam cc segment sink
  host1(config-subif-atm-vc)#exit
  ```

- Use the **no** version to disable F5 OAM CC verification and restore the default setting for cell termination, **end-to-end**.

oam-pvc

- Use to enable generation of F5 OAM loopback cells on an ATM data PVC and, optionally, enable F5 OAM VC integrity features on the circuit.
- Use this command only on data PVCs configured with **aal5snap**, **aal5autoconfig**, or **aal5 mux ip** encapsulation; the command is not valid for data PVCs configured with other encapsulation types.
- To enable F5 OAM VC integrity on the PVC, use the **manage** keyword.
- You can optionally specify the number of seconds, in the range 1–600, for the router to wait between the transmission of loopback cells during normal operation; the default value is 10.
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.

- Example

  host1(config-subif-atm-vc)#**oam-pvc manage 15**
  host1(config-subif-atm-vc)#**exit**

- Use the **no** version to restore the default behavior, which disables F5 OAM VC integrity on the router and restores the default value for loopback frequency, 10 seconds.

oam retry

- Use to configure F5 OAM VC integrity parameters on an ATM data PVC.
- You can optionally specify the following values:
  - *upRetryCount*—Number of successive loopback cell responses, in the range 1–60, for the router to receive before reporting that a PVC is up; default value is 3
  - *downRetryCount*—Number of successive loopback cell responses, in the range 1–60, for the router to miss before reporting that a PVC is down; default value is 5
  - *retryFrequency*—Number of seconds, in the range 1–600, for the router to wait between the transmission of loopback cells when it is verifying the state of the PVC; default value is 1
- To configure these VC integrity parameters, you must use the **oam retry** command in ATM VC Configuration mode. There is no equivalent **atm pvc** command to configure these parameters.
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example

  host1(config-subif-atm-vc)#**oam retry 5 6 3**
  host1(config-subif-atm-vc)#**exit**

- Use the **no** version to restore the default values for the up retry count, down retry count, and retry frequency parameters.

Configuring Inverse ARP for Data PVCs

You can use the **inarp** command in ATM VC Configuration mode to enable Inverse ARP (InARP) on a data PVC that resides on an ATM 1483 NBMA subinterface configured with the **multipoint** option. The PVC must use the default encapsulation method, **aal5snap**. For more information about InARP, see *Configuring an NBMA Interface* on page 37.

For example, the following commands enable InARP with a nondefault refresh rate (10 minutes) on a data PVC. The PVC uses **aal5snap** encapsulation by default. Issuing the **exit** command causes the configuration to take effect.

```
host1(config)#interface atm 3/2.1 multipoint
host1(config-subif)#pvc 6 0/11
host1(config-subif-atm-vc)#inarp 10
host1(config-subif-atm-vc)#exit
host1(config-subif)#
```

inarp

- Use to enable Inverse ARP on an ATM PVC that resides on an ATM 1483 NBMA subinterface and uses the default encapsulation method, **aal5snap**.
- You can optionally specify an Inverse ARP refresh rate, in the range 1–60 minutes; the default value is 15.
- You must issue the **exit** command from ATM VC Configuration mode for the configuration to take effect.
- Example

  ```
  host1(config-subif-atm-vc)#inarp 5
  host1(config-subif-atm-vc)#exit
  ```

- Use the **no** version to restore the default behavior, which disables Inverse ARP on the router.

Configuring ATM VC Classes

As an alternative to configuring individual parameters for ATM data PVCs, you can access ATM VC Class Configuration mode to configure a class of attributes for an ATM data PVC. A *VC class* is a set of attributes for a virtual circuit (VC) that can include the service category, encapsulation method, F5 OAM options, and Inverse ARP.

After you configure the VC class, you then apply the attributes in the class as a group by assigning the VC class to one of the following:

- An individual PVC
- All PVCs created on a specified static ATM major interface
- All PVCs created on a specified static ATM 1483 subinterface
- A base profile from which bulk-configured VC ranges are created on a dynamic ATM 1483 subinterface

VC class assignments are valid only for ATM data PVCs created with the **pvc** command. Assigning a VC class to a PVC created with the **atm pvc** command, or to a control (ILMI) PVC, has no effect. For information about creating a data PVC by using the **pvc** command, see *Creating Data PVCs* on page 45.

NOTE: For information about the total number of VC classes supported on the router, see *JUNOSe Release Notes*, *Appendix A*, *System Maximums*.

Benefits

Using VC classes to configure and assign attributes to ATM data PVCs provides the following benefits:

- VC classes enable you to classify and group ATM PVCs based on the OAM and traffic requirements of their associated subscribers.

  In a typical scenario, you might group subscribers based on their OAM and traffic requirements, and then create a VC class for each subscriber group. For example, you might create two VC classes: premium-subscriber-class and economy-subscriber-class.

  In premium-subscriber-class, you might enable F5 OAM VC integrity (with the **oam-pvc manage** command), and configure a traffic class that has a higher scheduling priority, such as CBR (with the **cbr** command). Conversely, in economy-subscriber-class, you might retain the default setting that disables F5 OAM VC integrity, and configure a traffic class that has a lower scheduling priority, such as UBR with or without a PCR (with the **ubr** command). By assigning each VC class to the appropriate interfaces or individual circuits, you can group and manage the PVCs associated with the VC class based on the network requirements of the subscribers they serve.

- VC classes facilitate modifications to PVC attributes.

  If the OAM or traffic requirements change for a particular subscriber group, you can simply reconfigure the VC class associated with the PVCs for that subscriber group. This method is easier and less time-consuming than having to modify the attributes for a large number of PVCs by using individual CLI commands.

  Modifications to the attributes in a VC class affect PVCs that are already associated with this VC class as well as PVCs subsequently created for this class.

Precedence Levels

Precedence levels play an important role in determining how the router assigns the attribute values for statically created and dynamically created PVCs that have associated VC classes.

Precedence Levels for Static PVCs

For PVCs that are statically created, the router determines the PVC attribute values according to the following precedence levels, in order from highest precedence to lowest precedence:

1. The most recent explicitly set value for a PVC attribute always has the highest precedence and overrides any settings in the VC class. Explicitly set values for PVC attributes are those values configured with the CLI (by using the **atm pvc** command or commands in ATM VC Configuration mode), SNMP, or assigned by RADIUS.

2. If an attribute value is not explicitly specified, the router takes the value for that attribute from the assigned VC class, in the following order of precedence:

   a. Attribute value specified in the VC class assigned to this PVC

   b. Attribute value specified in the VC class assigned to the ATM 1483 subinterface on which this PVC is created

   c. Attribute value specified in the VC class assigned to the ATM major interface on which this PVC is created

3. If no PVC attributes are explicitly specified and no VC class assignments exist, the router applies the default values for the commands listed in Table 9 on page 56. For information about the default value for each command, see the command descriptions in *Configuring VC Classes* on page 56.

Precedence Levels for Dynamic PVCs

For PVCs that are dynamically created, the router determines the PVC attribute values according to the following precedence levels, in order from highest precedence to lowest precedence:

1. The attribute value specified in the VC class assigned in the base profile always has the highest precedence.

2. If no VC class is assigned in the base profile, the router takes the value for that attribute from the VC class assigned to the associated ATM major interface.

3. If neither the base profile nor the ATM major interface has a VC class assigned, the router takes the value for that attribute from the individually specified attributes in the base profile.

4. If neither the base profile nor the ATM major interface has a VC class assigned, and no attributes are individually specified in the base profile, the router applies the default values for the commands listed in Table 9 on page 56. For information about the default value for each command, see the command descriptions in *Configuring VC Classes* on page 56.

Precedence Level Examples

For examples that illustrate how precedence levels affect the assignment of VC classes, see *Precedence Level Examples for Assigning VC Classes* on page 64.

To help you better understand these examples, we recommend that you first read the following sections to learn how to configure and assign VC classes:

- Configuring VC Classes on page 56
- Assigning VC Classes to Individual PVCs on page 61
- Assigning VC Classes to ATM Major Interfaces on page 62
- Assigning VC Classes to Static ATM 1483 Subinterfaces on page 63
- Assigning VC Classes to Base Profiles for Bulk-Configured VC Ranges on page 63

Upgrade Considerations

The following considerations apply to using ATM VC classes when you upgrade to the current JUNOSe software release from a lower-numbered JUNOSe software release:

- It is possible to use VC classes for PVCs created in a lower-numbered release with the **atm pvc** command. In such cases, the router uses the following rules to determine the PVC attribute values:
  - Nondefault values explicitly specified for PVC attributes with the **atm pvc** command take precedence over the attribute values specified in the associated VC class. As a result, the router takes the values for these attributes from the **atm pvc** command settings.
  - Default values implicitly specified for PVC attributes with the **atm pvc** command have a lower precedence than the attribute values specified in the associated VC class. As a result, the router takes the values for these attributes from the assigned VC class.
- The output of the **show configuration** command uses either the **pvc** command format or the **atm pvc** command format to display ATM PVCs. The display format of configuration information for ATM PVCs created with the **atm pvc** command depends on the JUNOSe software release from which you are upgrading, as follows:
  - When you upgrade to the current JUNOSe software release from a JUNOSe release numbered lower than Release 7.3.x, the output of the **show configuration** command uses the **pvc** command format (**pvc** *vcd vpi*/*vci*) to display configuration information for all ATM PVCs. This occurs even if those PVCs were created in a JUNOSe release numbered lower than Release 7.3.x with the **atm pvc** command. For example, assume that you created a PVC in JUNOSe Release 7.2.x by issuing the command **atm pvc 2 0 33 aal5snap 0 0 0**. The **show configuration** command in the current JUNOSe software release displays the identifier for this PVC as follows:

    ```
    pvc 2 0/33
    ```

  - When you upgrade to the current JUNOSe software release from JUNOSe Release 7.3.x or a higher-numbered release, the output of the **show configuration** command uses the **atm pvc** command format to display configuration information for ATM PVCs created with the **atm pvc** command. For example, assume that you created a PVC in JUNOSe Release 7.3.x or Release 8.0.x by issuing the command **atm pvc 2 0 33 aal5snap 0 0 0**. The **show configuration** command in the current JUNOSe software release displays the identifier for this PVC as follows:

    ```
    atm pvc 2 0 33 aal5snap 0 0 0
    ```

    For PVCs previously created in the lower-numbered release by using the **pvc** command, the **show configuration** command displays configuration information using the **pvc** command format, as described previously.

For information about how to use the **show configuration** command, see *JUNOSe System Basics Configuration Guide, Chapter 5, Managing the System*.

To make the most efficient use of the VC class feature when you upgrade to the current JUNOSe software release, we recommend that you follow these steps:

1. Delete any PVCs created with the **atm pvc** command and recreate them by using the **pvc** command. For information about creating a data PVC by using the **pvc** command, see *Creating Data PVCs* on page 45.

2. Configure the VC class as described in *Configuring VC Classes* on page 56.

3. Assign the VC class in one of the following ways:

   - Assign the VC class to the individual PVC when you create or modify the PVC.

   - Assign the VC class to the associated ATM major interface or ATM 1483 subinterface before you create the PVC.

Configuring VC Classes

To configure a VC class, you issue the **vc-class atm** command to create and name the VC class. The **vc-class atm** command accesses ATM VC Class Configuration mode, from which you configure a set of attributes to apply to an ATM data PVC.

Table 9 lists the commands that you can use in ATM VC Class Configuration mode to configure a set of attributes for a data PVC. These commands are identical to the commands in ATM VC Configuration mode described in *Configuring Individual ATM PVC Parameters* on page 43. For more information about the syntax of each command, see the *JUNOSe Command Reference Guide A to M* and the *JUNOSe Command Reference Guide N to Z*.

Table 9: Commands to Configure VC Class Attributes

cbr	oam-pvc
encapsulation	oam retry
inarp	ubr
oam ais-rdi	vbr-nrt
oam cc	vbr-rt

For example, the following commands configure two VC classes: premium-subscriber-class and dsl-subscriber-class. You must issue the **exit** command from ATM VC Class Configuration mode for each VC class configuration to take effect.

