Cisco NM-1A-OC3-POM Network Module

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This document provides configuration tasks for the Cisco NM-1A-OC3-POM network module hardware feature supported on Cisco 3800 series integrated services routers.

The Cisco NM-1A-OC3-POM network module is a high performance single-width, single-port ATM network module, utilizing an optical carrier level 3 (OC-3) link. The ATM interface is a small form-factor pluggable (SFP) optical port. Fiber-optic cables to the network are attached to an SFP module that is inserted into the SFP port. The network module has 3 modes of operation. The mode of operation is determined by the SFP module that is used. The modes of operation and usable SFP modules are:

- Multimode (MM)
  - POM-OC3-MM
  - SFP-OC3-MM
- Single mode intermediate reach (SMIR)
  - POM-OC3-SMIR
  - SFP-OC3-IR1
- Single mode long reach (SMLR)
  - POM-OC3-SMLR
  - SFP-OC3-LR1

This hardware feature introduces one new IOS debug command.

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Prerequisites for ATM-OC3-POM Modules

The following are prerequisites to configuring Cisco ATM-OC3-POM modules:

- Use of the Cisco IOS Release, beginning with release 12.4(3) or later, for Cisco NM-1A-OC3-POM support. (Refer to the Cisco IOS documentation.)

Restrictions for ATM-OC3-POM Modules

The following restrictions apply to the Cisco ATM-OC3-POM modules.

- The number of VCs supported is 1023.
- The following commands are not supported:
  - **atm vcper vp**
  - **tx-ring-limit**

Information About ATM-OC3-POM Modules

To configure the Cisco ATM-OC3-POM modules, you should understand the following concepts:

- Virtual Circuits, page 3
- Permanent Virtual Circuits, page 3
- Switched Virtual Circuits, page 4
- Classes of Service and Transmit Priority on the ATM-OC3-POM Module, page 5

Virtual Circuits

A virtual circuit (VC) is a point-to-point connection between remote hosts and routers. A VC is established for each ATM end node with which the router communicates. The characteristics of the VC are established when the VC is created and include the following:

- Class of service category:
  - Constant bit rate (CBR)
  - Variable bit rate non-real-time (VBR-nrt)
  - Variable bit rate real-time (VBR-rt)
  - Available bit rate (ABR)
  - Unspecified bit rate (UBR and UBR+)

Note UBR+ is supported only on switched virtual circuits (SVCs).

- ATM adaptation layer 5 (AAL5)
- Encapsulation type:
  - Logical link control Subnetwork Address Protocol (AAL5SNAP)
  - Multiplexer (AAL5MUX)
  - Network Layer Protocol ID (AAL5NLPID)
  - Integrated Local Management Interface (ILMI)
  - Switched Multimegabit Data Service (SMDS)
  - ITU/Q.2931 Signaling ATM Adaptation Layer (QSAAL)
  - Cisco AUTO PPP over AAL5 (aal5autoppp)
  - Cisco PPP over AAL5 (aal5ciscoppp)

Each VC supports the following router functions:

- Multiprotocol
- Fast switching of IP packets
- Flow, and Cisco Express Forwarding (CEF) switching of IP packets
- Pseudo broadcast support for multicast packets

By default, CEF switching is enabled on all OC-3 module interfaces. These switching features can be turned off with interface configuration commands. Flow must be explicitly enabled for each interface.

Permanent Virtual Circuits

To use a permanent virtual circuit (PVC), configure the PVC in both the router and the ATM switch. PVCs remain active until the circuit is removed from either configuration. When a PVC is configured, all of the configuration options are passed on to the OC-3 module. You can write these PVCs into nonvolatile RAM (NVRAM); they are used when the system image is reloaded.

Some ATM switches might have point-to-multipoint PVCs that do the equivalent of broadcasting. If a point-to-multipoint PVC exists, it can be used as the sole broadcast PVC for all multicast requests.

Like Frame Relay, ATM supports two types of interface: point-to-point and multipoint. The one you choose determines whether you need to use the configuration commands that ensure IP to ATM mappings.

Switched Virtual Circuits

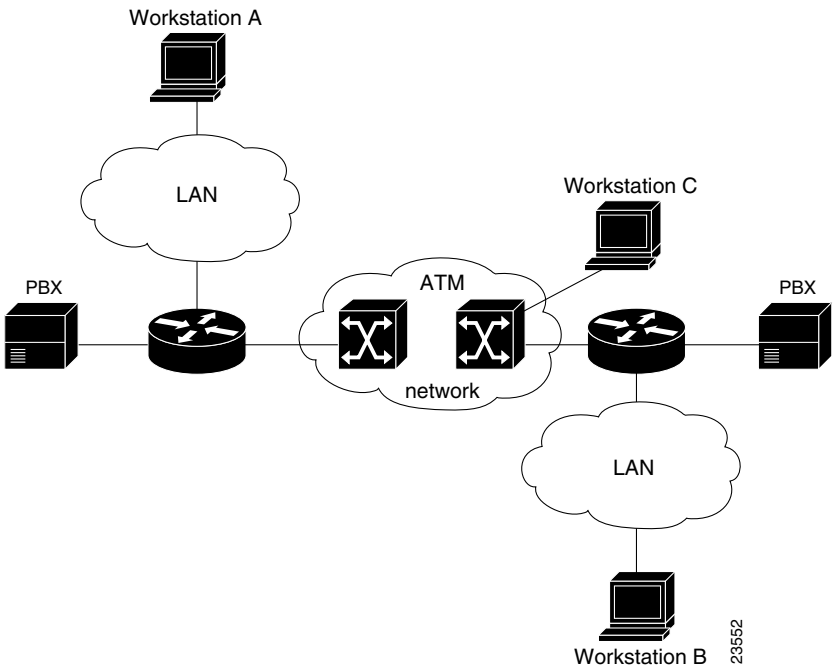
ATM switched virtual circuits (SVCs) are created and released dynamically, providing user bandwidth on demand. This service requires a signaling protocol between the router and the switch.

The ATM signaling software provides a method of dynamically establishing, maintaining, and clearing ATM connections at the User-Network Interface (UNI). The ATM signaling software conforms to the ATM Forum UNI 4.1 specification.

In UNI mode, the user is the router, and the network is an ATM switch. This is an important distinction. The Cisco router does not perform ATM-level call routing. Instead, the ATM switch does the ATM call routing, and the router routes packets through the resulting circuit. The router is viewed as the user and the LAN interconnection device at the end of the circuit, and the ATM switch is viewed as the network.

Figure 1 on page 4 illustrates the router position in a basic ATM environment. The router is used primarily to interconnect LANs through an ATM network. Workstation C is connected directly to the destination ATM switch. You can connect not only routers to ATM switches, but also any network device with an ATM interface that conforms to the ATM Forum UNI specification.

Figure 1 Basic ATM Environment



Classes of Service and Transmit Priority on the ATM-OC3-POM Module

The transmit priority determines which queued cell is chosen to be transmitted out of an interface during a cell time slot and ensures that real-time ATM service classes, which typically offer more robust QoS and traffic guarantees, have a higher likelihood of access to the next cell time slot. Table 1 lists the ATM service classes and their default transmit priorities on the ATM-OC3-POM module.

Table 1 ATM Classes of Service and Default Transmit Priorities on the ATM-OC3-POM Module

Service Category	Transmit Priority
CBR, OAM cells and signaling	0
VBR-rt, VBR-nrt	1
ABR	2
UBR, UBR+	3

How to Configure ATM-OC3-POM Modules

See the following sections for configuration tasks for the Cisco ATM-OC3-POM modules.

