CHAPTER 8

Configuring Operation, Administration, and Maintenance

This chapter describes the Operation, Administration, and Maintenance (OAM) implementation of the LightStream 1010 ATM Switch. OAM performs fault management and performance management functions at asynchronous transfer mode (ATM) management (M)-plane layer.

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

The LightStream 1010 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.

Over and above the standard OAM functions, the LightStream 1010 also has the added capability to send OAM packet internet gropers (PINGs). OAM cells containing the ATM node addresses or internet protocol (IP) addresses of intermediate switches allow network administrators to determine the integrity of a chosen connection at any intermediate point along the connection. This allows network connection debugging and troubleshooting.

OAM Operation

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
- On each ATM connection

If OAM operation is disabled, outgoing OAM cells will not be generated and all incoming OAM cells will be discarded.

In order to support various OAM operations, the LightStream 1010 switch 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 or not OAM cells will be processed by the LightStream 1010 software.

The hardware can perform the following functions on OAM cells:

Intercept—Intercepted to the CPU queue and processed by the LightStream 1010 software.

Relay—Relayed along user cell by hardware without any software processing.

Discard—Discarded by hardware.

An ATM connection consists of a group of network points which are the edges of each ATM switch or end systems.

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 Operations, Administration, and Maintenance tasks:

- Configure Operation and Maintenance Functions
- Use the atm ping Command
- Use show running-config to Display OAM Configuration

Configure Operation and Maintenance Functions

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

Configure OAM Commands

OAM AIS, RDI and loopback operations are enabled or disabled for the entire switch using the EXEC commands. Use the optional **interface atm** parameter to configure OAM on a specific connection.

Note These configuration commands are not stored in the nonvolatile RAM (NVRAM).

Task	Command
At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Configure loopback.	**atm oam** [**interface atm** *card/sub-card/port*] [**ais**] **[end-to-end-loopback**] [**max-limit**] [**rdi**] [**seg-loopback**]

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.

Use the **no** form of these commands to disable.

Note Number of maximum OAM configured connections allowed range from 1 to 3200. Default is 3200.

Example

The following example enables 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

Switch(config)#
```

Number of maximum OAM configured connections allowed range from 1 to 3200. Default is 3200.

Configure Global OAM Commands

Global configuration commands for the LightStream 1010 OAM are listed below.

Task	Command
At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
OAM AIS, RDI and Loopback operations are enabled or disabled with respect to entire switch.	**atm oam** [**ais**] [**rdi]** [**seg-loopback**] [**end-to-end-loopback**]
Maximum number OAM configured connections allowed per switch.	**atm oam max-count** *number*

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.

OAM AIS, RDI and Loopback operations are enabled or disabled with respect to switch.

Example

The following example enables AIS and RDI for the entire switch:

```
Switch(config)#atm oam ais rdi
```

The following example enables segment loopback and end-to-end loopback for the entire switch:

```
Switch(config)#atm oam seg-loopback end-loopback
```

The following example disables the OAM ATM maximum count back to the default for the entire switch:

```
Switch(config)#no atm oam max-count
```

The following example configures the ATM OAM connection maximum to 1600:

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

Configure the Interface-Level OAM

Configuration commands for the LightStream 1010 OAM at the interface configuration level are listed below.

Task	Command
At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Select the interface to be configured.	**interface atm** *card/sub_card/port* [.*vpt #*]
Configure interface OAM AIS, RDI and Loopback operation.	**atm oam** [**segment-loopback**] [**end-to-end-loopback**] [**ais**] [**rdi]**
Configure OAM loopback transmit timer.	**atm oam loopback-timer** *tx-timer-value*

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.

Example

The following example enables OAM AIS 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

Switch(config-if)#
```

Enable or disable OAM AIS, RDI and Loopback operation respective to a specified interface.

The following example enables interface 3/0/0, VPI=50, VCI=100 to allow OAM AIS at end and loopback:

```
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 not enabled

% OAM: Connection level ais is not enabled

Switch(config-if)
```

Enable or disable OAM AIS, RDI and Loopback operation respective to a specified connection.

Note You can use only virtual path identifier (VPI) values to turn on 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/sub-card/port*.

Example

The following example disables OAM AIS flows at interface 3/0/0:

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

Switch(config-if)#
```

Use the atm ping Command

To check ATM connection reachability and network connectivity, use the **atm ping** command in either **privilege** or **user level**. You can use either an IP address or an ATM address prefix as a ping destination. You can also ping a neighbor switch by selecting the segment loopback option. In privilege extended command mode, you can select various other parameters such as repeat count and timeout values.

Task	Command
At the privileged EXEC prompt, enter configuration mode from the terminal.	**configure**[1] [**terminal**]
Select the interface to be configured.	**interface atm** *card/sub_card/port* [.*vpt #*]
Use to check the connection.	**ping atm interface atm** *card/sub-card/port vpi vci* [**atm-prefix** *prefix*] | [**end-loopback**] | [**ip-address** *address*] | [**seg-loopback**]}

1. This command is documented in the *LightStream 1010 ATM Switch Command Reference* publication.

Example

The following examples ping an ATM virtual channel connection (VCC) with a segment loopback signal in both normal and extended mode:

Normal Command Mode

```
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 neighbour, timeout is 5 seconds:
.....
Success rate is 0 percent (0/5)
Switch#
```

Extended Command Mode

```
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)
Switch#
```

Note If you skip both destination IP address and the ATM prefix fields then extended PING will consider its neighbor switch as its destination and will use a segment loopback OAM cell. In IP address or ATM prefix case, PING will always use an end-to-end OAM loopback cell.

Use show running-config to Display OAM Configuration

To display the OAM configuration, use the **write terminal** command.

Task	Command
Display the OAM configuration using the **show running-config** command.	**show running-config**

Example

The following **show running-config** command example displays the OAM configuration:

```
Switch#show running-config
Building configuration...

Current configuration:
!
version 11.1
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
 atm oam 99
!
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
!
interface ATM0/0/1
 no keepalive
 --More--

<Infromation Deleted>

interface ATM1/1/3
 loopback diagnostic
 no keepalive
 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 ATM2/0/0
 mtu 1500
 ip address 10.0.0.2 255.0.0.0
 no ip route-cache
 no keepalive
 atm maxvp-number 0
 atm pvc 0 200  encap aal5snap
 lane client ethernet mis
 lane client-atm-address ...0800200C1001**
 lane pvc 100 55.00550055005500550055.00000C0425C2.00
!
interface Ethernet2/0/0
 ip address 172.20.40.93 255.255.255.0
 no ip route-cache
!
interface Ethernet2/0/0.100
 no ip route-cache
!
ip default-gateway 172.20.40.201
no ip classless
!
map-list atm
!
map-list atm_1
!
map-list atm-1
 ip 10.0.0.2 atm-vc 200 broadcast
!
map-list yyy
```

```
 ip 1.1.1.1 atm-vc 200
 ip 1.1.1.2 atm-vc 200
!
map-list zzz
!
map-list atm1
!
map-class atm atm-class
atm route default ATM0/0/0
atm route 47.0091.8100.5670.ca7c.e01... ATM2/0/0
atm route 47.0091.8100.0000.0000.0ca7.ce01... ATM0/0/0
!
line con 0
 exec-timeout 0 0
 vacant-message ^C hello ^C
line aux 0
 transport input all
line vty 0 4
 login
!
end

Switch#
```