```
! Configure VC class premium-subscriber-class.
host1(config)#vc-class atm premium-subscriber-class
host1(config-vc-class)#encapsulation aal5autoconfig
host1(config-vc-class)#cbr 200
host1(config-vc-class)#oam-pvc manage 60
host1(config-vc-class)#oam ais-rdi 5
host1(config-vc-class)#exit
```

```
! Configure VC class dsl-subscriber-class.
host1(config)#vc-class atm dsl-subscriber-class
host1(config-vc-class)#encapsulation aal5autoconfig
host1(config-vc-class)#ubr
host1(config-vc-class)#exit
host1(config)#
```

In premium-subscriber-class:

- The **encapsulation** command sets the encapsulation method to **aal5autoconfig**.
- The **cbr** command sets the service category to CBR with a PCR of 200 Kbps.
- The **oam-pvc** command enables generation of F5 OAM loopback cells and F5 OAM VC integrity.
- The **oam ais-rdi** command configures the alarm down count for successive AIS and RDI alarm cells to 5.

In dsl-subscriber-class:

- The **encapsulation** command sets the encapsulation method to **aal5autoconfig**.
- The **ubr** command configures the UBR service category without a PCR.

To configure an ATM VC class with systemwide default values, you can issue the **vc-class atm** command followed immediately by the **exit** command. For example, the following commands create a VC class named default-vc-class. Because no attribute values are explicitly specified in default-vc-class, the router applies the default values for the commands listed in Table 9 on page 56. For information about the default value for each command, see the command descriptions in this section.

```
! Configure VC class with default values.
host1(config)#vc-class atm default-subscriber-class
host1(config-vc-class)#exit
host1(config)#
```

To verify the VC class configuration, use the **show atm vc-class** command. For information about how to use this command, see **show atm vc-class** on page 94.

cbr

- Use to configure the CBR service category on an ATM data PVC.
- For detailed information about how to use this command, see **cbr** on page 46.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.
- Example

  ```
  host1(config-vc-class)#cbr 15000
  host1(config-vc-class)#exit
  ```

- Use the **no** version to restore the default service category, UBR without a PCR.

encapsulation

- Use to configure the encapsulation method on an ATM data PVC.
- For detailed information about how to use this command, see **encapsulation** on page 48.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.
- Example

  host1(config-vc-class)#**encapsulation aal5mux ip**
  host1(config-vc-class)#**exit**

- Use the **no** version to restore the default encapsulation method, **aal5snap**.

inarp

- Use to enable Inverse ARP on an ATM PVC that resides on an ATM 1483 NBMA subinterface and uses the default encapsulation method, **aal5snap**.
- For detailed information about how to use this command, see **inarp** on page 52.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.
- Example

  host1(config-vc-class)#**inarp 5**
  host1(config-vc-class)#**exit**

- Use the **no** version to restore the default behavior, which disables Inverse ARP on the router.

oam ais-rdi

- Use to configure surveillance parameters for AIS and RDI F5 OAM fault management cells on an ATM data PVC.
- For detailed information about how to use this command, see **oam ais-rdi** on page 49.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.
- Example

  host1(config-vc-class)#**oam ais-rdi 5 10**
  host1(config-vc-class)#**exit**

- Use the **no** version to restore the default values for the alarm down count (1 successive alarm cell) and alarm clear timeout duration (3 seconds).

oam cc

- Use to enable F5 OAM CC verification on an ATM data PVC.
- For detailed information about how to use this command, see **oam cc** on page 50.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.

- Example 1—Enables CC verification with a source endpoint

  host1(config-vc-class)#**oam cc source**
  host1(config-vc-class)#**exit**

- Example 2—Opens an F5 OAM CC segment cell flow and enables CC verification with a sink endpoint

  host1(config-vc-class)#**oam cc segment sink**
  host1(config-vc-class)#**exit**

- Use the **no** version to disable F5 OAM CC verification and restore the default setting for cell termination, **end-to-end**.

oam-pvc

- Use to enable generation of F5 OAM loopback cells on an ATM data PVC and, optionally, enable F5 OAM VC integrity features on the circuit.
- For detailed information about how to use this command, see **oam-pvc** on page 50.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.
- Example

  host1(config-vc-class)#**oam-pvc manage 15**
  host1(config-vc-class)#**exit**

- Use the **no** version to restore the default behavior, which disables F5 OAM VC integrity on the router and restores the default value for loopback frequency, 10 seconds.

oam retry

- Use to configure F5 OAM VC integrity parameters on an ATM data PVC.
- For detailed information about how to use this command, see **oam retry** on page 51.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.
- Example

  host1(config-vc-class)#**oam retry 5 6 3**
  host1(config-vc-class)#**exit**

- Use the **no** version to restore the default values for the up retry count (3 successive loopback cell responses), down retry count (5 successive loopback cell responses), and retry frequency (1 second).

ubr

- Use to configure the UBR service category on an ATM data PVC.
- For detailed information about how to use this command, see **ubr** on page 46.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.

- Example

  host1(config-vc-class)#**ubr 5000**
  host1(config-vc-class)#**exit**

- Use the **no** version to restore the default service category, UBR without a PCR.

vbr-nrt

- Use to configure the VBR-NRT service category on an ATM data PVC.
- For detailed information about how to use this command, see **vbr-nrt** on page 47.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.
- Example

  host1(config-vc-class)#**vbr-nrt 50000 10000 150**
  host1(config-vc-class)#**exit**

- Use the **no** version to restore the default service category, UBR without a PCR.

vbr-rt

- Use to configure the VBR-RT service category on an ATM data PVC.
- For detailed information about how to use this command, see **vbr-rt** on page 47.
- You must issue the **exit** command from ATM VC Class Configuration mode for the configuration to take effect.
- Example

  host1(config-vc-class)#**vbr-rt 200000 30000 400**
  host1(config-vc-class)#**exit**

- Use the **no** version to restore the default service category, UBR without a PCR.

vc-class atm

- Use to create and name a VC class for an ATM data PVC.
- You must specific a VC class name of up to 32 alphanumeric characters.
- The **vc-class atm** command accesses ATM VC Class Configuration mode, from which you can configure a set of attributes for the PVC including the service category, encapsulation method, F5 OAM options, and Inverse ARP.
- You must issue the **exit** command from ATM VC Class Configuration mode for the VC class configuration to take effect.
- For information about the total number of VC classes supported on the router, see *JUNOSe Release Notes*, *Appendix A*, *System Maximums*.
- Example

  host1(config)#**vc-class atm dsl-subscriber-class**
  host1(config-vc-class)#**exit**

- Use the **no** version to remove the named VC class from the router. You cannot remove a VC class that is currently assigned to at least one ATM PVC, ATM 1483 subinterface, or ATM major interface without first issuing the **no class-vc** command or the **no class-int** command to remove the VC class association with the PVC, interface, or subinterface.

Assigning VC Classes to Individual PVCs

To assign a previously configured VC class to an individual ATM data PVC, you use the **class-vc** command from ATM VC Configuration mode. Issuing this command applies the set of attributes configured in the specified VC class to the ATM data PVC.

NOTE: The **class-vc** command is valid only for a data PVC created with the **pvc** command. It has no effect for data PVCs created with the **atm pvc** command, or for control (ILMI) PVCs. For information about creating a data PVC by using the **pvc** command, see *Creating Data PVCs* on page 45.

For example, the following commands assign the VC class named premium-subscriber-class to the ATM data PVC with VCD 2, VPI 0, and VCI 200.

```
! Assign VC class premium-subscriber-class to PVC 2/0.200
host1(config)#interface atm 2/0.200
host1(config-subif)#pvc 200 0/200
host1(config-subif-atm-vc)#class-vc premium-subscriber-class
host1(config-subif-atm-vc)#exit
```

For those attributes that you do not explicitly specify for the ATM PVC, the router applies the values specified in the VC class. As explained in *Precedence Levels* on page 53, the values in a VC class assigned to an individual PVC take precedence over both of the following:

- Values in a VC class assigned to an ATM 1483 subinterface
- Values in a VC class assigned to an ATM major interface

For examples that illustrate how precedence levels affect the assignment of VC classes, see *Precedence Level Examples for Assigning VC Classes* on page 64.

class-vc

- Use to assign a previously configured VC class to an individual ATM data PVC.
- The **class-vc** command is valid only for data PVCs created with the **pvc** command.
- You must issue the **exit** command from ATM VC Configuration mode for the VC class association to take effect.
- Example

  ```
  host1(config-subif-atm-vc)#class-vc dsl-subscriber-class
  host1(config-subif-atm-vc)#exit
  ```

- Use the **no** version to remove the VC class association with the data PVC.

Assigning VC Classes to ATM Major Interfaces

To assign a previously configured VC class to an ATM major interface, you use the **class-int** command from Interface Configuration mode. Issuing this command applies the set of attributes in the specified VC class to the ATM data PVCs statically or dynamically created on this interface.

For example, the following commands assign the VC class named dsl-subscriber-class to an ATM major interface configured on slot 5, port 0.

```
! Assign VC class dsl-subscriber-class to ATM interface 5/0.
host1(config)#interface atm 5/0
host1(config-if)#class-int dsl-subscriber-class
host1(config-if)#exit
```

For those attributes that you do not explicitly specify for an ATM PVC, the router applies the values specified in the VC class. As explained in *Precedence Levels* on page 53, the values in a VC class assigned to an ATM major interface have a lower precedence than both of the following:

- Values in a VC class assigned to an individual ATM PVC
- Values in a VC class assigned to an ATM 1483 subinterface

This means that if a VC class is assigned to an individual PVC or ATM 1483 subinterface configured on the major interface, the attribute values configured in the VC class assigned to the PVC or subinterface override the attribute values configured in the VC class assigned to the major interface.

For examples that illustrate how precedence levels affect the assignment of VC classes, see *Precedence Level Examples for Assigning VC Classes* on page 64.

class-int

- Use from Interface Configuration mode to assign a previously configured VC class to an ATM major interface.
- You must issue the **exit** command from Interface Configuration mode for the VC class association to take effect.
- Example

  ```
  host1(config-if)#class-int gold-subscriber-class
  host1(config-if)#exit
  ```

- Use the **no** version to remove the VC class association with the interface. Issuing the **no** version causes the router to set the PVC attributes to their systemwide default values, or to the values set in the associated VC class with the next highest order of precedence.

Assigning VC Classes to Static ATM 1483 Subinterfaces

To assign a previously configured VC class to a static ATM 1483 subinterface, you use the **class-int** command from Subinterface Configuration mode. Issuing this command applies the set of attributes in the specified VC class to the ATM data PVCs statically or dynamically created on this subinterface.

For example, the following commands assign the VC class named premium-subscriber-class to an ATM 1483 subinterface configured on slot 5, port 0, subinterface 100.

```
! Assign VC class dsl-subscriber-class to ATM 1483 subinterface 5/0.100.
host1(config)#interface atm 5/0.100
host1(config-subif)#class-int premium-subscriber-class
host1(config-subif)#exit
```

For those attributes that you do not explicitly specify for an ATM PVC, the router applies the values specified in the VC class. As explained in *Precedence Levels* on page 53, the values in a VC class assigned to an ATM 1483 subinterface take precedence over the values in a VC class assigned to an ATM major interface, but have a lower precedence than the values in a VC class assigned to an individual ATM PVC.

This means that if a VC class is assigned to a PVC configured on the subinterface, the attribute values configured in the VC class assigned to the individual PVC override the attribute values configured in the VC class assigned to the subinterface.

For examples that illustrate how precedence levels affect the assignment of VC classes, see *Precedence Level Examples for Assigning VC Classes* on page 64.

class-int

- Use from Subinterface Configuration mode to assign a previously configured VC class to a static ATM 1483 subinterface.
- You must issue the **exit** command from Subinterface Configuration mode for the VC class association to take effect.
- Example

  ```
  host1(config-subif)#class-int silver-subscriber-class
  host1(config-subif)#exit
  ```

- Use the **no** version to remove the VC class association with the subinterface. Issuing the **no** version causes the router to set the VC attributes to their systemwide default values, or to the values set in the associated VC class with the next highest order of precedence.

Assigning VC Classes to Base Profiles for Bulk-Configured VC Ranges

To assign a VC class to a base profile for a dynamic ATM 1483 subinterface, you can use the **atm class-vc** command from Profile Configuration mode. Issuing this command applies the set of attributes in the specified VC class to all bulk-configured VC ranges that are dynamically created from this profile.

For more information, see *Configuring ATM 1483 Dynamic Subinterfaces* in *Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.

Precedence Level Examples for Assigning VC Classes

The examples in this section illustrate how the precedence level rules described in *Precedence Levels* on page 53 affect the assignment of VC classes and PVC attribute values.

For all of these examples, assume that you have issued the following commands to configure a VC class named my-premium-class:

```
host1(config)#vc-class atm my-premium-class
host1(config-vc-class)#encapsulation aal5autoconfig
host1(config-vc-class)#cbr 200
host1(config-vc-class)#oam-pvc manage 60
host1(config-vc-class)#oam ais-rdi 5
host1(config-vc-class)#exit
```

Example 1 and Example 2 illustrate the effect of precedence levels when you assign the VC class my-premium-class to an individual PVC with VCD 200, VPI 0, and VCI 200. Example 3 illustrates how using the **atm pvc** command affects VC class assignment. Finally, Example 4 illustrates how modifications to a VC class affect PVC attributes applied through RADIUS.

Example 1: Explicitly Changing the Service Category

Explicitly specified attribute values take precedence over attribute values specified in a VC class. As a result, the following commands cause the router to use the most recent explicitly specified value, UBR with a PCR of 200 Kbps, as the service category for this PVC instead of the service category specified in my-premium-class, CBR with a PCR of 200 Kbps. The router takes the values for the other attributes from the VC class my-premium-class.