- Configuring OC-3, page 5
- Configuring PVCs, page 6
- Configuring SVCs, page 9
- Customizing the ATM-OC3-POM Module, page 13
- Troubleshooting High Latency and Output Drop Rates in Low Bandwidth PVCs, page 14

Configuring OC-3

To configure the ATM-OC3-POM module for OC-3 operation, perform the following tasks beginning in privileged EXEC mode.

SUMMARY STEPS

1. **configure terminal**
2. **interface** *atm interface-id*
3. **sonet stm-1**
4. **atm clock internal**
5. **no shutdown**

DETAILED STEPS

	Command	Purpose
Step 1	`Router# configure terminal`	Enters global configuration mode from the terminal.
Step 2	`Router(config)# interface atm interface-id`	Specifies the ATM interface.

	Command	Purpose
Step 3	`Router(config-if)# sonet stm-1`	Optional. Specifies SONET framing. Default framing is **STS-3C**.
Step 4	`Router(config-if)# atm clock internal`	Optional. Specifies ATM clock source. Default source is **line**.
Step 5	`Router(config-if)# no shutdown`	Enables the ATM interface, thereby beginning the segmentation and reassembly (SAR) operation on the interface.

Configuring PVCs

To use a PVC, you must configure the PVC into both the router and the ATM switch. PVCs remain active until the circuit is removed from either configuration.

To configure a PVC, perform the tasks in the following sections.

- Creating a PVC, page 6
- Mapping a Protocol Address to a PVC, page 7
- Configuring the AAL and Encapsulation Type, page 7
- Configuring PVC Traffic Parameters, page 7
- Enabling Inverse ARP, page 8

Creating a PVC

To create a PVC on the ATM interface and enter interface-ATM-VC configuration mode, use the following command beginning in interface configuration mode:

Command	Purpose
`Router(config-if)# pvc [name] vpi/vci [ilmi | qsaal]`	Configures a new ATM PVC by assigning a name (optional) and VPI/VCI numbers. Enters interface-ATM-VC configuration mode. Optionally configures ILMI or QSAAL encapsulation.

The range of values for *vpi* is 0-255. The range of values for *vci* is 1-65535.

Note After configuring the parameters for an ATM PVC, you must exit interface-ATM-VC configuration mode in order to create the PVC and enable the settings.

Once you specify a name for a PVC, you can reenter the interface-ATM-VC configuration mode by simply entering **pvc** *name*.

Note The **ilmi** keyword in the **pvc** command is used for setting up an ILMI PVC in an SVC environment. Refer to the section “Configuring Communication with the ILMI” later in this chapter for more information.

Mapping a Protocol Address to a PVC

The ATM interface supports a static mapping scheme that identifies the network address of remote hosts or routers. This section describes how to map a PVC to an address, which is a required task for configuring a PVC.

To map a protocol address to a PVC, use the following command in interface-ATM-VC configuration mode:

Command	Purpose
`Router(config-if-atm-vc)# protocol protocol protocol-address [[no] broadcast]`	Maps a protocol address to a PVC.

Note If you enable or disable broadcasting directly on a PVC using the **protocol** command, this configuration will take precedence over any direct configuration using the **broadcast** command.

Configuring the AAL and Encapsulation Type

To configure the ATM adaptation layer (AAL) and encapsulation type, use the following command beginning in interface-ATM-VC configuration mode:

Command	Purpose
`Router(config-if-atm-vc)# encapsulation aal5encap`	Configures the ATM adaptation layer (AAL) and encapsulation type.

For a list of AAL types and encapsulations supported for the *aal-encap* argument, refer to the **encapsulation aal5** command in the "ATM Commands" chapter of the *Cisco IOS Wide-Area Networking Command Reference*. The global default is AAL5 with SNAP encapsulation.

Configuring PVC Traffic Parameters

The supported traffic parameters are part of the following service categories: Available Bit Rate (ABR), Unspecified Bit Rate (UBR), UBR+ (on SVCs only), Constant Bit Rate (CBR), non-realtime Variable Bit Rate (VBR-nrt), and realtime Variable Bit Rate (VBR-rt). Only one of these categories can be specified per PVC connection so if a new one is entered, it will replace the existing one.

To configure PVC traffic parameters, use one of the following commands beginning in interface-ATM-VC configuration mode:

Command	Purpose
`Router(config-if-atm-vc)# abr output-pcr output-mcr`	Configures the Available Bit Rate (ABR).
`Router(config-if-atm-vc)# ubr output-pcr`	Configures the Unspecified Bit Rate (UBR).
`Router(config-if-atm-vc)# ubr+ output-pcr output-mcr`	Configures the UBR with a soft minimum guaranteed rate.
`Router(config-if-atm-vc)# vbr-nrt output-pcr output-scr output-mbs`	Configures the non-realtime Variable Bit Rate (VBR-nrt).

Command	Purpose
`Router(config-if-atm-vc)# vbr-rt peak-rate average-rate burst`	Configures the realtime Variable Bit Rate (VBR-rt).
`Router(config-if-atm-vc)# cbr output-ccr`	Configures the Constant Bit Rate (CBR).

The *-pcr* and *-mcr* arguments are the peak cell rate and minimum cell rate, respectively. The *-scr* and *-mbs* arguments are the sustainable cell rate and maximum burst size, respectively.

For ABR VCs, you can optionally configure the amount that the cell transmission rate increases or decreases in response to flow control information from the network or destination. To configure this option, use the following command in interface-ATM-VC configuration mode:

Command	Purpose
`Router(config-if-atm-vc)# atm abr rate-factor [rate-increase-factor] [rate-decrease-factor]`	Specifies the ABR rate factors. The default rate increase factor is 1/16. The default rate decrease factor is 1/16.

Enabling Inverse ARP

Inverse ARP is enabled by default when you create a PVC using the **pvc** command. Once configured, a protocol mapping between an ATM PVC and a network address is learned dynamically as a result of the exchange of ATM Inverse ARP packets.

Inverse ARP is supported on PVCs running IP or IPX and no static map is configured. If a static map is configured, Inverse ARP will be disabled.

To enable Inverse ARP on an ATM PVC, use the following commands beginning in global configuration mode:

SUMMARY STEPS

1. **interface atm** *interface-id*[**.***subinterface-number* {**multipoint** | **point-to-point**}]
2. **pvc** [*name*] *vpi*/*vci*
3. **encapsulation aal5snap**
4. **inarp** *minutes*

DETAILED STEPS

	Command	Purpose
Step 1	`Router(config)# interface atm interface-id[.subinterface-number {multipoint | point-to-point}]`	Specifies the ATM interface.
Step 2	`Router(config-if)# pvc [name] vpi/vci`	Specifies an ATM PVC by name (optional) and VPI/VCI numbers.
Step 3	`Router(config-if-atm-vc)# encapsulation aal5snap`	Configures AAL5 LLC-SNAP encapsulation if it is not already configured.
Step 4	`Router(config-if-atm-vc)# inarp minutes`	(Optional) Adjusts the Inverse ARP time period.

Address mappings learned through Inverse ARP are aged out. However, mappings are refreshed periodically. This period is configurable using the **inarp** command, which has a default of 15 minutes.

