Configuring Operation, Administration, and Maintenance

This chapter describes the Operation, Administration, and Maintenance (OAM) implementation on the ATM switch router.

Note This chapter provides advanced configuration instructions for the Catalyst 8540 MSR, Catalyst 8510 MSR, and LightStream 1010 ATM switch routers. For complete descriptions of the commands mentioned in this chapter, refer to the *ATM Switch Router Command Reference* publication.

This chapter includes the following sections:

OAM Overview

OAM performs fault management and performance management functions at the ATM management (M)-plane layer.

Note Current OAM implementation supports only the fault management function, which includes connectivity verification and alarm surveillance.

The ATM switch router has full support for the following ATM OAM cell flows:

- F4 flows—OAM information flows between network elements (NEs) used within virtual paths to report an unavailable path or a virtual path (VP) that cannot be guaranteed.

- F5 flows—OAM information flows between network elements (NEs) used within virtual connections to report degraded virtual channel (VC) performance such as late arriving cells, lost cells, and cell insertion problems.

Both F4 and F5 flows can be configured as either end-to-end or segment-loopback and used with alarm indication signal (AIS) and remote defect indication (RDI) functions.

Note   Cells can be sent either on demand or periodically to verify link and connection integrity.

In addition to the standard OAM functions, the ATM switch router can also send OAM pings. OAM cells containing the ATM node addresses or IP addresses of intermediate switches allow network administrators to determine the integrity of a chosen connection at any intermediate point along the connection, allowing for network connection debugging and troubleshooting.

OAM software implements ATM Layer F4 and F5 OAM fault management functions. OAM performs standard loopback (end-to-end or segment) and fault detection and notification (AIS and RDI) for each connection. It also maintains a group of timers for the OAM functions. When there is an OAM state change such as loopback failure, OAM software notifies the connection management software. The network operator can enable or disable OAM operation for the following switch components:

- The entire switch
- A specific ATM interface
- A specific ATM connection

If OAM operation is disabled, outgoing OAM cells (AIS, RDI and loopbacks) are not generated and AIS and RDI cells that arrive at connection endpoints are discarded.

To support various OAM operations, the ATM switch router hardware provides OAM cell routing functions on a per-connection basis for each direction and for different OAM cell spans (segment and end-to-end). The hardware OAM cell routing determines the destination of an OAM cell received from the link or the network and then determines whether OAM cells are processed by the switch software.

The hardware can perform the following functions on OAM cells:

- Intercept—Intercepted to the CPU queue and processed by the ATM switch router software
- Relay—Relayed along with user cell by hardware without any software processing
- Discard—Discarded by hardware

An ATM connection consists of a group of network points that form the edges of each ATM switch or end system.

Each point can be one of the following:

- Connection end point—The end of a connection where the user ATM cells are terminated
- Segment end point—The end of a connection segment
- Connecting point—The middle point of a connection segment

The following sections describe the OAM tasks:

Configuring OAM Functions

This section describes OAM commands in EXEC, global, and interface configuration mode.

Configuring OAM for the Entire Switch (Catalyst 8540 MSR)

To enable OAM operations for the Catalyst 8540 MSR, use the global configuration command, as shown in the following table:

Command	Purpose
atm oam [**ais**] [**end-loopback**] [**max-limit** *number*] [**rdi**] [**seg-loopback**]	Enables or disables OAM operations for the entire switch.

Note   The number of maximum OAM configured connections allowed ranges from 1 to 3200; the default is 3200.

Examples

The following example shows how to enable AIS and segment loopback for the entire switch:

```
Switch(config)# atm oam ais seg-loopback
% OAM: Switch level seg loopback is enabled

% OAM: Switch level ais is enabled
```

The following example shows how to configure the ATM OAM connection maximum to 1600:

```
Switch(config)# atm oam max-limit 1600
```

Configuring OAM for the Entire Switch (Catalyst 8510 MSR and LightStream 1010)

To enable OAM operations for the entire Catalyst 8510 MSR and LightStream 1010 ATM switch router, use the global configuration command, as shown in the following table:

Command	Purpose
atm oam [**ais**] [**end-loopback**] [**intercept end-to-end**] [**max-limit** *number*] [**rdi**] [**seg-loopback**]	Enables or disables OAM operations for the entire switch.

Note   The number of maximum OAM configured connections allowed ranges from 1 to 3200; the default is 3200.

Examples

The following example shows how to enable AIS and segment loopback for the entire switch:

```
Switch(config)# atm oam ais seg-loopback
% OAM: Switch level seg loopback is enabled

% OAM: Switch level ais is enabled
```

The following example shows how to configure the ATM OAM connection maximum to 1600:

```
Switch(config)# atm oam max-limit 1600
```

Configuring the Interface-Level OAM

To enable OAM operations on an interface, perform the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	Switch(config)# **interface atm** *card*/*subcard*/*port*[**.***vpt#*] Switch(config-if)#	Selects the interface to be configured.
Step 2	Switch(config-if)# **atm oam** [**interface atm** *card*/*subcard*/*port*[**.***vpt#*]] [*vpi* [*vci*]] [**ais**] [**end-loopback**] [**rdi**] [**seg-loopback**]	Configures interface OAM operations.
Step 3	Switch(config-if)# **atm oam** *vpi* [*vci*] **loopback-timer** *tx-timer-value*	Configures the OAM loopback transmit timer.

Examples

The following example shows how to enable OAM AIS and end-to-end loopback on interface 3/0/0:

```
Switch(config)# interface atm 3/0/0
Switch(config-if)# atm oam ais end-loopback
% OAM: Interface level end to end loopback is enabled

% OAM: Interface level ais is enabled
```

The following example shows how to enable OAM AIS and end-to-end loopback on interface 3/0/0, VPI = 50, VCI = 100:

```
Switch(config)# interface atm 3/0/0
Switch(config-if)# atm oam 50 100 ais end-loopback
% OAM: Connection level end to end loopback is enabled

% OAM: Connection level ais is enabled
```

Note   You can use only VPI values to configure OAM operations on VP connections.