```
host1(config)#interface atm 2/0.200
host1(config-subif)#pvc 200 0/200
host1(config-subif-vc)#ubr 200
host1(config-subif-vc)#class-vc my-premium-class
host1(config-subif-vc)#exit
```

The following commands change the service category for the PVC to VBR-RT because this is the most recent explicitly specified value for this attribute. The router takes the values for the other attributes from the VC class my-premium-class, which is still assigned to the PVC.

```
host1(config)#interface atm 2/0.200
host1(config-subif)#pvc 200 0/200
host1(config-subif-vc)#vbr-rt 200 150 200
host1(config-subif-vc)#exit
```

The following commands cause the router to retain the VBR-RT service category for the PVC because it is still the most recent explicitly specified value for this attribute. The router takes the values for the other attributes from the VC class my-premium-class.

```
host1(config)#interface atm 2/0.200
host1(config-subif)#pvc 200 0/200
host1(config-subif-vc)#class-vc my-premium-class
host1(config-subif-vc)#exit
```

Example 2: Changing the Encapsulation Method in the VC Class

The following commands change the value for the encapsulation method in the VC class my-premium-class from **aal5autoconfig** to **aal5snap**. As a result, the router now uses **aal5snap** instead of **aal5autoconfig** as the encapsulation method for the PVCs to which this VC class is assigned.

```
host1(config)#vc-class atm my-premium-class
host1(config-vc-class)#encapsulation aal5snap
host1(config-vc-class)#exit
```

Example 3: Effect of Using the atm pvc Command

The following commands, which attempt to assign the my-premium-class VC class to a PVC originally created with the **atm pvc** command, have no effect. The router interprets all attribute values specified with the **atm pvc** command as explicitly specified values, and therefore takes the values for these attributes from the **atm pvc** command instead of from the VC class. As a result, the router continues to use **aal5mux ip** as the encapsulation method for this PVC instead of the encapsulation method specified in the VC class my-premium-class.

```
host1(config)#interface atm 2/0.300
host1(config-subif)#atm pvc 300 0 300 aal5mux ip
host1(config-subif)#pvc 300 0/300
host1(config-subif-vc)#class-vc my-premium-class
host1(config-subif-vc)#exit
```

Example 4: Overriding RADIUS Values

If RADIUS is configured to provide traffic parameters for PVCs, a more recent, explicitly specified change in the VC class associated with that PVC overrides the PVC values applied through RADIUS.

In the following example, assume that RADIUS has been configured to apply a service category of CBR with a PCR of 400 Kbps to the PVC. Initially, the PVC uses the service category configured in my-premium-class, CBR with a PCR of 200 Kbps. However, when the subscriber logs in through RADIUS, the router applies the RADIUS-configured service category, CBR with a PCR of 400 Kbps.

While the subscriber is still logged in, my-premium-class is modified to change the service category to CBR with a PCR of 600 Kbps. Because this VC class modification results in the most recent, explicitly specified value for the service category, the router now uses CBR with a PCR of 600 Kbps as the service category for the PVC instead of the service category configured through RADIUS.

```
host1(config)#interface atm 2/0.200
host1(config-subif)#pvc 200 0/200
host1(config-subif-vc)#class-vc my-premium-class
host1(config-subif-vc)#exit
! Subscriber logs in through RADIUS, which applies service category of CBR
! with a PCR of 400 Kbps to PVC.
host1(config)#vc-class atm my-premium-class
host1(config-vc-class)#cbr 600
host1(config-vc-class)#exit
! Router now applies service category of CBR with a PCR of 600 Kbps to PVC.
```

Configuring Dynamic ATM 1483 Subinterfaces

As an alternative to the static ATM interface configurations described in this chapter, you can also configure dynamic ATM 1483 subinterfaces over static ATM AAL5 interfaces over ATM. Dynamic ATM 1483 subinterfaces can perform autodetection and dynamic creation of the following upper-layer encapsulation types:

- Bridged Ethernet
- IP
- PPP
- PPPoE

For details, see *Configuring ATM 1483 Dynamic Subinterfaces* in *Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.

Monitoring ATM

This section explains how to set a statistics baseline, display bit rate and packet rate statistics for ATM virtual circuits (VCs), and use the **show** commands to view your ATM configuration and monitor ATM VCs and VPs.

NOTE: The E120 router and E320 router output for **monitor** and **show** commands is identical to output from other E-series routers, except that the E120 and E320 router output also includes information about the adapter identifier in the interface specifier (*slot/adapter/port*).

Setting Statistics Baselines

You can set a statistics baseline for ATM interfaces, ATM virtual circuits, and ATM virtual paths configured on the router.

baseline atm vp interface

- Use to set a statistics baseline for an ATM virtual path (VP) interface.
- The router implements the baseline by reading and storing the statistics at the time the baseline is set and then subtracting this baseline whenever baseline-relative statistics are retrieved.
- To set the baseline for an ATM VP, specify the VPI. The numeric range of the VPI depends on the line module capabilities and current configuration.
- To display baseline statistics, use the **delta** keyword with ATM **show** commands.
- Examples

  host1#**baseline atm vp interface atm 12/0 0**
  host1#**baseline atm vp interface atm 5/0/0 1**

- There is no **no** version.

baseline interface atm

- Use to set a statistics baseline for ATM interfaces or a specific virtual circuit.
- The router implements the baseline by reading and storing the statistics at the time the baseline is set and then subtracting this baseline whenever baseline-relative statistics are retrieved.
- To set the baseline for a circuit, specify a VCD in the range 1–2147483647.
- To set the baseline on an interface, omit the VCD.
- To display baseline statistics, use the **delta** keyword with ATM **show** commands.
- Examples

  host1#**baseline interface atm 9/1 123**
  host1#**baseline interface atm 5/0/0 123**

- There is no **no** version.

Displaying Interface Rate Statistics for ATM VCs and ATM VPs

You can use the following commands to display bit rate and packet rate statistics over a specified time interval for one or more ATM virtual circuits (VCs) or virtual paths (VPs) configured on the router.

- To monitor the data rate for ATM VCs, use the **monitor atm vc** command.
- To monitor the data rate for ATM VPs, use the **monitor atm vp** command.

To monitor the data rate for ATM VCs and ATM VPs:

1. Log in to the router by using a local console session or a virtual terminal (vty) session (such as a Telnet session).

   While you use the **monitor atm vc** command or the **monitor atm vp** command, you must keep the console or terminal session open. You cannot issue any other commands during the session.

   For information about logging in to the router, see *Accessing the CLI* in *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

2. Access User Exec mode or Privileged Exec mode.

   For information, see *Accessing Command Modes* in *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

3. Specify the interface identifier and VCD (for each ATM VC) or VPI (for each ATM VP) that you want to monitor. For information about specifying an ATM interface, see *Interface Types and Specifiers* in *JUNOSe Command Reference Guide, About This Guide*.

   host1#**monitor atm vc atm 12/0 1 atm 8/0 1 display-time-of-day**

   host1#**monitor atm vp atm 12/0 0 atm 12/0 1 load-interval 15 display-time-of-day**

By default, the router uses a 5-second time interval between polls to calculate bit rates and packet rates for each specified VC or VP. Optionally, you can use the **load-interval** keyword to specify a nondefault time interval in the range 5–30 seconds (for ATM VCs) or 5–300 seconds (for ATM VPs).

You can also include the optional **display-time-of-day** keyword to show the time of day at which the router gathers statistics for each interval. Displaying the time of day enables you to monitor when a particular VC or VP is underutilized or overutilized.

4. Review the command output.

```
host1#monitor atm vc atm 12/0 1 atm 8/0 1 display-time-of-day
                            Seconds
                            between                                    Time
       Interface         VCD  polls    Input bps/pps   Output bps/pps  (UTC)
----------------------- ----- -------- --------------- --------------- --------
ATM 12/0                    1        0           --/--           --/-- 10:43:11
ATM 8/0                     1        0           --/--           --/-- 10:43:11
ATM 12/0                    1        5     121840/100      121840/100 10:43:16
ATM 8/0                     1        5     121600/100      121600/100 10:43:16
ATM 12/0                    1        5       98008/80        98008/80 10:43:21
ATM 8/0                     1        5       98008/80        98008/80 10:43:21
...

host1#monitor atm vp atm 12/0 0 atm 12/0 1 load-interval 15 display-time-of-day
                            Seconds
                            between                                    Time
       Interface         VPI  polls    Input bps/pps  Output bps/pps  (UTC)
----------------------- ----- -------- --------------- --------------- --------
ATM 12/0                    0        0           --/--           --/-- 09:47:18
ATM 12/0                    1        0           --/--           --/-- 09:47:18
ATM 12/0                    0       15   6635792/6480    6635792/6480 09:47:33
ATM 12/0                    1       15   6635312/6479    6635312/6479 09:47:33
ATM 12/0                    0       15   6635176/6479    6635176/6479 09:47:48
ATM 12/0                    1       15   6634424/6478    6634424/6478 09:47:48
ATM 12/0                    0       15   6635448/6479    6635448/6479 09:48:03
```

The **monitor atm vc** command and **monitor atm vp** command display similar information, except that the **monitor atm vc** command displays the VCD for each interface and the **monitor atm vp** command displays the VPI for each interface.

The router polls the statistics of each VC or VP identified in the command at the specified load interval to calculate and display bit rate and packet rate statistics. The first line of output for each interface always displays 0 (zero) for the number of seconds between polls, and dashes (*--/--*) in the Input bps/pps and Output bps/pps columns. These values indicate that the router initially takes a baseline for each interface against which to measure subsequent statistics. The router continues to display subsequent lines of output for each interface at the specified load interval until you press Ctrl + c to stop the command.

For a description of the fields in the command display, see **monitor atm vc** and **monitor atm vp** on page 69.

5. If you remove an ATM interface or (for VCs) an ATM 1483 subinterface while you are monitoring one or more VCs or VPs that reside on the deleted interface, press Ctrl + c to stop the **monitor atm vc** command or **monitor atm vp** command, and then restart the command to ensure accurate interface rate statistics are displayed.

   If you leave the **monitor atm vc** command or **monitor atm vp** command running after you remove the interface, the command displays undefined or inaccurate statistics for the VC or VP on the interface that has been removed. The display of undefined or inaccurate statistics can result when you remove the interface by issuing either the **no interface atm** command or **slot erase** command, and can continue even after you recreate the interface with the same VC or VP configuration.

6. When you are finished monitoring, press Ctrl + c to stop the **monitor atm vc** command or **monitor atm vp** command.

   ```
   host1#^C
   ```

monitor atm vc
monitor atm vp

- Use the **monitor atm vc** command to display bit rate and packet rate statistics over a specified time interval for one or more ATM VCs.
- Use the **monitor atm vp** command to display bit rate and packet rate statistics over a specified time interval for one or more ATM VPs.
- You must use either command in a dedicated console or terminal session for the duration of the monitoring session.
- Specify the interface identifier and VCD (for each ATM VC) or VPI (for each ATM VP) that you want to monitor.
- To specify a nondefault time interval in the range 5–30 seconds (for ATM VCs) or 5–300 seconds (for ATM VPs) at which the router calculates bit rate and packet rate statistics, use the optional **load-interval** keyword. The default time interval for either command is 5 seconds.
- To display the time at which the router calculates bit rate and packet rate statistics for the current interval, use the optional **display-time-of-day** keyword.
- To stop either command, press Ctrl + c.
- Field descriptions
  - Interface—Interface identifier for the ATM interface on which the VC or VP resides
  - VCD—Virtual circuit descriptor that identifies the VC (**monitor atm vc** command only)
  - VPI—Virtual path identifier of the PVC (**monitor atm vp** command only)
  - Seconds between polls—Number of seconds at which the router calculates bit rate and packet rate statistics
  - Input bps/pps—Number of bits per second (bps) and packets per second (pps) received on this interface during the specified load interval

  - Output bps/pps—Number of bits per second (bps) and packets per second (pps) transmitted on this interface during the specified load interval
  - Time—Time of day, in hh:mm:ss format, at which the router calculates the bit rate and packet rate statistics for the current interval

- Example 1—Displays bit rate and packet rate statistics over the default (5-second) load interval for a single ATM VC