You can also enable Inverse ARP using the **protocol** command. This is necessary only if you disabled Inverse ARP using the **no protocol** command. For more information about this command, refer to the "ATM Commands" chapter in the *Cisco IOS Wide-Area Networking Command Reference*.

Configuring SVCs

To use SVCs, complete the tasks in the following sections:

- Configuring Communication with the ILMI, page 9
- Configuring the PVC That Performs SVC Call Setup, page 10
- Configuring the NSAP Address, page 11
- Creating an SVC, page 12

Configuring Communication with the ILMI

In an SVC environment, you must configure a PVC for communication with ILMI so the router can receive SNMP traps and new network prefixes. The recommended *vpi* and *vci* values for the ILMI PVC are 0 and 16, respectively. To configure ILMI communication, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# pvc [name] 0/16 ilmi`	Creates an ILMI PVC on an ATM main interface.

Note This ILMI PVC can be set up only on an ATM main interface, not on ATM subinterfaces.

Once you have configured an ILMI PVC, you can optionally enable the ILMI keepalive function by using the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# atm ilmi-keepalive [seconds]`	Enables ILMI keepalives and sets the interval between keepalives.

No other configuration steps are required.

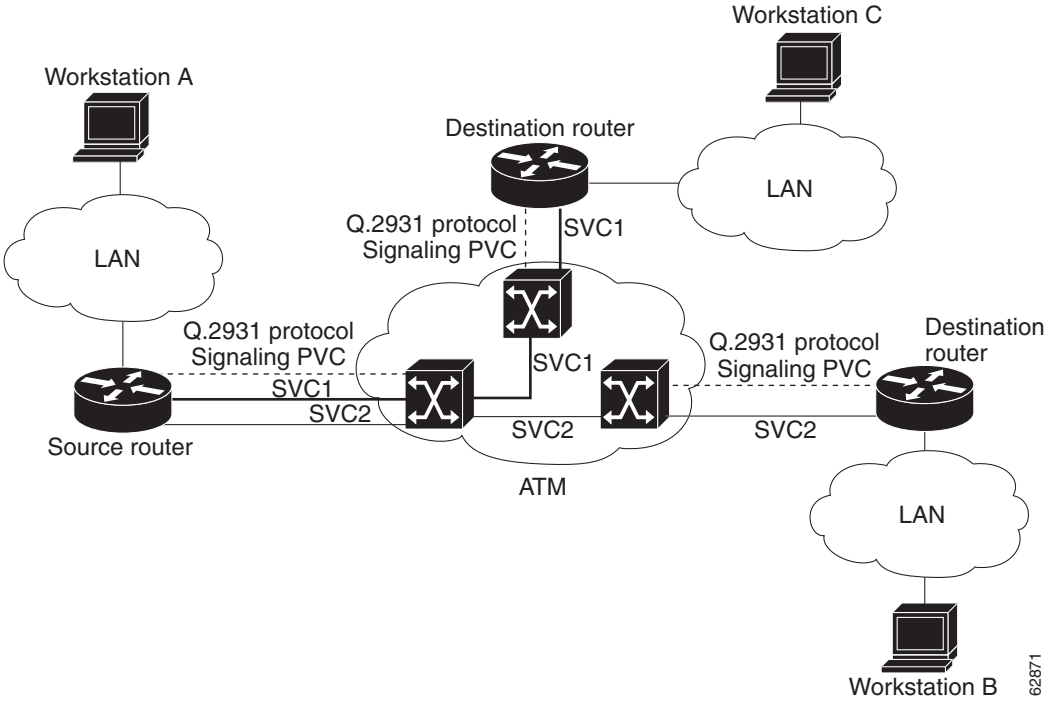
ILMI address registration for receipt of SNMP traps and new network prefixes is enabled by default. The ILMI keepalive function is disabled by default; when enabled, the default interval between keepalives is 3 seconds.

Configuring the PVC That Performs SVC Call Setup

ATM uses out-of-band signalling. One dedicated PVC exists between the router and the ATM switch, over which all SVC call establishment and call termination requests flow. After the call is established, data transfer occurs over the SVC, from router to router. The signalling that accomplishes the call setup and teardown is called *Layer 3 signalling* or the *Q.2931 protocol*.

For out-of-band signalling, a signalling PVC must be configured before any SVCs can be set up. Figure 2 illustrates that a signalling PVC from the source router to the ATM switch is used to set up two SVCs. This is a fully meshed network; workstations A, B, and C all can communicate with each other.

Figure 2 One or More SVCs Require a Signalling PVC



To configure the signalling PVC for all SVC connections, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# pvc [name] vpi/vci qsaal`	Configures the signalling PVC for an ATM main interface that uses SVCs.

Note This signaling PVC can be set up only on an ATM main interface, not on ATM subinterfaces.

The VPI and VCI values must be configured consistently with the local switch. The standard value for VPI and VCI are 0 and 5, respectively.

Configuring the NSAP Address

Every ATM interface involved with signalling must be configured with a network service access point (NSAP) address. The NSAP address is the ATM address of the interface and must be unique across the network.

To configure an NSAP address, complete the tasks described in one of the following sections:

- Configuring the ESI and Selector Fields
- Configuring the Complete NSAP Address

Configuring the ESI and Selector Fields

If the switch is capable of delivering the NSAP address prefix to the router by using ILMI, and the router is configured with a PVC for communication with the switch via ILMI, you can configure the endstation ID (ESI) and selector fields using the **atm esi-address** command. The **atm esi-address** command allows you to configure the ATM address by entering the ESI (12 hexadecimal characters) and the selector byte (2 hexadecimal characters). The NSAP prefix (26 hexadecimal characters) is provided by the ATM switch.

To configure the router to get the NSAP prefix from the switch and use locally entered values for the remaining fields of the address, use the following commands beginning in interface configuration mode:

SUMMARY STEPS

1. **pvc** [*name*] **0/16 ilmi**
2. **exit**
3. **atm esi-address** *esi.selector*

DETAILED STEPS

	Command	Purpose
Step 1	`Router(config-if)# pvc [name] 0/16 ilmi`	Configures an ILMI PVC on an ATM main interface for communicating with the switch by using ILMI.
Step 2	`Router(config-if-atm-vc)# exit`	Returns to interface configuration mode.
Step 3	`Router(config-if)# atm esi-address esi.selector`	Enters the ESI and selector fields of the NSAP address.

The recommended *vpi* and *vci* values for the ILMI PVC are 0 and 16, respectively.

You can also specify a keepalive interval for the ILMI PVC. See the "Configuring Communication with the ILMI" section earlier in this chapter for more information.

Configuring the Complete NSAP Address

When you configure the ATM NSAP address manually, you must enter the entire address in hexadecimal format because each digit entered represents a hexadecimal digit. To represent the complete NSAP address, you must enter 40 hexadecimal digits in the following format:

```
xx.xxxx.xx.xxxxxx.xxxx.xxxx.xxxx.xxxx.xxxx.xxxx.xx
```

Note All ATM NSAP addresses may be entered in the dotted hexadecimal format shown, which conforms to the UNI specification. The dotted method provides some validation that the address is a legal value. If you know your address format is correct, the dots may be omitted.

Because the interface has no default NSAP address, you must configure the NSAP address for SVCs. To set the ATM interface source NSAP address, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# atm nsap-address nsap-address`	Configures the ATM NSAP address for an interface.