In interface configuration command mode, you can enable or disable OAM operations on existing connections on different interfaces by specifying **interface atm** *card*/*subcard*/*port*. The following example disables OAM AIS flows at interface 1/0/0 while in interface 3/0/0:

```
Switch(config)# interface atm 3/0/0
Switch(config-if)# no atm oam interface atm 1/0/0 ais
% OAM: Interface level ais is disabled
```

Checking the ATM Connection (Catalyst 8540 MSR)

To check ATM connection reachability and network connectivity on the Catalyst 8540 MSR, use the **ping** EXEC command, as shown in the following table:

Command	Purpose
ping atm interface atm *card*/*subcard*/*port* **vpi** [*vci*] {**end-loopback** [*destination*]	**seg-loopback** [*destination*]}	Checks the connection.

You can ping a neighbor switch by selecting the segment loopback option. In privileged EXEC mode, you can select various other parameters such as repeat count and timeout values.

Examples

The following example shows the **ping** command used in normal mode to check a virtual channel connection (VCC) with a segment loopback flow:

```
Switch# ping atm interface atm 3/0/0 50 100 seg-loopback

Type escape sequence to abort.
Sending Seg-Loopback 5, 53-byte OAM Echoes to a neighbor, timeout is 5 seconds:
.....
Success rate is 0 percent (0/5)
```

The following example shows the **ping** command used in extended mode to check a VCC with end-to-end loopback flow:

```
Switch# ping
Protocol [ip]: atm
Interface [card/sub-card/port]: 3/0/0
VPI [0]: 0
VCI [0]: 16
Send OAM-Segment-Loopback ? [no]:
Target IP address:
Target NSAP Prefix:
Repeat count [5]:
Timeout in seconds [5]:
Type escape sequence to abort.
Sending end-Loopback 5, 53-byte OAM Echoes to a connection end point, timeout is
 5 seconds:
.....
Success rate is 0 percent (0/5)
```

Checking the ATM Connection (Catalyst 8510 MSR and LightStream 1010)

To check ATM connection reachability and network connectivity on the Catalyst 8510 MSR and LightStream 1010 ATM switch router, use the **ping** EXEC command, as shown in the following table:

Command	Purpose
ping atm interface atm *card*/*subcard*/*port* **vpi** [*vci*] {[**atm-prefix** *prefix*]	**end-loopback** [*destination*]	**ip-address** *ip-address*	**seg-loopback** [*destination*]}	Checks the connection.

You can use either an ATM address prefix or an IP address as a ping destination. You can ping a neighbor switch by selecting the segment loopback option. In privileged EXEC mode, you can select various other parameters such as repeat count and timeout values.

Examples

The following example shows the **ping** command used in normal mode to check a VCC with a segment loopback flow:

```
Switch# ping atm interface atm 3/0/0 50 100 seg-loopback

Type escape sequence to abort.
Sending Seg-Loopback 5, 53-byte OAM Echoes to a neighbor, timeout is 5 seconds:
.....
Success rate is 0 percent (0/5)
```

The following example shows the **ping** command used in extended mode to check a VCC with end-to-end loopback flow:

```
Switch# ping
Protocol [ip]: atm
Interface [card/sub-card/port]: 3/0/0
VPI [0]: 0
VCI [0]: 16
Send OAM-Segment-Loopback ? [no]:
Target IP address:
Target NSAP Prefix:
Repeat count [5]:
Timeout in seconds [5]:
Type escape sequence to abort.
Sending end-Loopback 5, 53-byte OAM Echoes to a connection end point, timeout is
 5 seconds:
.....
Success rate is 0 percent (0/5)
```

Note If you do not enable the OAM segment loopback option, the **ping** command uses an OAM end-to-end loopback cell. If you do not provide a target address, the connection end point becomes the target.

Displaying the OAM Configuration

To display the OAM configuration, use the following EXEC command:

Command	Purpose
more system:running-config	Displays the OAM configuration.

Example

The OAM configuration is displayed in the following example:

```
Switch# more system:running-config
Building configuration...

Current configuration:
!
version XX.X
no service pad
service udp-small-servers
service tcp-small-servers
!
hostname Switch
!
boot system flash slot0:rhino/ls1010-wi-m_1.083.bin.Z
!
ip rcmd remote-username doug
atm oam max-limit 1600
atm over-subscription-factor 16
atm service-category-limit cbr 3000
atm qos uni3-default  cbr max-cell-loss-ratio 12
atm lecs-address 47.0091.0000.0000.0000.0000.0000.0000.0000.0000.00
atm address 47.0091.8100.0000.0060.3e5a.db01.0060.3e5a.db01.00
!
interface ATM0/0/0
 no keepalive
 map-group atm-1
 no atm auto-configuration
 no atm address-registration
 no atm ilmi-enable
 no atm ilmi-lecs-implied
 atm iisp side user
 atm pvp 99
 atm oam 0 5 seg-loopback  end-loopback  rdi
 atm oam 0 16 seg-loopback  end-loopback  rdi
 atm oam 0 18 seg-loopback  end-loopback  rdi
!
interface ATM0/0/0.99 point-to-point
 no atm auto-configuration
 no atm address-registration
 no atm ilmi-enable
 no atm ilmi-lecs-implied
 atm maxvp-number 0
 atm oam 99 5 end-loopback  rdi
 atm oam 99 16 end-loopback  rdi
 atm oam 99 18 end-loopback  rdi
!
--More--

<information deleted>
```