```
host1#monitor atm vc atm 12/0 100
                              Seconds
                              between
       Interface         VCD   polls    Input bps/pps  Output bps/pps
----------------------- ----- -------- --------------- ---------------
ATM 12/0                  100        0           --/--           --/--
ATM 12/0                  100        5    6631624/6476    6631624/6476
ATM 12/0                  100        5    6630808/6475    6631008/6475
ATM 12/0                  100        5    6632448/6477    6632240/6476
ATM 12/0                  100        5    6629168/6473    6629168/6473
ATM 12/0                  100        5    6631008/6475    6631216/6475
host1#^C
```

- Example 2—Displays bit rate and packet rate statistics over the default (5-second) load interval for two ATM VCs, with the time of day that the statistics were calculated

```
host1#monitor atm vc atm 12/0 100 atm 12/0 200 display-time-of-day
                              Seconds
                              between                                  Time
       Interface         VCD   polls    Input bps/pps  Output bps/pps   (UTC)
----------------------- ----- -------- --------------- --------------- --------
ATM 12/0                  100        0           --/--           --/-- 17:33:06
ATM 12/0                  200        0           --/--           --/-- 17:33:06
ATM 12/0                  100        5    6635104/6479    6635104/6479 17:33:11
ATM 12/0                  200        5    6633264/6477    6633472/6478 17:33:11
ATM 12/0                  100        5    6632856/6477    6632856/6477 17:33:16
ATM 12/0                  200        5    6633264/6477    6633056/6477 17:33:16
host1#^C
```

- Example 3—Displays bit rate and packet rate statistics over a 10-second load interval for two ATM VPs

```
host1#monitor atm vp atm 12/0 0 atm 12/0 1 load-interval 10
                              Seconds
                              between
       Interface         VPI   polls    Input bps/pps  Output bps/pps
----------------------- ----- -------- --------------- ---------------
ATM 12/0                    0        0           --/--           --/--
ATM 12/0                    1        0           --/--           --/--
ATM 12/0                    0       10    6635312/6479    6635312/6479
ATM 12/0                    1       10    6634288/6478    6634288/6478
ATM 12/0                    0       10    6637664/6482    6637664/6482
ATM 12/0                    1       10    6637872/6482    6637872/6482
host1#^C
```

- Example 4—Displays bit rate and packet rate statistics over a 15-second load interval for two ATM VPs, with the time of day that the statistics were calculated

```
host1#monitor atm vp atm 12/0 0 atm 12/0 1 load-interval 15 display-time-of-day
                            Seconds
                            between                                      Time
       Interface         VPI   polls    Input bps/pps  Output bps/pps   (UTC)
----------------------- ----- -------- --------------- --------------- --------
ATM 12/0                    0        0           --/--           --/-- 17:36:19
ATM 12/0                    1        0           --/--           --/-- 17:36:19
ATM 12/0                    0       15    6634352/6478    6634352/6478 17:36:34
ATM 12/0                    1       15    6633608/6478    6633608/6478 17:36:34
ATM 12/0                    0       15    6635176/6479    6635176/6479 17:36:49
ATM 12/0                    1       15    6635040/6479    6635040/6479 17:36:49
host1#^C
```

- There is no **no** version.

Using ATM show Commands

Use the **show** commands described in this section to display information about your ATM configuration and monitor ATM interfaces.

You can use the output filtering feature of the **show** command to include or exclude lines of output based on a text string you specify. See *show Commands* in *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

show atm aal5 interface

- Use to display information about a configured ATM AAL5 interface.
- Field descriptions
  - AAL5 Interface operational status—Operational status of the AAL5 interface: up, down, lowerlayerDown
  - time since last status change—Time since last reported change to the AAL5 interface operational status
  - SNMP trap link-status—Whether SNMP link status traps are enabled or disabled on the ATM AAL5 interface
  - Auto configure ATM 1483 status—Setting of the autoconfiguration feature for a dynamic ATM 1483 subinterface configured over the ATM AAL5 interface:
    - enabled—Autodetection of the ATM 1483 dynamic encapsulation type is enabled on the ATM AAL5 interface
    - disabled—Autodetection of the ATM 1483 dynamic encapsulation type is not currently enabled on the ATM AAL5 interface
  - InPackets—Number of packets received on this interface
  - InBytes—Number of bytes received on this interface
  - OutPackets—Number of packets transmitted on this interface
  - OutBytes—Number of bytes transmitted on this interface
  - InErrors—Number of incoming errors received on this interface
  - OutErrors—Number of outgoing errors on this interface

- InPacketDiscards—Number of incoming packets discarded on this interface
- OutDiscards—Number of outgoing packets discarded on this interface

- Example

```
host1#show atm aal5 interface atm 3/0
AAL5 Interface ATM 3/0 operational status:    lowerLayerDown
      time since last status change: 00:08:46

SNMP trap link-status: disabled
Auto configure ATM 1483 status: disabled

InPackets:        0
InBytes:          0
OutPackets:       0
OutBytes:         0
InErrors:         0
OutErrors:        0
InPacketDiscards: 0
OutDiscards:      0
```

show atm atm1483

- Use to display whether or not the router is set up to export ATM 1483 subinterface descriptions to the line module.
- Example

```
host1#show atm atm1483
ATM1483 IF Descriptions exported
```

show atm interface
show interfaces atm

- Use to display configuration and state information and statistics about a specific ATM interface, or to display a brief description of all ATM interfaces configured in the router.
- To specify an ATM interface for ERX-7xx models, ERX-14xx models, and ERX-310 routers, use the *slot*/*port* format.
  - *slot*—Number of the chassis slot
  - *port*—Port number on the I/O module; on the OC3-2 GE APS I/O module, you can specify ATM interfaces only in ports 0 and 1; port 2 is reserved for a Gigabit Ethernet interface
- To specify an ATM interface for the E120 router and the E320 router, use the *slot*/*adapter*/*port* format.
  - *slot*—Number of the chassis slot
  - *adapter*—Identifier for the IOA within the E320 chassis, either 0 or 1, where:
    - 0 indicates that the IOA is installed in the right IOA bay (E120 router) or the upper IOA bay (E320 router).
    - 1 indicates that the IOA is installed in the left IOA bay (E120 router) or the lower IOA bay (E320 router).
  - *port*—Port number on the IOA

- To display the status and number of configured VCs for all ATM interfaces configured in the router, use the **brief** keyword.
- Field descriptions
  - ATM Interface status—State of the physical interface: up, down
  - line protocol—State of the ILMI protocol: disabled, up, down
  - AAL5 operational status—Operational status of the ATM AAL5 interface: up, down, lowerLayerDown
  - time since last status change—Time since last reported change to the AAL5 operational status
  - ATM operational status—Operational status of the ATM interface: up, down, lowerLayerDown
  - time since last status change—Time since last reported change to the ATM operational status
  - UNI version—UNI version: 3.0, 3.1, 4.0
  - Maximum VCs—Maximum number of virtual circuits supported on this interface
  - Current VCs—Current number of virtual circuits configured
  - ILMI VPI/VCI—Number of VPI and VCI configured for ILMI (displayed only when ILMI is configured on the interface)
  - VCD—Number of VCD (displayed only when ILMI is configured on the interface)
  - ILMI keepalive—State and status of the ILMI (displayed only when ILMI is configured on the interface)
  - Max VCI per VPI—Maximum number of virtual circuits on each virtual path
  - CAC admin state—Enabled, disabled
  - Subscription bandwidth—Maximum allowable bandwidth on the port (displayed only when CAC is enabled)
  - UBR weight—Configured bandwidth for UBR and UBR-PCR connections (displayed only when CAC is enabled)
  - Available bandwidth—Bandwidth currently available on the port (displayed only when CAC is enabled)
  - SNMP trap link-status—Enabled, disabled
  - OAM cell receive status—Whether the ATM interface processes or flushes OAM cells: enabled, disabled
  - OAM cell filter—Whether the interface flushes all OAM cells or flushes only AIS and RDI alarm cells (displayed only when OAM cell receive status is enabled)
  - atm oam loopback-location—Loopback location ID for this interface
  - Interface Alias—Text description or alias if configured for the interface
  - Assigned VC Class—Name of the VC class assigned to this interface, if configured
  - InPackets—Number of packets received on this interface

- InBytes—Number of bytes received on this interface
- InCells—Number of cells received on this interface
- OutPackets—Number of packets transmitted on this interface
- OutBytes—Number of bytes transmitted on this interface
- OutCells—Number of cells transmitted on this interface
- InErrors—Number of incoming errors received on this interface
- OutErrors—Number of outgoing errors on this interface
- InPacketDiscards—Number of incoming packets discarded on this interface
- InByteDiscards—Number of incoming bytes discarded on this interface
- InCellErrors—Increments when a T3 or an E3 ATM interface receives cells for a VPI or VCI that is not configured on that interface

- Field descriptions specific to the applicable physical interface. In Example 1, the output contains the following physical interface fields:
  - SONET path operational status—State of the SONET path interface: up, down, lowerLayerDown
  - time since last status change—Time since last reported change to the SONET path operational status
  - SONET operational status—State of SONET interface: up, down, lowerLayerDown
  - time since last status change—Time since last reported change to the SONET operational status
  - PHY Type—Physical port type on which this interface is running
  - Framing—Framing type of the physical interface
  - TX clocking—Clocking type for the physical interface
  - Loopback—Loopback status for the physical interface: enabled, disabled
  - Receive FIFO Overruns—Number of times received FIFO was overrun
  - qos-mode-port—Status of SAR backpressure: enabled, disabled
  - queue—Hardware packet queue associated with the specified traffic class and interface
  - Forwarded packets, Bytes—Number of packets and bytes forwarded on this queue
  - Dropped committed packets, Bytes—Number of committed packets and bytes that were dropped
  - Dropped conformed packets 0, Bytes 0—Number of conformed packets and bytes that were dropped
  - Dropped exceeded packets 0, Bytes 0—Number of exceeded packets and bytes that were dropped
  - Interface—ATM interface identifier
  - Status—Status of the ATM interface: up, down, lowerLayerDown
  - Configured VCs—Number of VCs configured on the interface

- Example 1—Displays information about a specific interface

```
host1#show atm interface atm 2/0
ATM Interface 2/0 is down, line protocol is down

AAL5 operational status:       lowerLayerDown
      time since last status change: 22:08:21
ATM operational status:        down
      time since last status change: 22:02:11
SONET path operational status: lowerLayerDown
      time since last status change: 1 day, 0 hours
SONET operational status:      down
      time since last status change: 1 day, 0 hours
UNI version: 3.0, Maximum VCs: 4096
Current VCs: 1
ILMI VPI/VCI: 17/23, VCD 26, ILMI keepalive: disabled
Max VCI per VPI: 32768
CAC admin state: enabled
Subscription bandwidth: 3000000 kbps
UBR weight: 3000 kbps
Available bandwidth: 2992000 kbps
SNMP trap link-status: enabled
OAM cell receive status: enabled
OAM cell filter : all cells
atm oam loopback-location 0XFFFFFFFF
Interface Alias: ATM interface slot #2 port 0
Assigned VC class       : dsl-subscriber-class

PHY Type: oc3, Framing: sonet, TX clocking: line
Loopback: none, Receive FIFO Overruns: 0

5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec

InPackets:        0
InBytes:          0
InCells:          0
OutPackets:       0
OutBytes:         0
OutCells:         0
InErrors:         0
OutErrors:        0
InPacketDiscards: 0
InByteDiscards:   0
InCellErrors:     0
qos-mode-port disabled

queue 0: traffic class control, bound to ATM2/0
  Forwarded packets 643, Bytes 36008
  Dropped committed packets 0, Bytes 0
  Dropped conformed packets 0, Bytes 0
  Dropped exceeded packets 0, Bytes 0
```

- Example 2—Shows a summary of all ATM interfaces

```
host1#show atm interface brief
                                Configured
Interface       Status             VCs
---------   --------------   ----------
ATM 2/0     up                        2
ATM 2/1     up                        3
ATM 2/2     lowerLayerDown            4
ATM 2/3     down                      5
ATM 4/0     up                        2
ATM 6/0     lowerLayerDown            2
```

show atm map

- Use to display the list of all configured ATM static maps to remote hosts on an ATM network.
- Field descriptions
  - Map list—Name of map list and method used to enter the map list. PERMANENT indicates that the map entry was configured; it was not entered automatically by a process.
  - protocol address maps to VCx—Name of protocol, the protocol address, and the VCD that the address is mapped to (for ATM VCs configured with the **atm pvc** command).
    - VC—Number of the virtual circuit
    - broadcast—Indicates pseudo-broadcasting
    - connection up—Indicates a point-to-point virtual circuit
- Example 1