The **atm nsap-address** and **atm esi-address** commands are mutually exclusive. Configuring the router with the **atm nsap-address** command negates the **atm esi-address** setting, and vice versa. For information about using the **atm esi-address** command, see the preceding section "Configuring the ESI and Selector Fields."

Creating an SVC

To create an SVC, use the following commands beginning in interface configuration mode:

SUMMARY STEPS

1. **svc** [*name*] **nsap** *address*
2. **encapsulation aal5***encap*
3. **protocol** *protocol protocol-address* [[**no**] **broadcast**]

DETAILED STEPS

	Command	Purpose
Step 1	`Router(config-if)# svc [name] nsap address`	Creates an SVC and specifies the destination NSAP address.
Step 2	`Router(config-if-atm-vc)# encapsulation aal5encap`	Optional. Configures the ATM adaptation layer (AAL) and encapsulation type.
Step 3	`Router(config-if-atm-vc)# protocol protocol protocol-address [[no] broadcast]`	Maps a protocol address to an SVC.

Once you specify a name for an SVC, you can reenter interface-ATM-VC configuration mode by simply entering the **svc** *name* command; you can remove an SVC configuration by entering the **no svc** *name* command.

For a list of AAL types and encapsulations supported for the *aal-encap* argument, refer to the **encapsulation aal5** command in the "ATM Commands" chapter of the *Cisco IOS Wide-Area Networking Command Reference*. The default is AAL5 with SNAP encapsulation.

Customizing the ATM-OC3-POM Module

You can customize the ATM-OC3-POM module. The features you can customize have default values that will probably suit your environment and not need to be changed. However, you might need to enter configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. Perform the tasks in the following sections if you need to customize the ATM-OC3-POM module:

- Setting the MTU Size
- Setting the Loopback Mode

Setting the MTU Size

Each interface has a default maximum packet size or maximum transmission unit (MTU) size. For ATM interfaces, this number defaults to 4470 bytes. The maximum is 9188 bytes for the AIP and NPM, 17969 for the ATM port adapter, and 17998 for the ATM-CES port adapter. The MTU can be set on a per-sub-interface basis as long as the interface MTU is as large or larger than the largest subinterface MTU.

To set the maximum MTU size, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# mtu bytes`	Sets the maximum MTU size.

Setting the Loopback Mode

To loop all packets back to your ATM interface instead of to the network, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# loopback`	Sets loopback mode.

To loop the incoming network packets back to the ATM network, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# loopback line`	Sets line loopback mode.

Troubleshooting High Latency and Output Drop Rates in Low Bandwidth PVCs

When the bandwidth of a PVC is 10 Mbps or less, there may be high latency of large packets going through the interface queue. Bursty packets in a low bandwidth PVC may also exhibit high latency. This problem may be corrected by adjusting the queue depth of the PVC queue within the SAR.

The SAR mechanism has a queue for each PVC. Each PVC queue has two thresholds associated with it called the high watermark and low watermark. These watermarks define the number of cells the queue can hold. The high and low watermark settings define the depth of the PVC interface queue.

The high watermark is a threshold that triggers a flow-off signal and the low watermark is a threshold that triggers a flow-on signal. The high watermark is the maximum number of cells that can be in the PVC queue for the SAR before a flow-off signal is sent to the host.

If packets are being queued at the host because the flow-off signal has been sent, when the number of cells in the PVC queue reaches the low watermark threshold a flow-on signal is sent to the host. The flow-on signal restarts the packet flow from this PVC to the SAR.

For example, after router startup the flow signal defaults to on. If the number of cells in the PVC queue for the SAR is 35, the high watermark is 50, and the low watermark is 10, packets of all classes flow from the PVC to the SAR. If the number of cells increases to 50, the high watermark triggers the flow-off signal, which stops packet flow for all packets. Packet flow is not restarted until the number of cells decreases to 10, when the low watermark triggers the flow-on signal.

Note While the high watermark threshold and low watermark threshold are defined by the numbers of cells, the crossing of the high watermark is evaluated on a packet boundary. This means that only whole packets are placed in the PVC queue for the SAR.

If it is necessary to better control queuing latency or obtain better TCP performance for a PVC, modify the watermark values for it by using the **queue-depth** command. This command will set the high watermark and low watermark levels for the PVC queue.

Note PVC bundles also support the **queue-depth** command.

To configure the queue depth of a PVC, enter the command sequence given below, beginning in the global configuration mode.

Restrictions

Cisco recommends using default values of the watermarks whenever possible, keeping the use of the **queue-depth** command to an absolute minimum.

Cisco does not recommend altering the default watermark values when sending small time-sensitive high priority packets.

The **queue- depth** command is to be used only when the PVC has a bandwidth of 10 Mbps or less, for packets experiencing large delays, and in cases where LLQ is not used.

SUMMARY STEPS

1. **interface atm** *interface-id*[**.***subinterface-number* {**multipoint** | **point-to-point**}]
2. **pvc** *vpi*/*vci*
3. **queue-depth** *hwm lwm*

DETAILED STEPS

	Command	Purpose
Step 1	`Router(config)# interface atm interface-id[.subinterface-number {multipoint | point-to-point}]`	Specifies the ATM interface.
Step 2	`Router(config-if)# pvc vpi/vci`	Specifies an ATM PVC by VPI/VCI numbers.
Step 3	`Router(config-if-atm-vc)#queue-depth hwm lwm`	Defines the queue depth size by setting the high and low watermarks. • *hwm* is the high watermark. • *lwm* is the low watermark.

If you decide to use the **queue-depth** command, Cisco recommends that the high watermark should not exceed 400. The low watermark must be less than the high watermark.

Use the **no** form of the **queue-depth** command to restore default values.

Command	Purpose
`Router(config-if-atm-vc)# no queue-depth`	Restores default values of watermarks to the SAR for the selected PVC. • The default value of *hwm* is 50. • The default value of *lwm* is 10.

Configuration Example for ATM-OC3-POM Modules

This section shows how to configure the ATM-OC3-POM module.

```
Router# configure terminal
Router(config)# interface ATM1/0
Router(config-if)# ip address 10.1.1.1 255.255.255.0
Router(config-if)# load-interval 30
Router(config-if-atm-vc)# atm pvp 10 10000
Router(config-if-atm-vc)# no atm ilmi-keepalive
Router(config-if-atm-vc)# pvc 1/1
Router(config-if-atm-vc)# protocol ip 10.1.1.2 broadcast
Router(config-if-atm-vc)# exit
Router(config-if)#
```

Verifying the Configuration

Use the **show controller** command to verify the configuration of the ATM-OC3-POM module. Explanations of principal outputs of the command are given after the example below.

An Example of the Output of the show controller Command

```
router# show controller atm 1/0
```

```
Interface ATM1/0 is up
  Hardware is CX27470 ATMOC3
  hwidb=0x658F2E60, sardb=0x65906B90, interrupts=1500391
  slot 1, unit 1, subunit 0
  PM Build Version: Build ID 0x3976, Version 0x11753E31, Password 0xEE8AC1CE
  PM Running Version: 1.6.0.2.1
  Current (cx27470_t)sardb:
    Buffs with Host 0x7
    Max Buffs with Host 0x4D
    Max Pkts Hndld 0x0
    Command Indication Queue (0x2D91B5C0)
      Queued (0), ExpSeq (0xB7), Sent (0x14C9DA), Acked (0x14C9DA)
      Cmds Timed Out 0x0, Cmds no buffs 0x0
    Packet Indication Queue (0x2E706200)
      NextEntry (0x1CF0), ExpSeq (0x1)
    Flow Indication Queue (0x2E726240)
      NextEntry (0x0), ExpSeq (0x1)
    Count/Event Indication Queue (0x2E72A280)
      NextEntry (0x3), ExpSeq (0x4)
  CX27470 Interface Info:
    RSY Interface No (0x1), Interface ID (0x101), Status (OPEN)
    SEG Interface No (0x2), Interface ID (0x202), Status (OPEN)
    PCI Interface ID (0x0), Status (OPEN)
    UTOPIA Interface ID (0x303), Status (OPEN)
  CX27470 Port Info:
    RSY Port ID (0x0), Interface ID (0x101), Status (OPEN)
    SEG Port ID (0x1), Interface ID (0x202), Status (OPEN)
    PCI Port ID (0x3F), Interface ID (0x0), Status (OPEN)
    UTOPIA Port ID (0x40), Interface ID (0x303), Status (OPEN)
  VC's configured RSY(3) SEG(3)
  Port Counters
    Tx bytes (157292928),  Tx packets (105297)
    Rx bytes (206868330), Rx packets (138480)
  CX27470 Tunnel Info:
  Tunnel Info (0):
   VPI (0x64) Tunnel_ID (0x1) PCR (9999) Status (OPEN)
   Dest_Port_ID (0x1) Source_Port_ID (0x40) VC's (2)
  CX27470 Channel Info:
  Channel Info (0):
   Chan_Handle (0x0) Chan_ID RSY/SEG (0x82/0x83)
   VC (2), VPI/VCI (1/1), Status RSY/SEG (OPEN/OPEN)
    Tx bytes (145002744), Tx packets (97066), PCR/SCR (150007/0)
    Inst Queue depth (0), Average Queue depth (0)
    Rx bytes (187393500), Rx packets (125440)
    HW Events - 0; LW Events - 0
  Channel Info (1):
   Chan_Handle (0x1) Chan_ID RSY/SEG (0x106/0x107)
   VC (3), VPI/VCI (100/3), Status RSY/SEG (OPEN/OPEN)
    Tx bytes (0), Tx packets (0), PCR/SCR (149790/0)
    Inst Queue depth (0), Average Queue depth (0)
    Rx bytes (0), Rx packets (0)
    HW Events - 0; LW Events - 0
  Channel Info (2):
   Chan_Handle (0x2) Chan_ID RSY/SEG (0x108/0x109)
   VC (4), VPI/VCI (100/4), Status RSY/SEG (OPEN/OPEN)
    Tx bytes (0), Tx packets (0), PCR/SCR (149790/0)
    Inst Queue depth (0), Average Queue depth (0)
    Rx bytes (0), Rx packets (0)
    HW Events - 0; LW Events - 0

PM5384 info:
Framer Chip Type    PM5384
Framer Chip ID      0x10
Framer State        RUNNING
```

```
Layer Status        NO ERRORS
Loopback Mode       NONE
Clock Source        INTERNAL
SONET Mode          STS3C
Line Coding         B3ZS

TX cells                          3173606028
Last output time                  3d01h
RX cells                          4430925
RX bytes                          234839025
Last input time                   3d00h
Section BIP-8 errors              0
Line BIP-8 errors                 0
Line FEBE errors                  33
Path BIP-8 errors                 0
Path FEBE errors                  41
HEC errors                        0
Section errored secs              0
Line errored secs                 0
Line FEBE error secs              1
Path errored secs                 0
Path FEBE errored secs            1
HEC errored secs                  0
Section error-free secs           264358
Line error-free secs              264358
Line FEBE error-free secs         264357
Path error-free secs              264358
Path FEBE error-free secs         264357
HEC error-free secs               264368

PM5384 registers (base 0x4A180000):
 mr           0x10, mcfgr        0x12,
 cmcfg1r      0x10, cmcfg2r      0x0F, crisr        0x00, cmisr        0x00,
 calrdicr     0x32, caprdicr     0x3C, caeprdicr    0x10, crerdicr     0x13,
 crlaiscr     0x30, crpaiscr     0xFC, cralmc1r     0x0E, cralmc2r     0x1B,
 rsop_cier    0x06, rsop_sisr    0x00, rsop_bip80r  0x00, rsop_bip81r  0x00,
 tsop_ctlr    0x80, tsop_diagr   0x80,
 rlop_csr     0x00, rlop_ieisr   0x00, rlop_bip8_0r 0x00, rlop_bip8_1r 0x00,
 rlop_bip8_2r 0x00, rlop_febe0r  0x00, rlop_febe1r  0x00, rlop_febe2r  0x00,
 tlop_ctlr    0x00, tlop_diagr   0x00,
 rpop_scr     0x00, rpop_isr     0x00, rpop_pisr    0x00, rpop_ier     0x00,
 rpop_pier    0x00, rpop_p0r     0xF5, rpop_p1r     0x02, rpop_pslr    0x13,
 rpop_bip8_0r 0x00, rpop_bip8_1r 0x00, rpop_febe0r  0x00, rpop_febe1r  0x00,
 rpop_rdir    0x40,
 tpop_cdr     0x80, tpop_pcr     0x00, tpop_cp0r    0xF5,
 tpop_cp1r    0x02, tpop_ap0r    0x00, tpop_ap1r    0x90, tpop_ptr     0x00,
 tpop_pslr    0x13, tpop_psr     0x00,
 rxcp_cfg1r   0x25, rxcp_cfg2r   0x00, rxcp_fuccr   0x10, rxcp_iecsr   0xC1,
 rxcp_sisr    0x00, rxcp_lct0r   0x01, rxcp_lct1r   0x68, rxcp_ichpr   0x00,
 rxcp_ichmr   0xFE, rxcp_hecr    0x00, rxcp_rcc0r   0x00,
 rxcp_rcc1r   0x00, rxcp_rcc2r   0x00, rxcp_icc0r   0xA6, rxcp_icc1r   0x63,
 rxcp_icc2r   0x05,
 txcp_cfg1r   0x04, txcp_cfg2r   0x01, txcp_tccsr   0x68, txcp_iesr    0x08,
 txcp_ichcr   0x00, txcp_icpcr   0x6A, txcp_tcc0r   0xA1, txcp_tcc1r   0x63,
 txcp_tcc2r   0x05,
 tfclk_cfgr   0xC0, tfclk_resr   0x00, tfclk_dllrr  0x70, tfclk_dllcsr 0xD1,
 rfclk_cfgr   0xC8, rfclk_resr   0x00, rfclk_dllrr  0x6F, rfclk_dllcsr 0xD9,

SFP Info:

 SFP prev_state: 0000 , SFP state: 0000
 rx_los_cnt=0, tx_fault_cnt=0

 SFP Serial EEPROM:
```

```
 SFP type is OC3 MM
 identifier              0x03 (SFP)
 connector               0x07 (LC)
 encoding                0x03 (NRZ)
 br_nominal(100MHz)      2
 length_9km(100m)        0               length_9m(100m)         0
 length_50m(100m)        200             length_62_5m(100m)      200
 length_cu(10m)          0
 vendor name             CISCO-OCP
 vendor_oui              0x00 00 00
 vendor_pn               TRP-03BCS
 vendor_rev
 cc_base                 0x000000E5      options[0]              0x00000000
 br_max(%)               71              br_min(%)               68
 vendor serial number    2733622
 date_code               040721   (yymmddvv, v=vendor specific)
 cc_ext                  0x00000094

FPGA Info:

Revision : 0x42
CSR 0x42 CR 0x2 Test Reg 0x0 PLL SCR 0x46 IR 0x0

router#
```