```
host1#show atm map
Map list my-map : PERMANENT
 ip 192.168.2.10 maps to VC 10 atm 2/0
 ip 192.168.2.20 maps to VC 11 atm 2/0    broadcast
 ip 192.168.2.30 maps to VC 12 atm 2/0
Map list other-map : PERMANENT
 ip 192.10.2.10 maps to VC 100 atm 2/1
 ip 192.10.2.20 maps to VC 101 atm 2/1
 ip 192.10.2.30 maps to VC 102 atm 2/1    broadcast
```

- Example 2

```
host1#show atm map brief
Map list my-map : PERMANENT
Map list other-map : PERMANENT
```

- Example 3

```
host1#show atm map my-map
Map list my-map : PERMANENT
 ip 192.168.2.10 maps to VC 10 atm 2/0
 ip 192.168.2.20 maps to VC 11 atm 2/0    broadcast
 ip 192.168.2.30 maps to VC 12 atm 2/0
```

show atm oam

- Use to display F4 OAM statistics for an ATM interface.
- You must specify a VPI value in addition to the required ATM interface specifier.
- You can use the following keywords.
  - **segment**—Displays information about segment loopbacks
  - **end-to-end**—Displays information about end-to-end loopbacks
- To see F4 OAM circuits that are open, use the **show atm vc** command.
- Field descriptions
  - Sending End To End Loopback Cells—Enabled, disabled
  - Frequency—Frequency configured on this circuit
  - End To End OAM CC verification—Whether end-to-end CC verification is enabled or disabled
  - OAM CC Type—Whether the circuit is a sink or a source, or both a sink and a source
  - OAM Current CC state
    - Ready—OAM CC is not enabled
    - Active—OAM CC cell flow is running
    - Activation Failed—OAM CC activation failed
    - Wait Activate—Waiting for interface to come up before the software sends the activation request
    - Wait Activation Confirmation—Waiting for activation confirmation from the peer
    - Wait DeActivate—Waiting for interface to come up before the software sends the deactivation request
    - Wait DeActivation Confirmation—Waiting for deactivation confirmation from the peer
  - Segment OAM CC verification—Whether segment CC verification is enabled or disabled
  - VP State—State of the VP: up, down
  - VP End To End Oam State
    - not managed—Circuit is in normal OAM state; no OAM fault conditions
    - AIS—Circuit is in AIS state
    - RDI—Circuit is in RDI state
  - VP Segment Oam State
    - not managed—Circuit is in normal OAM state; no OAM fault conditions
    - AIS—Circuit is in AIS state
    - RDI—Circuit is in RDI state
  - InOamF4Cells—Number of F4 OAM cells received

- InOamF4CellsDropped—Number of incoming F4 OAM cells that were dropped
- InOamF4EndLoopbackCells—Total number of F4 end-to-end loopback cells received on this interface, which is the sum of the following counts:
  - InOamF4EndLoopbackCommands—Number of F4 end-to-end loopback commands received
  - InOamF4EndLoopbackResponses—Number of F4 end-to-end loopback responses received
- InOamF4SegLoopbackCells—Total number of F4 segment loopback cells received on this interface, which is the sum of the following counts:
  - InOamF4SegLoopbackCommands—Number of F4 segment loopback commands received
  - InOamF4SegLoopbackResponses—Number of F4 segment loopback responses received
- InOamF4EndAisCells—Number of F4 end-to-end AIS cells received
- InOamF4SegAisCells—Number of F4 segment AIS cells received
- InOamF4EndRdiCells—Number of F4 end-to-end RDI cells received
- InOamF4SegRdiCells—Number of F4 segment RDI cells received
- InOamF4EndCCActDeActCells—Number of F4 end-to-end activation or deactivation CC cells received
- InOamF4SegCCActDeActCells—Number of F4 segment activation or deactivation CC cells received
- InOamF4EndCCCells—Number of F4 end-to-end CC cells received
- InOamF4SegCCCells—Number of F4 segment CC cells received
- OutOamF4Cells—Number of F4 OAM cells sent
- OutOamF4EndLoopbackCells—Total number of F4 end-to-end loopback cells sent on this interface, which is the sum of the following counts:
  - OutOamF4EndLoopbackCommands—Number of F4 end-to-end loopback commands sent
  - OutOamF4EndLoopbackResponses—Number of F4 end-to-end loopback responses sent
- OutOamF4SegLoopbackCells—Total number of F4 segment loopback cells sent on this interface, which is the sum of the following counts:
  - OutOamF4SegLoopbackCommands—Number of F4 segment loopback commands sent
  - OutOamF4SegLoopbackResponses—Number of F4 segment loopback responses sent
- OutOamF4EndRdiCells—Number of end-to-end RDI cells sent
- OutOAM F4SegRdiCells—Number of segment RDI cells sent
- OutOamF4EndCCActDeActCells—Number of F4 end-to-end activation or deactivation CC cells sent

- OutOamF4SegCCActDeActCells—Number of F4 segment activation or deactivation CC cells sent
- OutOamF4EndCCCells—Number of F4 end-to-end CC cells sent
- OutOamF4SegCCCells—Number of F4 segment CC cells sent

- Example 1

```
host1#show atm oam 2/1 0
Sending End To End Loopback Cells is Enabled: Frequency = 20 secs
End To End OAM CC verification enabled
OAM CC Type : CC Sink End Point
OAM Current CC state : Ready
Segment OAM CC verification enabled
OAM CC Type : CC Sink End Point
OAM Current CC state : Ready
VP State                          :down
VP End To End Oam State           :not managed
VP Segment Oam State              :not managed
InOamF4Cells                      :0
InOamF4CellsDropped               :0
InOamF4EndLoopbackCells           :0
  InOamF4EndLoopbackCommands          :0
  InOamF4EndLoopbackResponses         :0
InOamF4SegLoopbackCells           :0
  InOamF4SegLoopbackCommands          :0
  InOamF4SegLoopbackResponses         :0
InOamF4EndAisCells                :0
InOamF4SegAisCells                :0
InOamF4EndRdiCells                :0
InOamF4SegRdiCells                :0
InOamF4EndCCActDeActCells         :0
InOamF4SegCCActDeActCells         :0
InOamF4EndCCCells                 :0
InOamF4SegCCCells                 :0
OutOamF4Cells                     :0
OutOamF4EndLoopbackCells          :0
  OutOamF4EndLoopbackCommands         :0
  OutOamF4EndLoopbackResponses        :0
OutOamF4SegLoopbackCells          :0
  OutOamF4SegLoopbackCommands         :0
  OutOamF4SegLoopbackResponses        :0
OutOamF4EndRdiCells               :0
OutOamF4SegRdiCells               :0
OutOamF4EndCCActDeActCells        :0
OutOamF4SegCCActDeActCells        :0
OutOamF4EndCCCells                :0
OutOamF4SegCCCells                :0
Time since last status change     :00:00:33
```

- Example 2

```
host1#show atm oam 2/1 0 segment
Segment OAM CC verification enabled
OAM CC Type : CC Sink End Point
OAM Current CC state: Ready
VP State                         :down
VP Oam State                     :not managed
InOamF4SegmentCells               :0
InOamF4SegmentCellsDropped        :0
InOamF4SegLoopbackCells           :0
  InOamF4SegLoopbackCommands             :0
  InOamF4SegLoopbackResponses            :0
```

```
InOamF4SegCCActDeActCells        :0
InOamF4SegCCCells                :0
OutOamF4SegmentCells             :0
OutOamF4SegLoopbackCells         :0
  OutOamF4SegLoopbackCommands             :0
  OutOamF4SegLoopbackResponses            :0
OutOamF4SegRdiCells              :0
OutOamF4SegCCActDeActCells       :0
OutOamF4SegCCCells               :0
Time since last status change    :00:00:53
```

- Example 3

```
host1#show atm oam 2/1 0 end-to-end
Sending End To End Loopback Cells Disabled:
End To End OAM CC verification enabled
OAM CC Type : CC Sink End Point
OAM Current CC state: Ready
VP State                          :down
VP Oam State                      :not managed
InOamF4EndCells                  :0
InOamF4EndCellsDropped           :0
InOamF4EndLoopbackCells          :0
  InOamF4EndLoopbackCommands              :0
  InOamF4EndLoopbackResponses             :0
InOamF4EndAisCells :0
InOamF4EndRdiCells :0
InOamF4EndCCActDeActCells        :0
InOamF4EndCCCells                :0
OutOamF4EndCells                 :0
OutOamF4EndLoopbackCells         :0
  OutOamF4EndLoopbackCommands             :0
  OutOamF4EndLoopbackResponses            :0
OutOamF4EndRdiCells              :0
OutOamF4EndCCActDeActCells       :0
OutOamF4EndCCCells               :0
Time since last status change    :00:00:53
```

show atm ping

- Use to show all existing ping entries, both completed and outstanding. Remember that ping statistics are overwritten when a new ping is issued on the circuit.
- You can specify the following options to show ping for entries for a specific interface, VPI, or VCI.
  - *interfaceSpecifier*—Shows ping entries for this interface
  - *vpi*—Shows details of the last **ping atm** command on this VPI
  - *vci*—Shows details of the last **ping atm** command on this VCI
- Field descriptions
  - Interface—Interface number
  - VPI—Virtual path identifier
  - VCI—Virtual channel identifier
  - CellCount—OAM loopback cell count configured on the interface
  - TimeOut—Timeout configured on the interface

- SentCellCount—Number of loopback cells sent
- RespCount—Number of loopback response cells received
- Status—Status of the ping
- Ping Cell Count—Cell count configured on the circuit
- Ping Time Out—Timeout, in seconds, configured on the circuit
- No Of Cells Sent—Number of ping cells sent on this circuit
- No Of Response Received—Number of ping responses received on this circuit
- Success Rate—Percentage of successful responses received for pings sent
- round-trip min/max/avg—Minimum, maximum, and average time in milliseconds that it took to receive responses to ping messages sent
- Ping Status—Results of the ping operation
  - Ping Completed—Number of ping requests in the cell count were sent
  - Ping in Progress—Ping is in operation
  - Ping Not Started—Ping operation is not started; you may see this via SNMP
  - Ping Stopped—Ping operation was manually stopped
  - Ping Stopped OAM Down—**atm oam flush** command was issued when ping was enabled
  - ATM Interface Down—Ping operation is stopped as a result of interface down operational status
- OAM Flow Type—Segment, End-to-end

- Example 1—Displays all entries in the router

```
host1#show atm ping
Interface VPI VCI CellCount TimeOut  SentCellCount  RespCount    Status
--------- --- --- --------- -------  -------------  ----------   -------
ATM 2/1   0   100         5       5              5           5   Ping Completed
ATM 2/1   0   200         5       5              5           5   Ping Completed
ATM 2/2   0   100         5       5              5           5   Ping Completed
ATM 2/2   0   200         5       5              5           5   Ping Completed
% Found 4  Entries in the system
```

- Example 2—Displays entries on an interface

```
host1#show atm ping 2/1
Interface VPI VCI  CellCount TimeOut  SentCellCount  RespCount    Status
--------- --- ---  --------- -------  -------------  ----------   -------
ATM 2/1   0   100          5       5              5           5   Ping Completed
ATM 2/1   0   200          5       5              5           5   Ping Completed
% Found 2  Entries in this Interface
```

- Example 3—Displays entries on a circuit

```
host1#show atm ping atm 2/1 0 100
Ping Cell Count            :5
Ping Time Out              :5secs
No Of Cells Sent           :5
No Of Response Received    :5
Success Rate               :100%
round-trip min/max/avg     :0/10/2 ms
Ping Status                :Completed
Oam Flow Type              :Segment
```

show atm subinterface

- Use to display the current state of all ATM subinterfaces, all ATM subinterfaces configured on a specified ATM physical interface, or a specific ATM subinterface.
- To specify an ATM subinterface for ERX-7xx models, ERX-14xx models, and ERX-310 routers, use the *slot*/*port*.*subinterface* format.
  - *slot*—Number of the chassis slot
  - *port*—Port number on the I/O module
  - *subinterface*—Number of the subinterface in the range 1–2147483647
- To specify an ATM subinterface for the E120 router and the E320 router, use the *slot*/*adapter*/*port*.*subinterface* format.
  - *slot*—Number of the chassis slot
  - *adapter*—Identifier for the IOA within the E320 chassis, either 0 or 1, where:
    - 0 indicates that the IOA is installed in the right IOA bay (E120 router) or the upper IOA bay (E320 router).
    - 1 indicates that the IOA is installed in the left IOA bay (E120 router) or the lower IOA bay (E320 router).
  - *port*—Port number on the IOA
  - *subinterface*—Number of the subinterface in the range 1–2147483647
- To display brief summary information for all ATM subinterfaces, or for ATM subinterfaces configured on a specified ATM physical interface, use the **summary** keyword.
- To display status information only for ATM subinterfaces with a specific operating status, use the **status** keyword with one of the following status values. (See the Status field description for an explanation of these values.)
  - dormant
  - dormantLockout
  - down
  - lowerLayerDown
  - notPresent
  - up

- To display the current state of an ATM subinterface created on the PVC with the specified VPI and VCI values, use the **atm** *slot*/*port*/*vpi*/*vci* format (for ERX-7xx models, ERX-14xx models, and ERX-310 routers) or the *slot/adapter/port/vpi/vci* format (for E120 routers and E320 routers) to identify the ATM subinterface (Example 5).

NOTE: You can use the **atm** *slot*/*port*/*vpi*/*vci* format as an alternative to the **atm** *slot*/*port*.*subinterface* format with the specific **show interface** and **show subinterface** commands to monitor all ATM 1483 subinterfaces (except NBMA interfaces) as well as the upper-layer interfaces configured over an ATM 1483 subinterface. You cannot, however, use the **atm** *slot*/*port*/*vpi*/*vci* format to create or modify an ATM 1483 subinterface.

These guidelines also apply to E120 routers and E320 routers when you use the **atm** *slot*/*adapter*/*port*/*vpi*/*vci* format as an alternative to the **atm** *slot*/*adapter*/*port*.*subinterface* format.

- For more information, see *Creating a Basic Configuration* on page 20.
- Field descriptions
  - Interface—Interface identifier
  - ATM-Prot—One of the following ATM protocol types:
    - RFC-1483—Multiprotocol encapsulation over AAL5
    - NBMA—Nonbroadcast multiaccess interface
    - ATM/MPLS—Local ATM passthrough interface
  - VCD—Virtual circuit descriptor
  - VPI—Virtual path identifier
  - VCI—Virtual circuit (or channel) identifier
  - Circuit Type—Type of circuit: PVC
  - Encap—Administered encapsulation method based on what was configured with the **atm pvc** command
  - MTU—Maximum transmission unit size for the interface
  - Status—One of the following ATM 1483 subinterface states:
    - absent—Represents the notPresent state and indicates that, although the SRP detects the ATM 1483 subinterface, the module on which the subinterface resides has not completed booting up, has failed, or is disabled.
    - dormant—Indicates that the ATM 1483 subinterface is performing autodetection of one or more upper-layer encapsulation types and is waiting to receive a packet of that type on a lower-layer interface. An ATM 1483 subinterface transitions from the dormant state to the up state when the router receives a valid packet of the specified encapsulation type on the interface.

  - dormantLockout—Indicates that a dormant ATM 1483 subinterface has one or more upper-layer encapsulation types currently undergoing encapsulation type lockout. An ATM 1483 subinterface transitions from the dormantLockout state to the dormant state when the lockout time expires for all upper-layer encapsulation types undergoing lockout. An ATM 1483 subinterface transitions from the dormantLockout state to the up state when the router receives a valid packet for an encapsulation type that is configured for autodetection but is not undergoing lockout.
  - down—Indicates that the ATM 1483 subinterface is administratively disabled or has a circuit that is down or not configured.
  - lowerLayerDown—Indicates that a lower-layer interface below the ATM 1483 subinterface is down.
  - up—Indicates that the ATM 1483 subinterface is up and able to transfer data. For an ATM 1483 subinterface that supports one or more dynamic upper-layer interfaces, indicates that the router has created the dynamic upper-layer interface or is in the process of creating it.
- Interface Type—Type of ATM 1483 subinterface: dynamic or static
- Auto configure status—Setting of the autoconfiguration feature
  - dynamic—Autodetection is on; the router automatically detects the next upper interface
  - static—Autodetection is off
- Auto configure interface(s)—Types of dynamic upper interfaces configured with the **auto-configure** command: bridged Ethernet, IP, PPP, or PPPoE
- Detected 1483 encapsulation—If the encapsulation type is set to **aal5autoconfig**, displays the 1483 encapsulation type detected on the subinterface (displays AUTO until a packet is detected)
- Detected dynamic interface—Type of dynamic upper interface detected during autoconfiguration: bridged Ethernet, IP, PPP, PPPoE, or (if no packet has been received) none
- Interface types in lockout—Encapsulation types currently experiencing lockout: bridged Ethernet, IP, PPP, PPPoE, or none
- Lockout state (seconds)—Settings of encapsulation type lockout for the upper-layer encapsulation type indicated
  - Min—Minimum lockout time, in seconds
  - Max—Maximum lockout time, in seconds
  - Current—Current lockout time, in seconds; displays 0 (zero) if lockout is not occurring
  - Elapsed—Time elapsed into the lockout time, in seconds; displays 0 (zero) if lockout is not occurring
  - Next—Lockout time for the router to use for the next lockout event, in seconds
- Assigned profile—For each dynamic interface type, indicates whether or not a profile is assigned and, if assigned, displays the profile name
- Interface Alias—Text description or alias if configured for the subinterface

- Subscriber info—Subscriber login information for the specified dynamic interface type (bridged Ethernet or IP)
- Assigned VC Class—Name of the VC class assigned to this subinterface, if configure
- SNMP trap link-status—Trap link status: enabled or disabled
- Advisory receive speed—Configured receive speed, in Kbps, for the dynamic ATM 1483 subinterface. The E-series LAC sends this value to the LNS in the RX Connect-Speed AVP [38].
- InPackets—Number of packets received on this interface
- InBytes—Number of bytes received on this interface
- OutPackets—Number of packets transmitted on this interface
- OutBytes—Number of bytes transmitted on this interface
- InErrors—Number of errors received on this interface
- OutErrors—Number of outgoing errors on this interface
- InPacketDiscards—Number of incoming packets discarded on this interface
- InPacketsUnknownProtocol—Number of incoming packets with an unknown protocol type
- OutDiscards—Number of outgoing packets discarded on this interface

- Example 1—Displays the current state of all ATM subinterfaces

```
host1#show atm subinterface
                                      Circuit                              Interface
 Interface  ATM-Prot VCD VPI VCI  Type   Encap MTU      Status              Type
----------- -------- --- --- --- ------- ----- ---- -------------- ---------
ATM 2/0.101 RFC-1483 101   0 101 PVC     AUTO  9180 dormantLockout Static
ATM 2/0.102 RFC-1483 102   0 102 PVC     AUTO  9180 up             Dynamic
ATM 2/0.103 RFC-1483 103   0 103 PVC     AUTO  9180 dormant        Static
3 interface(s) found
```

- Example 2—Displays summary information for all ATM subinterfaces shown in Example 1

```
host1#show atm subinterface summary
3 subinterfaces: 1 up, 0 down,
1 dormant, 1 dormantLockout,
0 lowerLayerDown, 0 not present
```

- Example 3—Displays status information about the current state of all ATM subinterfaces in the dormantLockout state

```
host1#show atm subinterface status dormantLockout
                                      Circuit                              Interface
 Interface  ATM-Prot VCD VPI VCI  Type   Encap MTU      Status              Type
----------- -------- --- --- --- ------- ----- ---- -------------- ---------
ATM 2/0.101 RFC-1483 101   0 101 PVC     AUTO  9180 dormantLockout Static
1 interface(s) found
```

- Example 4—Displays the current state of a specific ATM subinterface

```
host1#show atm subinterface atm 2/0.101
                                    Circuit                              Interface
 Interface  ATM-Prot VCD VPI VCI  Type   Encap MTU      Status            Type
----------- -------- --- --- --- ------- ----- ---- -------------- ---------
ATM 2/0.101 RFC-1483 101   0 101 PVC     AUTO  9180 dormantLockout Static

Auto configure status         : dynamic
Auto configure interface(s)   : IP  bridgedEthernet  PPP  PPPoE
Detected 1483 encapsulation   : AUTO
Detected dynamic interface    : none
Interface types in lockout    : IP
Lockout state (seconds)       : Min Max  Current Elapsed Next
------------------------------ --- ---- ------- ------- ----
IP                               1   30      16       7   30
BridgedEnet                    900 3600       0       0  900
PPP                              1  300       0       0    1
PPPoE                            1  300       0       0    1

Assigned profile (IP)         : ipoa
Assigned profile (BridgedEnet): beth
Assigned profile (PPP)        : ppptest
Assigned profile (PPPoE)      : pppoetest
Assigned profile (any)        : none assigned

Interface Alias: atm20101

BridgedEnet subscriber info   :
Username: elaine@jpeterman.com
Password: putty
Authenticate: enabled

Assigned VC class             : premium-subscriber-class
SNMP trap link-status: disabled

InPackets:                0
InBytes:                  1904
OutPackets:               0
OutBytes:                 0
InErrors:                 0
OutErrors:                0
InPacketDiscards:         14
InPacketsUnknownProtocol: 0
OutDiscards:              0
1 interface(s) found
```

- Example 5—Displays the current state of a specific ATM subinterface created on the PVC with the specified VPI and VCI values

```
host1#show atm subinterface atm 0/0/0/101
                                    Circuit                  Interface
Interface   ATM-Prot VCD VPI VCI  Type   Encap MTU  Status   Type
----------- -------- --- --- --- ------- ----- ---- ------ ---------
ATM 0/0.101 RFC-1483 101   0 101 PVC     AUTO  9180 up     Static

Auto configure status         : dynamic
Auto configure interface(s)   : PPPoE
Detected 1483 encapsulation   : SNAP
Detected dynamic interface    : PPPoE
Interface types in lockout    : none
```

```
Lockout state (seconds)       : Min Max Current Elapsed Next
------------------------------ --- --- ------- ------- ----
PPPoE                            1 300       0       0    1

Assigned profile (IP)         : none assigned
Assigned profile (BridgedEnet): none assigned
Assigned profile (PPP)        : none assigned
Assigned profile (PPPoE)      : pppoeprofile
Assigned profile (any)        : none assigned

Assigned VC class             : dsl-subscriber-class
SNMP trap link-status: disabled

Advisory receive speed: 2000

InPackets:                5119
InBytes:                  358672
OutPackets:               5107
OutBytes:                 357510
InErrors:                 0
OutErrors:                0
InPacketDiscards:         3
InPacketsUnknownProtocol: 0
OutDiscards:              0
1 interface(s) found
```

show atm vc

- Use to display a summary of all configured ATM virtual circuits (VCs) and reserved VC ranges.
- You can specify one or more of the following keywords individually or in combination:
  - **vpi**—Displays VCs on a specific VPI
  - **category**—Displays VCs that have a specific service category
  - **status**—Displays VCs with a certain status
- You can also specify the **reserved** keyword with no other keywords to display only a summary of all reserved VC ranges on the router. This includes VPI/VCI ranges reserved for use by dynamic ATM 1483 subinterfaces and by MPLS.
- Field descriptions
  - Interface—Interface number
  - VPI—Virtual path identifier
  - VCI—Virtual channel identifier
  - VCD—Virtual circuit descriptor
  - Type—Type of circuit: PVC
  - Encap—Encapsulation method: AUTO, AAL5, AAL0, MUX, SNAP, ILMI, F4-OAM
  - Category—Service type configured on the VC: UBR, UBR-PCR, NRT-VBR, RT-VBR, or CBR
  - Rx/Tx Peak—Peak rate, in Kbps
  - Rx/Tx Avg—Average rate, in Kbps

- Rx/Tx Burst—Maximum number of cells that can be burst at the peak cell rate
- Status—State of the virtual circuit: Up or Down
- Start VPI—Starting virtual path identifier (inclusive) of the reserved VC range
- Start VCI—Starting virtual circuit identifier (inclusive) of the reserved VC range
- End VPI—Ending virtual path identifier (inclusive) of the reserved VC range
- End VCI—Ending virtual circuit identifier (inclusive) of the reserved VC range

- Example 1—Displays all VCs and reserved VC ranges on the router

```
host1#show atm vc
                                          Cate Rx/Tx Rx/Tx Rx/Tx Sta
Interface    VPI VCI  VCD  Type Encap gory Peak   Avg  Burst tus
------------ --- ---- ---- ---- ----- ---- ----- ----- ----- ---
ATM 3/0.2      0 101  4375 PVC  AUTO  CBR   1000     0     0 UP
ATM 3/0.3      0 102  4376 PVC  AUTO  CBR   1000     0     0 DOWN
...
ATM 3/0.8099   1 8099 8099 PVC  SNAP  UBR      0     0     0 UP
ATM 3/0.8100   1 8100 8100 PVC  SNAP  UBR      0     0     0 DOWN
8000 circuit(s) found
Reserved VCC ranges:

          Start Start End End
Interface  VPI   VCI  VPI VCI
--------- ----- ----- --- ---
ATM 2/0       2   100   2 102
ATM 2/0       3   300   3 303
2 reservation(s) found
```

- Example 2—Displays VCs with a VPI of zero (0)

```
host1#show atm vc vpi 0
                                          Cate Rx/Tx Rx/Tx Rx/Tx Sta
Interface    VPI VCI  VCD  Type Encap gory Peak   Avg  Burst tus
------------ --- ---- ---- ---- ----- ---- ----- ----- ----- ---
ATM 3/0.2      0 101  4375 PVC  AUTO  CBR   1000     0     0 UP
ATM 3/0.3      0 102  4376 PVC  AUTO  CBR   1000     0     0 DOWN
2 circuit(s) found that match filter criteria
```

- Example 3—Displays VCs with a VPI of 1 (one) that are assigned the service category UBR

```
host1#show atm vc vpi 1 category ubr
                                          Cate Rx/Tx Rx/Tx Rx/Tx Sta
Interface    VPI VCI  VCD  Type Encap gory Peak   Avg  Burst tus
------------ --- ---- ---- ---- ----- ---- ----- ----- ----- ---
ATM 3/0.8099   1 8099 8099 PVC  SNAP  UBR      0     0     0 UP
ATM 3/0.8100   1 8100 8100 PVC  SNAP  UBR      0     0     0 DOWN
2 circuit(s) found that match filter criteria
```

- Example 4—Displays VCs with a VPI of 0 (zero) and a service category of CBR that have a status of up

```
host1#show atm vc vpi 0 category cbr status up
                                        Cate Rx/Tx Rx/Tx Rx/Tx Sta
Interface    VPI VCI  VCD  Type Encap gory Peak   Avg  Burst tus
------------ --- ---- ---- ---- ----- ---- ----- ----- ----- ---
ATM 3/0.2      0 101  4375 PVC  AUTO  CBR   1000     0     0 UP
1 circuit(s) found that match the filter criteria
```

- Example 5—Displays all reserved VC ranges on the router

```
host1#show atm vc reserved
Reserved VCC ranges:

          Start Start End End
Interface  VPI   VCI  VPI VCI
--------- ----- ----- --- ---
ATM 2/0       2   100   2 102
ATM 2/0       3   300   3 303
2 reservation(s) found
```

show atm vc atm

- Use to display information about a specific VC.
- To specify the circuit to display, do one of the following:
  - Enter the VCD.
  - Use the **vpi-vci** keyword and enter the VPI and VCI.
  - Enter the description configured for the ATM 1483 subinterface (with the **atm atm1483 description** command) on which the VC resides.
- Field descriptions
  - VCD—Virtual circuit descriptor
  - VPI—Virtual path identifier
  - VCI—Virtual channel identifier
  - Encap—Encapsulation method
  - Service Type—Service type configured on the VC: UBR, UBR-PCR, NRT-VBR, RT-VBR, CBR
  - Inverse ARP enable—Whether or not Inverse ARP is enabled: yes, no
  - Assigned VC class—Name of the VC class assigned to this VC, if configured
  - InPackets—Number of packets received on this circuit
  - InBytes—Number of bytes received on this circuit
  - InCells—Number of ATM cells received on this circuit
  - OutPackets—Number of packets transmitted on this circuit
  - OutBytes—Number of bytes transmitted on this circuit
  - OutCells—Number of ATM cells transmitted on this circuit
  - InErrors—Number of errors received on this circuit
  - OutErrors—Number of outgoing errors on this circuit

- InPacketDiscards—Number of incoming packets discarded on this circuit
- InPacketUnknownProtocol—Number of incoming packets with an unknown protocol type
- InByteDiscards—Number of incoming bytes discarded on this circuit
- CrcErrors—Number of CRC errors detected on this circuit
- SAR time-outs—Number of segmentation and reassembly (SAR) timeouts reached on this circuit
- Over-sized SDUs—Number of oversized service data units (SDUs) received on this circuit
- Alarm drop count—Number of successive alarm cells that the router receives before reporting that the PVC is down
- Alarm clear timeout—Number of seconds that the router waits before reporting that the PVC is up after the PVC stops receiving alarm cells
- OAM VC verification—Whether OAM verification is enabled or disabled
- OAM loopback cell status:
  - disabled—VC integrity disabled for VC
  - sent—OAM loopback cell sent; waiting for response
  - received—OAM loopback cell response received
  - failed—OAM loopback reply not received within frequency period, or reply contained a bad correlation tag
- OAM VC status:
  - AIS—VC is in AIS state
  - RDI—VC is in RDI state
  - Down Retry—OAM loopback failed; using retry frequency to verify that the VC is really down
  - Down—OAM loopback failed after Down Retry verification
  - Up Retry—OAM loopback successful; using retry frequency to verify that the VC is really up
  - Up—OAM loopback successful after Up Retry verification
  - Not Managed—VC integrity is not enabled; for more information about this status value, see *Automatic Disabling of F5 OAM Services* on page 18
- OAM loopback frequency—Frequency with which OAM loopback cells are transmitted (when enabled), in seconds
- OAM up retry count—Number of consecutive successfully looped OAM cells required to mark the VC as Up
- OAM down retry count—Number of consecutive unsuccessfully looped OAM cells required to mark the VC as Down
- OAM loopback retry frequency—Frequency with which OAM cells are transmitted in verification mode, in seconds
- OAM CC verification—Whether CC verification is enabled or disabled

- OAM CC Type—Whether the VC is a sink or a source, or both sink and source end point
- OAM CC Flow Type—End-to-end or segment
- OAM Current CC state
  - Ready—OAM CC is not enabled
  - Active—OAM CC cell flow is running
  - Activation Failed—OAM CC activation failed
  - Wait Activate—Waiting for interface to come up before the software sends the activation request
  - Wait Activation Confirmation—Waiting for activation confirmation from the peer
  - Wait DeActivate—Waiting for interface to come up before the software sends the deactivation request
  - Wait DeActivation Confirmation—Waiting for deactivation confirmation from the peer
- InOamF5Cells—Number of F5 OAM cells received on this circuit
- InOamCellDiscards—Number of received OAM cells that were dropped; dropped cells include unsupported and invalid F5 cells. The InOamCellDiscards counter is not incremented after an OAM flush is performed with the **atm oam flush** command. For more information about the InOamCellDiscards counter, see *Rate Limiting for F5 OAM Cells* on page 18.
- InF5EndLoopCells—Total number of F5 end-to-end loopback cells received on this circuit, which is the sum of the following counts:
  - InF5EndLoopCommands—Number of F5 end-to-end loopback commands received
  - InF5EndLoopResponses—Number of F5 end-to-end loopback responses received
- InF5SegLoopCells—Total number of F5 segment loopback cells received on this circuit, which is the sum of the following counts:
  - InF5SegLoopCommands—Number of F5 segment loopback commands received
  - InF5SegLoopResponses—Number of F5 segment loopback responses received
- InF5EndAisCells—Number of F5 end-to-end AIS cells received on this circuit
- InF5SegAisCells—Number of F5 segment AIS cells received on this circuit
- InF5EndRdiCells—Number of F5 end-to-end RDI cells received on this circuit
- InF5SegRdiCells—Number of F5 segment RDI cells received on this circuit
- InF5EndCCActDeActCells—Number of F5 end-to-end activation and deactivation CC cells received on this circuit

- InF5SegCCActDeActCells—Number of F5 segment activation and deactivation CC cells received on this circuit
- InF5EndCCCells—Number of F5 end-to-end CC cells received on this circuit
- InF5SegCCCells—Number of F5 segment CC cells received on this circuit
- OutOamF5Cells—Number of F5 OAM cells transmitted on this circuit
- OutF5EndLoopCells—Total number of F5 end-to-end loopback cells transmitted on this circuit, which is the sum of the following counts:
  - OutF5EndLoopCommands—Number of F5 end-to-end loopback commands transmitted
  - OutF5EndLoopResponses—Number of F5 end-to-end loopback responses transmitted
- OutF5SegLoopCells—Total number of F5 segment loopback cells transmitted on this circuit, which is the sum of the following counts:
  - OutF5SegLoopCommands—Number of F5 segment loopback commands transmitted
  - OutF5SegLoopResponses—Number of F5 segment loopback responses transmitted
- OutF5EndRdiCells—Number of F5 end-to-end RDI cells transmitted on this circuit
- OutF5SegRdiCells—Number of F5 segment RDI cells transmitted on this circuit
- OutF5EndCCActDeActCells—Number of F5 end-to-end activation and deactivation CC cells transmitted on this circuit
- OutF5SegCCActDeActCells—Number of F5 segment activation and deactivation CC cells transmitted on this circuit
- OutF5EndCCCells—Number of F5 end-to-end CC cells transmitted on this circuit
- OutF5SegCCCells—Number of F5 segment CC cells transmitted on this circuit
- Circuit is Up/Down—Status of the circuit and time since the status of the circuit last changed

- Example 1—Displays statistics for the VC with a VPI of 46 and a VCI of 47

```
host1#show atm vc atm 2/0 vpi-vci 46 47
ATM 2/0.1.1: VCD: 45, VPI: 46, VCI: 47, Encap: AAL5-AUTO
Service Type: Ubr
Inverse ARP enable:No
Assigned VC class :premium-subscriber-class
InPackets:         0
InBytes:           0
InCells:           0
OutPackets:        0
OutBytes:          0
OutCells:          0
InErrors:          0
OutErrors:         0
InPacketDiscards:  0
InPacketUnknownProtocol: 0
InByteDiscards:    0
```

```
CrcErrors:         0
SAR time-outs:     0
Over-sized SDUs:   0
Alarm drop count:  1
Alarm clear timeout:3
OAM VC verification: enabled
OAM loopback cell status: sent
OAM VC status: up
OAM loopback frequency: 10 second interval
OAM up retry count: 3, OAM down retry count: 5
OAM loopback retry frequency: 1 second interval
OAM CC verification: disabled
InOamF5Cells:      258
InOamCellDiscards: 12598
InF5EndLoopCells:  258
  InF5EndLoopCommands:    50
  InF5EndLoopResponses:   208
InF5SegLoopCells:  46
  InF5SegLoopCommands:    17
  InF5SegLoopResponses:   29
InF5EndAisCells:        49
InF5SegAisCells:        0
InF5EndRdiCells:        0
InF5SegRdiCells:        0
InF5EndCCActDeActCells: 0
InF5SegCCActDeActCells: 0
InF5EndCCCells:         0
InF5SegCCCells:         0
OutOamF5Cells:     258
OutF5EndLoopCells: 258
  OutF5EndLoopCommands:    208
  OutFEndLoopResponses:    50
OutF5SegLoopCells: 48
  OutF5SegLoopCommands:    19
  OutF5SegLoopResponses:   29
OutF5EndRdiCells:       50
OutF5SegRdiCells:       0
OutF5EndCCActDeActCells:1
OutF5SegCCActDeActCells:0
OutF5EndCCCells:        1
OutF5SegCCCells:        0

Circuit is Up, time since last change: 5 days, 23 hours
```

- Example 2—Displays statistics for the VC that resides on the ATM 1483 subinterface configured with the specified description (myAtm301)

```
host1#show atm vc myAtm301
ATM3/0.1: VCD: 10, VPI: 5, VCI: 100, Encap: SNAP
Service Type: Ubr
Assigned VC class         :dsl-subscriber-class
InPackets:                 0
InBytes:                   0
InCells:                   0
OutPackets:                0
OutBytes:                  0
OutCells:                  0
InErrors:                  0
OutErrors:                 0
InPacketDiscards:          0
InPacketUnknownProtocol:   0
InByteDiscards:            0
CrcErrors:                 0
```

```
SAR time-outs:             0
Over-sized SDUs:           0
Alarm drop count:          1
Alarm clear timeout:       3
OAM VC verification:       disabled
OAM VC status:             not managed
OAM CC verification:       disabled
InOamF5Cells:              0
InOamCellDiscards:         384723
InF5EndLoopCells:          0
  InF5EndLoopCommands:     0
  InF5EndLoopResponses:    0
InF5SegLoopCells:          0
  InF5SegLoopCommands:     0
  InF5SegLoopResponses:    0
InF5EndAisCells:           0
InF5SegAisCells:           0
InF5EndRdiCells:           0
InF5SegRdiCells:           0
InF5EndCCActDeActCells:    0
InF5SegCCActDeActCells:    0
InF5EndCCCells:            0
InF5SegCCCells:            0
OutOamF5Cells:             0
OutF5EndLoopCells:         0
  OutF5EndLoopCommands:    0
  OutFEndLoopResponses:    0
OutF5SegLoopCells:         0
  OutF5SegLoopCommands:    0
  OutF5SegLoopResponses:   0
OutF5EndRdiCells:          0
OutF5SegRdiCells:          0
OutF5EndCCActDeActCells:   0
OutF5SegCCActDeActCells:   0
OutF5EndCCCells:           0
OutF5SegCCCells:           0