Explanations of Principal Command Outputs

The table below defines the parameters in the following lines of output:

```
Interface ATM1/0 is up
  Hardware is CX27470 ATMOC3
  hwidb=0x658F2E60, sardb=0x65906B90, interrupts=1500391
```

Parameter	Explanation
hwidb	The location of the instance of the hardware interface device block (hwidb) in memory
sardb	The location of the instance of the SAR device block (sardb) in memory
interrupts	The total number of interrupts received since the last boot

The following lines of output give the version of the SAR firmware.

```
  PM Build Version: Build ID 0x3976, Version 0x11753E31, Password 0xEE8AC1CE
  PM Running Version: 1.6.0.2.1
```

The tables below define parameters in the following lines of output:

```
  Current (cx27470_t)sardb:
    Buffs with Host 0x7
    Max Buffs with Host 0x4D
    Max Pkts Hndld 0x0
    Command Indication Queue (0x2D91B5C0)
      Queued (0), ExpSeq (0xB7), Sent (0x14C9DA), Acked (0x14C9DA)
      Cmds Timed Out 0x0, Cmds no buffs 0x0
```

Parameter	Explanation
Buffs with Host	Number of buffers that need to be replenished
Max Buffs with Host	Maximum number of buffers that need replenishing
Queued	Number of commands queued that need to be sent to the SAR
Sent	Number of commands sent to the SAR
Acked	Number of ACKs received from the SAR
Cmds Timed Out	Number of commands for which an ACK was not received from the SAR
Cmds no buff	Commands that failed because no memory was available

```
Packet Indication Queue (0x2E706200)
  NextEntry (0x1CF0), ExpSeq (0x1)
```

Parameter	Explanation
NextEntry	Offset of the next packet to be processed on the ingress path

```
Flow Indication Queue (0x2E726240)
  NextEntry (0x0), ExpSeq (0x1)
```

Parameter	Explanation
NextEntry	Offset of the next flow control event that needs to be processed

```
Count/Event Indication Queue (0x2E72A280)
  NextEntry (0x3), ExpSeq (0x4)
```

Parameter	Explanation
NextEntry	Offset of the next counter/alarm event that needs to be processed

The following output gives the port information for the ATM-OC3 module. The status of all the ports must be OPEN for the module to work correctly.

```
CX27470 Port Info:
  RSY Port ID (0x0), Interface ID (0x101), Status (OPEN)
  SEG Port ID (0x1), Interface ID (0x202), Status (OPEN)
  PCI Port ID (0x3F), Interface ID (0x0), Status (OPEN)
  UTOPIA Port ID (0x40), Interface ID (0x303), Status (OPEN)
```

The tables below define the parameters for VC configuration, tunnel information, and channel information.

```
VC's configured RSY(3) SEG(3)
Port Counters
  Tx bytes (157292928),  Tx packets (105297)
  Rx bytes (206868330), Rx packets (138480)
```

Parameter	Explanation
VC’s	Number of VCs configured (3 in the example above)

Parameter	Explanation
Tx bytes/packets	Total number of bytes/packets sent to the OC3 framer
Rx bytes/packets	Total number of bytes/packets received from the OC3 framer

```
CX27470 Tunnel Info:
Tunnel Info (0):
 VPI (0x64) Tunnel_ID (0x1) PCR (9999) Status (OPEN)
 Dest_Port_ID (0x1) Source_Port_ID (0x40) VC's (2)
```

Parameter	Explanation
PCR	Peak rate of the VP tunnel created
Status	Status of the VP tunnel (must be OPEN for proper operation)
VC's	Number of VCs in the VP tunnel

```
CX27470 Channel Info:
Channel Info (0):
 Chan_Handle (0x0) Chan_ID RSY/SEG (0x82/0x83)
 VC (2), VPI/VCI (1/1), Status RSY/SEG (OPEN/OPEN)
  Tx bytes (145002744), Tx packets (97066), PCR/SCR (150007/0)
  Inst Queue depth (0), Average Queue depth (0)
  Rx bytes (187393500), Rx packets (125440)
  HW Events - 0; LW Events - 0
```

Parameter	Explanation
VPI/VCI	Vpi/vci of the VC created
Status RSY/SEG	Status of the reassembly/segmentation channels (should be OPEN/OPEN when the VC is created)
Tx bytes/packets	Total number of bytes/packets transmitted from this VC since the VC was created
PCR/SCR	Peak cell rate/sustainable cell rate of the created VC
Rx bytes/packets	Total number of bytes/packets received on this VC since the VC was created
HW/LW Events	Number of high watermark and low watermark flow control events received from the SAR (This number will increase if traffic is sent to the SAR at a rate greater than the PCR.)

Additional References

The following sections provide references related to Cisco ATM-OC3-POM modules.

Related Documents

Related Topic	Document Title
Hardware installation of network modules	*Cisco Network Modules Hardware Installation Guide*

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards have not been modified by this feature.	—

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs have not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs have not been modified by this feature.	—

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

This section documents new commands only.

New Commands

- **debug atm oc3 pom**

debug atm oc3 pom

To display debug messages for ATM-OC3 Provisioning Object Manager (POM) network modules, use the **debug atm oc3 pom** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug atm oc3 pom {**data** | **flow** | **pa** | **sar** | **sfp** | **trace**}

no debug atm oc3 pom {**data** | **flow** | **pa** | **sar** | **sfp** | **trace**}

Syntax Description

data	Displays debug messages for incoming packet indications.
flow	Displays debug messages for flow control indications.
pa	Displays debug messages for online insertion or removal (OIR) of the ATM-OC3 POM network module.
sar	Displays debug messages for blocking commands sent to the segmentation and reassembly (SAR) and their acknowledgments.
sfp	Displays debug messages for OIR of modules in the SFP port of the network module.
trace	Displays debug messages that give the hexadecimal representation of commands sent to the SAR and their acknowledgments.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(2)T	This command was introduced.

Usage Guidelines

debug atm oc3 pom data command

Use the **debug atm oc3 pom data** command to display the incoming packet indications. Each incoming packet transferred by direct memory access (DMA) to the host memory by the SAR will cause a packet indication.

debug atm oc3 pom flow command

Use the **debug atm oc3 pom flow** command to display flow control indications.

When traffic sent to the SAR exceeds the peak cell rate for a particular virtual circuit (VC), the SAR indicates this to the host by sending flow control indications. These indications inform the host that either the high watermark or the low watermark has been reached for that VC queue.

When a high watermark is received from the SAR, indicating that the VC queue is full, the host will stop sending packets to the SAR until a low watermark indication is received. A low watermark indicates that the VC queue has been drained sufficiently to receive additional packets.

debug atm oc3 pom pa command

Use the **debug atm oc3 pom pa** command on those platforms supporting OIR to display the indications generated when the port adapter (the ATM-OC3 POM network module) is subjected to OIR. This command is used principally during the port adapter initialization phase.

debug atm oc3 pom sar command

Use the **debug atm oc3 pom sar** command to display blocking commands or indications sent to or received from the SAR. This includes commands or indications of the creation or deletion of virtual circuits or virtual paths.

debug atm oc3 pom sfp command

Use the **debug atm oc3 pom sfp** command to display the indications generated when a module in the SFP port is subjected to OIR.

debug atm oc3 pom trace command

Use the **debug atm oc3 pom trace** command to display the hexadecimal representation of commands sent to or received from the SAR. To facilitate debugging, use this command in conjunction with the **debug atm oc3 pom sar** command.