Circuit is DOWN, time since last change: 02:25:52
```

show atm vc-class

- Use to display information about the VC classes configured on the router.
- To display only the names of all VC classes configured on the router, use the command with no keywords.
- To display detailed configuration information about a particular VC class, specify the name of the VC class.
- To display the settings for parameters in the VC class that are configured with default values, use the **include-defaults** keyword.
- Field descriptions
  - Encapsulation Type—Encapsulation method configured in the VC class: AUTO, AAL5, AAL0, MUX, SNAP
  - Service Category—Service category configured in the VC class: UBR, UBR-PCR, NRT-VBR, RT-VBR, CBR
  - Peak Cell Rate—Peak cell rate (PCR), in Kbps, configured for the service category

- OAM VC Integrity—Status of F5 OAM VC integrity features on the PVC: enabled or disabled
- OAM VC Integrity loop-back timer—Number of seconds the router waits between the transmission of loopback cells during normal operation
- OAM VC Integrity Up Retry Count—Number of successive loopback cell responses that the router receives before reporting that a PVC is up
- OAM VC Integrity Down Retry Count—Number of successive loopback cell responses that the router misses before reporting that a PVC is down
- OAM VC Integrity Retry Frequency—Number of seconds that the router waits between the transmission of loopback cells when it is verifying the state of a PVC
- OAM alarm down count—Number of successive alarm cells that the router receives before reporting that a PVC is down
- OAM alarm clear time out—Number of seconds that the router waits before reporting that a PVC is up after the PVC has stopped receiving alarm cells
- OAM continuity check—Status of F5 OAM continuity check verification on the PVC: enabled or disabled
- Inverse ARP—Status of Inverse ARP (InARP) on the PVC: enabled or disabled

- Example 1

```
host1#show atm vc-class
premium-subscriber-class
dsl-subscriber-class
found 2 VC class entrie(s) in the system
```

- Example 2

```
host1#show atm vc-class premium-subscriber-class
Encapsulation Type                  :AUTO
Service Category                    :CBR
Peak Cell Rate                      :200 kbps
OAM VC Integrity                    :enabled
OAM VC Integrity loop-back timer    :60 seconds
OAM alarm down count                :5
```

- Example 3

```
host1#show atm vc-class premium-subscriber-class include-defaults
Encapsulation Type                  :AUTO
Service Category                    :CBR
Peak Cell Rate                      :200 kbps
OAM VC Integrity                    :enabled
OAM VC Integrity loop-back timer    :60 seconds
OAM VC Integrity Up Retry Count     :3
OAM VC Integrity Down Retry Count   :5
OAM VC Integrity Retry Frequency    :1
OAM alarm down count                :5
OAM alarm clear time out            :3 seconds
OAM continuity check                :disabled
Inverse ARP                         :disabled
```

show atm vp

- Use to display detailed statistics for a specific ATM VP configured on the router.
- Field descriptions
  - ServiceCategory—Service type on the VP tunnel, if configured: UBR, UBR-PCR, VBR-NRT, VBR-RT, or CBR
  - Peak Cell Rate—Peak cell rate in kilobits per second, if a VP tunnel is configured
  - Maximum VCI per VPI—Maximum number of virtual circuits on each virtual path
  - Current VCs—Number of VCs currently configured on the router
  - InPackets—Number of packets received
  - InBytes—Number of bytes received
  - InCells—Number of ATM cells received
  - OutPackets—Number of packets transmitted
  - OutBytes—Number of bytes transmitted
  - OutCells—Number of ATM cells transmitted
  - InErrors—Number of packets with errors received
  - OutErrors—Number of packets not transmitted on this VP due to errors
  - InPacketDiscards—Number of incoming packets discarded
  - InPacketUnknownProtocol—Number of incoming packets with an unknown protocol type
  - InByteDiscards—Number of incoming bytes discarded
  - CrcErrors—Number of CRC errors detected
  - SAR time-outs—Number of segmentation and reassembly (SAR) timeouts reached
  - Over-sized SDUs—Number of oversized service data units (SDUs) received
  - The following fields appear only if F4 OAM is enabled on the VP:
    - Sending End to End Loopback Cells—Enabled, Disabled
    - End to End OAM CC verification—Enabled, Disabled
    - VP State—State of the VP: up, down
    - VP Oam State—OAM state of the VP: not managed (normal OAM state with no OAM fault conditions), AIS, RDI
    - InOamF4EndCells—Number of F4 end-to-end cells received
    - InOamF4EndCellsDropped—Number of incoming F4 end-to-end cells that were dropped
    - InOamF4EndLoopbackCells—Number of F4 end-to-end loopback cells received
    - InOamF4EndLoopbackCommands—Number of F4 end-to-end loopback commands received

- InOamF4EndLoopbackResponses—Number of F4 end-to-end loopback responses received
- InOamF4EndAisCells—Number of F4 end-to-end AIS cells received
- InOamF4EndRdiCells—Number of F4 end-to-end RDI cells received
- InOamF4EndCCActDeActCells—Number of F4 end-to-end activation or deactivation CC cells received
- InOamF4EndCCCells—Number of F4 end-to-end CC cells received
- OutOamF4EndCells—Number of F4 end-to-end CC cells transmitted
- OutOamF4EndLoopbackCells—Number of F4 end-to-end loopback cells transmitted
- OutOamF4EndLoopbackCommands—Number of F4 end-to-end loopback commands transmitted
- OutOamF4EndLoopbackResponses—Number of F4 end-to-end loopback responses transmitted
- OutOamF4EndRdiCells—Number of F4 end-to-end RDI cells transmitted
- OutOamF4EndCCActDeActCells—Number of F4 end-to-end activation or deactivation CC cells transmitted
- OutOamF4EndCCCells—Number of F4 end-to-end CC cells transmitted
- Time since last status change—Time since last reported change to the end-to-end OAM circuit status
- Segment OAM CC verification—Enabled or Disabled
- VP State—State of the VP: up, down
- VP Oam State—OAM state of the VP: not managed (normal OAM state with no OAM fault conditions), AIS, RDI
- InOamF4SegmentCells—Number of F4 segment cells received
- InOamF4SegmentCellsDropped—Number of incoming F4 segment cells that were dropped
- InOamF4SegmentLoopbackCells—Number of F4 segment loopback cells received
- InOamF4SegmentLoopbackCommands—Number of F4 segment loopback commands received
- InOamF4SegmentLoopbackResponses—Number of F4 segment loopback responses received
- InOamF4SegCCActDeActCells—Number of F4 segment activation or deactivation CC cells received
- InOamF4SegCCCells—Number of F4 segment CC cells received
- OutOamF4SegmentCells—Number of F4 segment cells transmitted
- OutOamF4SegmentLoopbackCells—Number of F4 segment loopback cells transmitted
- OutOamF4SegmentLoopbackCommands—Number of F4 segment loopback commands transmitted

- OutOamF4SegmentLoopbackResponses—Number of F4 segment loopback responses transmitted
- OutOamF4SegRdiCells—Number of F4 segment RDI cells transmitted
- OutOamF4SegCCActDeActCells—Number of F4 segment activation or deactivation CC cells transmitted
- OutOamF4SegCCCells—Number of F4 segment CC cells transmitted
- Time since last status change—Time since last reported change to the segment OAM circuit status

VP Description—Text description for this VP, if configured

- Example

```
host1#show atm vp atm 12/0 1
Maximum VCI per VPI: 65535     Current VCs: 3
InPackets                        :1604710953
InBytes                          :205403001984
InCells                          :519165564
OutPackets                       :1604632002
OutBytes                         :205392896256
OutCells                         :4813896006
InErrors                         :0
OutErrors                        :0
InPacketDiscards                 :0
InPacketUnknownProtocol          :0
InByteDiscards                   :0
CrcErrors                        :0
SAR time-outs                    :0
Over-sized SDUs                  :0
Sending End To End Loopback Cells Disabled:
End To End OAM CC verification Disabled
VP State                         :up
VP Oam State                     :not managed
InOamF4EndCells                  :0
InOamF4EndCellsDropped           :0
InOamF4EndLoopbackCells          :0
  InOamF4EndLoopbackCommands       :0
  InOamF4EndLoopbackResponses      :0
InOamF4EndAisCells               :0
InOamF4EndRdiCells               :0
InOamF4EndCCActDeActCells        :0
InOamF4EndCCCells                :0
OutOamF4EndCells                 :0
OutOamF4EndLoopbackCells         :0
  OutOamF4EndLoopbackCommands      :0
  OutOamF4EndLoopbackResponses     :0
OutOamF4EndRdiCells              :0
OutOamF4EndCCActDeActCells       :0
OutOamF4EndCCCells               :0
Time since last status change    :08:48:43
Segment OAM CC verification Disabled
VP State                         :up
VP Oam State                      :not managed
InOamF4SegmentCells              :0
InOamF4SegmentCellsDropped       :0
InOamF4SegmentLoopbackCells      :0
  InOamF4SegmentLoopbackCommands   :0
  InOamF4SegmentLoopbackResponses  :0
InOamF4SegCCActDeActCells        :0
InOamF4SegCCCells                :0
```

```
OutOamF4SegmentCells             :0
OutOamF4SegmentLoopbackCells     :0
  OutOamF4SegmentLoopbackCommands  :0
  OutOamF4SegmentLoopbackResponses :0
OutOamF4SegRdiCells              :0
OutOamF4SegCCActDeActCells       :0
OutOamF4SegCCCells               :0
Time since last status change    :08:48:44
VP Description: ATM-12/0-VPI-1
```

show atm vp-description

- Use to display VP descriptions configured using the **atm vp-description** command.
- To display all VP descriptions configured on the router, issue the command without an ATM identifier or VPI number (Example 1).
- To display all VP descriptions for a particular ATM interface, specify the ATM interface identifier without the VPI number (Example 2).
- To display the VP description for a particular VPI, specify both the ATM interface identifier and the VPI number (Example 3).
- Field descriptions
  - Interface—ATM interface identifier
  - VPI—Virtual path identifier
  - Description—Text description configured for the VP
- Example 1—Displays all VP descriptions configured on the router

```
host1#show atm vp-description
Interface    VPI    Description
ATM 2/0      0      atm20Vpi0Subscribers
ATM 2/0      1      atm20Vpi1Subscribers
ATM 2/1      0      atm21Vpi0Subscribers
```

- Example 2—Displays all VP descriptions for the specified ATM interface

```
host1#show atm vp-description atm 2/0
Interface    VPI    Description
ATM 2/0      0      atm20Vpi0Subscribers
ATM 2/0      1      atm20Vpi1Subscribers
```

- Example 3—Displays the VP description for the specified VPI

```
host1#show atm vp-description atm 2/0 1
Interface    VPI    Description
ATM 2/0      1      atm20Vpi1Subscribers
```

show atm vp-tunnel

- Use to display a summary of all configured ATM virtual path tunnels.
- Field descriptions
  - Intfc—Interface number
  - VPI—Virtual path identifier
  - Type—VP tunnel traffic management type
  - Kbps—Rate, in Kbps
  - Description—Text description for the VP, if configured
- Example

```
host1#show atm vp-tunnel 9/1
Intfc    VPI  Type  Kbps    Description
ATM 9/1  2    Cbr   4096    atm91Vpi2Subscribers
```

show mpls cross-connects atm

- Use to display all ATM cross-connects (passthrough connections between local subinterfaces).
- See *Monitoring ATM Cross-Connects for Layer 2 Services over MPLS* in *JUNOSe BGP and MPLS Configuration Guide, Chapter 6, Monitoring Layer 2 Services over MPLS* for information about using the **show mpls cross-connects atm** command.

show nbma arp

- Use to display ARP table entries for ATM NBMA interfaces.
- Field descriptions
  - IP Address—IP address of the entry
  - VPI/VCI—VPI and VCI of the entry
  - Interface—Interface specifier of the entry
- Example

```
host1#show nbma arp
                NBMA ARP Table Entries
IP Address              VPI/VCI         Interface
1.1.1.2                 0/100           4/1
2.2.2.2                 0/101           4/1
```