Examples

Example for the debug atm oc3 pom data command

The following is sample output from the **debug atm oc3 pom data** command:

```
Router# debug atm oc3 pom data

DATA debugging is on
Router#
*Jun 27 22:03:17.996: Packet Indication:
*Jun 27 22:03:17.996:   word 0: 0x00007D24
*Jun 27 22:03:17.996:   word 1: 0x00002F02
*Jun 27 22:03:17.996:   word 2: 0xEE323464
*Jun 27 22:03:17.996:   word 3: 0x006C006D
```

Table 2 describes the significant fields shown in the display.

Table 2 debug atm oc3 pom data Field Descriptions

Field	Description
Jun 27 22:03:17.996:	Date or time stamp of packet DMA transfer.
word [0 - 3]: 0xXXXXXXXX	Hexadecimal representation of four-word acknowledgment from the SAR when a packet is transferred by DMA to the host memory by the SAR.

Example for the debug atm oc3 pom flow command

The following example illustrates the output from the **debug atm oc3 pom flow** command:

```
Router# debug atm oc3 pom flow

FLOW CNTL INDICATION debugging is on
Router#
*Jun 27 15:14:13.123: Flow Indication:
*Jun 27 15:14:13.123:   word 0: 0x00000001
*Jun 27 15:14:13.123:   word 1: 0x300012C0
*Jun 27 15:14:13.123:   word 2: 0x18001060
```

```
*Jun 27 15:14:13.123:   word 3: 0x00080021

*Jun 27 15:14:13.456: Flow Indication:
*Jun 27 15:14:13.456:   word 0: 0x00000001
*Jun 27 15:14:13.456:   word 1: 0x300012C0
*Jun 27 15:14:13.456:   word 2: 0x18001060
*Jun 27 15:14:13.456:   word 3: 0x00090022
```

Table 3 describes the significant fields shown in the display.

Table 3 debug atm oc3 pom flow Field Descriptions

Field	Description
Jun 27 15:14:13.456:	Date or time stamp of flow indication
word [0 - 3]: 0xXXXXXXXX	Hexadecimal representation of four-word indication sent by the SAR to the host that a high watermark or low watermark event has occurred.
word 3: 0x00XXYYYY	When XX is 08, a high watermark has been received by the host. The host will stop queueing packets for the VC. When XX is 09, a low watermark has been received by the host. The host will resume sending packets to the VC. YYYY is the running count of flow indication events sent to the host.

Examples for the debug atm oc3 pom pa command

The following examples illustrate the output from the **debug atm oc3 pom pa** command.

The first example gives the output when the network module is removed:

```
Router# debug atm oc3 pom pa

PA debugging is on

*Jun 27 22:40:56.110: %OIR-6-REMCARD: Card removed from slot 2, interfaces disabled
*Jun 27 22:40:56.122: *** Freed 6146 buffers
```

The second example gives the output when the network module is inserted, and gives the values of internal registers of the module:

```
*Jun 27 22:41:08.654: %OIR-6-INSCARD: Card inserted in slot 2, interfaces administratively
shut down
*Jun 27 22:41:11.402: sar_base_addr 0x5C800000
*Jun 27 22:41:11.402: PCI_MEMBAR2_REG after configuring:0x5E000008
*Jun 27 22:41:11.402: PCI_MEMBAR3_REG after configuring:0x5F000000
*Jun 27 22:41:11.402: PCI_COMMAND_REG: Offset= 0x4; value= 0x2A00006
*Jun 27 22:41:11.402: FPGA Base address is 0x5C900000
*Jun 27 22:41:11.402: FPGA PCI config Reg is 0x02200002
```

Examples for the debug atm oc3 pom sar command

The following examples illustrate the output from the **debug atm oc3 pom sar** command.

The first example displays command indications for setting up a VC and opening the reassembly channel and the segmentation channel in the SAR:

```
Router# debug atm oc3 pom sar
```

```
SAR debugging is on
Router# configure terminal
Router(config)# interface atm 2/0
Router(config-if)# pvc 2/2
Router(config-if-atm-vc)# exit
Router(config-if)#
*Jun 27 22:12:28.816: ATM2/0: Setup_VC: vc:3 vpi:2 vci:2
*Jun 27 22:12:28.816: ATM2/0: Open_Channel(RSY): CH (1), VPI (2), VCI (2)
*Jun 27 22:12:28.816: ATM2/0: HI/LO watermarks: 526/263; PeakRate: 149760
*Jun 27 22:12:28.816: ATM2/0: Open_Channel(SEG): CH (1), VPI (2), VCI (2)
*Jun 27 22:12:28.820: ATM2/0: Setup_Cos: vc:3 wred_name:- max_q:0
```

The second example displays the commands sent to the SAR and the acknowledgements returned when the VC is deleted and the segmentation and reassembly channels are closed:

```
Router(config-if)# no pvc 2/2
Router(config-if)#
*Jun 27 22:12:59.016: ATM2/0: Sent pending EOP successfully
*Jun 27 22:12:59.016: ATM2/0: Close_Channel(RSY): Chan_ID (0x104)
*Jun 27 22:12:59.016: ATM2/0: Close_Channel(RSY): Chan_ID (0x104) CLOSE
*Jun 27 22:12:59.016: ATM2/0: Close_Channel: CLOSE_PENDING
*Jun 27 22:12:59.016: ATM2/0: Close_Channel(SEG): Chan_ID (0x105)
*Jun 27 22:12:59.016: ATM2/0: Close_Channel: CLOSE
```

Examples for the debug atm oc3 pom sfp command

The following examples illustrate the output from the **debug atm oc3 pom sfp** command.

The first example gives the output when the module is removed from the SFP port:

```
Router# debug atm oc3 pom sfp

SFP debugging is on

*Jun 27 22:27:40.792: SFP TX FAULT detected
*Jun 27 22:27:40.808: SFP LOS detected
*Jun 27 22:27:40.812: SFP removal detected
*Jun 27 22:27:41.464: NM-1A-OC3-POM: SFP 2/0 - Removed unique
*Jun 27 22:27:43.464: %LINK-3-UPDOWN: Interface ATM2/0, changed state to down
*Jun 27 22:27:44.464: %LINEPROTO-5-UPDOWN: Line protocol on Interface ATM2/0, changed
state to down
```

The second example gives the output when the module is inserted in the SFP port.

```
*Jun 27 22:27:47.776: SFP LOS cleared
*Jun 27 22:27:47.776: SFP TX FAULT detected
*Jun 27 22:27:48.276: SFP present detected
*Jun 27 22:27:48.276: SFP TX FAULT cleared
*Jun 27 22:27:48.496:  Set the Container_id to 17
*Jun 27 22:27:50.496: %LINK-3-UPDOWN: Interface ATM2/0, changed state to up
*Jun 27 22:27:51.496: %LINEPROTO-5-UPDOWN: Line protocol on Interface ATM2/0, changed
state to up
```

Examples for the debug atm oc3 pom trace command

The first example illustrates the output from the **debug atm oc3 pom trace** command when it is run without the **debug atm oc3 sar** command being activated:

```
Router# debug atm oc3 pom trace
SAR CMD/ACK debugging is on
Router# configure terminal
Router(config)# interface atm 2/0
router(config-if)# pvc 2/2
Router(config-if-atm-vc)# exit
```

```
Router(config-if)#
*Jun 27 22:15:09.284: Command Sent:
*Jun 27 22:15:09.284:   word 0: 0x00000480
*Jun 27 22:15:09.284:   word 1: 0x00012010
*Jun 27 22:15:09.284:   word 2: 0x00000000
*Jun 27 22:15:09.284:   word 3: 0x00000000
*Jun 27 22:15:09.284:   word 4: 0x00200020
*Jun 27 22:15:09.284:   word 5: 0x00000000
*Jun 27 22:15:09.284:   word 6: 0x00000000
*Jun 27 22:15:09.284:   word 7: 0x00000000
*Jun 27 22:15:09.284:   word 8: 0x00000000
*Jun 27 22:15:09.284: Command Indication:
*Jun 27 22:15:09.284:   word 0: 0x00000000
*Jun 27 22:15:09.284:   word 1: 0x01042110
*Jun 27 22:15:09.284:   word 2: 0x01050000
*Jun 27 22:15:09.284:   word 3: 0x0000003B
*Jun 27 22:15:09.284: ACK received = 200 usecs
*Jun 27 22:15:09.284: Command Sent:
*Jun 27 22:15:09.284:   word 0: 0x01050480
*Jun 27 22:15:09.284:   word 1: 0x00011010
*Jun 27 22:15:09.284:   word 2: 0x02000000
*Jun 27 22:15:09.284:   word 3: 0x00010003
*Jun 27 22:15:09.284:   word 4: 0x00200020
*Jun 27 22:15:09.284:   word 5: 0x64B30000
*Jun 27 22:15:09.284:   word 6: 0x10C00000
*Jun 27 22:15:09.284:   word 7: 0x86850000
*Jun 27 22:15:09.284:   word 8: 0x00010040
*Jun 27 22:15:09.284:   word 9: 0x00000000
*Jun 27 22:15:09.284: Command Indication:
*Jun 27 22:15:09.284:   word 0: 0x00010000
*Jun 27 22:15:09.284:   word 1: 0x00011110
*Jun 27 22:15:09.284:   word 2: 0x02000000
*Jun 27 22:15:09.284:   word 3: 0x0001003D
*Jun 27 22:15:09.284: ACK received = 200 usecs
```

Table 4 describes the significant fields shown in the display.

Table 4 debug atm oc3 pom trace Field Descriptions

Field	Description
Jun 27 22:15:09.284:	Date or time stamp for the command dialog.
word [0 - n]: 0xXXXXXXXX	Hexadecimal representation of the **n-word** command sent to the SAR (under Command Sent:) and the four-word acknowledgment returned by the SAR (under Command Indication:).
ACK received	Time (in microseconds) between sending the command to the SAR and receiving the acknowledgment.

The second example illustrates the output from the **debug atm oc3 pom trace** command run in conjunction with the **debug atm oc3 pom sar** command.

In this example, each command sent to the SAR is displayed by the **debug atm oc3 pom sar** command. Then the hexadecimal representation of the command and its acknowledgement are displayed by the **debug atm oc3 pom trace** command.

```
Router# debug atm oc3 pom trace

SAR CMD/ACK debugging is on
```

```
Router# debug atm oc3 pom sar
SAR debugging is on
Router# configure terminal
Router(config)# interface atm 2/0
router(config-if)# pvc 2/2
Router(config-if-atm-vc)# exit
Router(config-if)#
*Jun 27 22:15:09.284: ATM2/0: Setup_VC: vc:4 vpi:2 vci:2
*Jun 27 22:15:09.284: ATM2/0: Open_Channel(RSY): CH (1), VPI (2), VCI (2)
*Jun 27 22:15:09.284: Command Sent:
*Jun 27 22:15:09.284:   word 0: 0x00000480
*Jun 27 22:15:09.284:   word 1: 0x00012010
*Jun 27 22:15:09.284:   word 2: 0x00000000
*Jun 27 22:15:09.284:   word 3: 0x00000000
*Jun 27 22:15:09.284:   word 4: 0x00200020
*Jun 27 22:15:09.284:   word 5: 0x00000000
*Jun 27 22:15:09.284:   word 6: 0x00000000
*Jun 27 22:15:09.284:   word 7: 0x00000000
*Jun 27 22:15:09.284:   word 8: 0x00000000
*Jun 27 22:15:09.284: Command Indication:
*Jun 27 22:15:09.284:   word 0: 0x00000000
*Jun 27 22:15:09.284:   word 1: 0x01042110
*Jun 27 22:15:09.284:   word 2: 0x01050000
*Jun 27 22:15:09.284:   word 3: 0x0000003B
*Jun 27 22:15:09.284: ACK received = 200 usecs
*Jun 27 22:15:09.284: ATM2/0: HI/LO watermarks: 526/263; PeakRate: 149760
*Jun 27 22:15:09.284: ATM2/0: Open_Channel(SEG): CH (1), VPI (2), VCI (2)
*Jun 27 22:15:09.284: Command Sent:
*Jun 27 22:15:09.284:   word 0: 0x01050480
*Jun 27 22:15:09.284:   word 1: 0x00011010
*Jun 27 22:15:09.284:   word 2: 0x02000000
*Jun 27 22:15:09.284:   word 3: 0x00010003
*Jun 27 22:15:09.284:   word 4: 0x00200020
*Jun 27 22:15:09.284:   word 5: 0x64B30000
*Jun 27 22:15:09.284:   word 6: 0x10C00000
*Jun 27 22:15:09.284:   word 7: 0x86850000
*Jun 27 22:15:09.284:   word 8: 0x00010040
*Jun 27 22:15:09.284:   word 9: 0x00000000
*Jun 27 22:15:09.284: Command Indication:
*Jun 27 22:15:09.284:   word 0: 0x00010000
*Jun 27 22:15:09.284:   word 1: 0x00011110
*Jun 27 22:15:09.284:   word 2: 0x02000000
*Jun 27 22:15:09.284:   word 3: 0x0001003D
*Jun 27 22:15:09.284: ACK received = 200 usecs
*Jun 27 22:15:09.284: ATM2/0: Setup_Cos: vc:4 wred_name:- max_q:0
```

Feature Information for ATM-OC3-POM Modules

Table 5 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Note Table 5 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 5 Feature Information for ATM-OC3-POM Modules

Feature Name	Releases	Feature Information
NM-1A-OC3-POM Network Module	12.4(3)	The NM-1A-OC3-POM network module is a high performance single-width, single-port ATM network module, utilizing an optical carrier level 3 (OC-3) link. The ATM interface is a small form-factor pluggable (SFP) optical port. Fiber-optic cables to the network are attached to an SFP module that is inserted into the SFP port. The network module has 3 modes of operation: multimode (MM), single mode intermediate reach (SMIR), and single mode long reach (SMLR). This hardware feature is supported on Cisco 3800 series routers.
	12.4(4)T3	The following feature was added in this release: • Toubleshooting High Latency and Output Drop Rates in Low Bandwidth PVCs
	12.4(15)T4	The feature Toubleshooting High Latency and Output Drop Rates in Low Bandwidth PVCs was enhanced by extending the support of the **queue-depth** command to include PVC bundles.