OAM on ATM Interfaces FAQs

Document ID: 9202

Contents

Introduction

This document addresses frequently asked questions about operations, administration, and maintenance (OAM) cells for ATM interfaces.

Q. Where can I learn more about OAM?

> **A.** The International Telecommunications Union (ITU−T) defines OAM in specification number ITU−T I.610 .

Q. What is the format of an OAM cell?

> **A.** OAM cells follow a format defined in the I.610 specification.

Header	Cell Type	Func Type	Func Field	Rsvd	CRC-10

The following table describes these fields.

Field	Length	Description
Header	5 bytes	Defined in ITU–T standard I.361. F5 flows use two predefined payload type identifier (PTI) values in the cell header, while F4 flows use two predefined VCI values.
Cell type	4 bits	Indicates a cell's management function, such as fault management, performance management, or activation/deactivation.
Function type	4 bits	Indicates the actual function performed by this cell within the management type indicated by the OAM cell type field. For example, alarm indication signal (AIS) and remote defect indication (RDI) cells are two function types within the fault management cell type.
Function specific field	45 bytes	Provides the body of the message.
Rsvd	6 bits	Reserved for future use.
CRC–10	10 bits	Detects errors on all bits other than the CRC field itself.

Depending on the cell type and function type, OAM cells follow a unique format in the body of the cell. Loopback cells use the following format.

Loopback Ind	Correlation Tag	Loopback Location ID	Source ID	Unused

The following table describes the content of these fields.

Field	Description
Loopback Location Indication	The first bit of this 8–bit field is set to 0 or 1 depending on the direction. A command cell downstream is set to 1, and the destination device returns a response cell and changes this bit to 0.

Correlation Tag	Matches outgoing command cells with associated incoming response cells.
Loopback Location ID	For inbound command cells, the loopback location ID field identifies the VC segment where the loopback is to occur. ♦ All 1s – Represents the endpoint. ♦ All 0s – Applies only to segment loopback cells. ♦ 0x6A – "No loopback shall be performed." ♦ All other values – Indicates the specific location where the loopback is to occur.
Source ID	(Optional) Identifies the source of a loopback cell.

Use the **debug atm oam–pkt** command on a Cisco ATM switch router to capture a protocol decode of OAM cells. The following output captures F5 end–to–end and segment loopback cells on the well–known QSAAL and ILMI VCs.

```
21:00:42: % Intf: 0/0/1 VPI: 0 VCI: 5 OAM: F5-END-LPBK
      21:00:42: A0 00 00 05 00
      21:00:42: 18 01 00 00 00 1F FF FF FF FF FF FF
      21:00:42: FF FF FF FF FF FF FF FF FF FF FF FF
      21:00:42: FF FF FF FF FF FF FF FF FF FF FF FF
      21:00:42: FF FF 6A 6A 6A 6A 6A 6A 6A 6A 00 00
      21:00:42: % OAM Pkt Sent
      21:00:42: % Intf: 0/0/1 VPI: 0 VCI: 16 OAM: F5-END-LPBK
      21:00:42: A0 00 00 10 00
      21:00:42: 18 01 00 00 00 1F FF FF FF FF FF FF
      21:00:42: FF FF FF FF FF FF FF FF FF FF FF FF
      21:00:42: FF FF FF FF FF FF FF FF FF FF FF FF
      21:00:42: FF FF 6A 6A 6A 6A 6A 6A 6A 6A 00 00
      21:00:42: % OAM Pkt Sent
      21:00:42: % Intf: 0/0/0 VPI: 0 VCI: 5 OAM: F5-SEG-LPBK
      21:00:42: 80 00 00 05 00
      21:00:42: 18 01 00 00 00 0A FF FF FF FF FF FF
      21:00:42: FF FF FF FF FF FF FF FF FF FF FF FF
      21:00:42: FF FF FF FF FF FF FF FF FF FF FF FF
      21:00:42: FF FF 6A 6A 6A 6A 6A 6A 6A 6A 00 00
      21:00:42: % OAM Pkt Sent
      21:00:42: % Intf: 0/0/0 VPI: 0 VCI: 5 OAM: F5-END-LPBK
      21:00:42: A0 00 00 05 00
      21:00:42: 18 01 00 00 00 1F FF FF FF FF FF FF
      21:00:42: FF FF FF FF FF FF FF FF FF FF FF FF
      21:00:42: FF FF FF FF FF FF FF FF FF FF FF FF
      21:00:42: FF FF 6A 6A 6A 6A 6A 6A 6A 6A 00 00
```

The ITU–T has published more than one version of the OAM specification. These versions, which include a 1993 version and a 1999 update, differ in the length of the loopback location ID, source ID, and fill area fields. In rare cases, devices using different formats will experience interoperability issues.

1993 Version Length of Field	1999 Update Length of Field

Correlation Tag	4	4
Loopback Location ID	12	16
Source ID	12	16
Fill Area	16	–
Unused	–	8
Reserved / CRC	–	16

Cisco routers implement the 1993 format. Catalyst 8540s use the 1999 version and loop received cells using the 1993 format. Cisco bug ID CSCds68007 (registered customers only) implemented an option on Cisco routers to initiate OAM cells in the 1999 format.

Q. How do I configure oam pvc management?

A. To configure OAM PVC management, you only need to add the command "oam−pvc manage" underneath the pvc configuration in the new pvc style configuration. This is available on Cisco IOS release 12.0 and later. For more detail configuration please read Using OAM for PVC Management.

Q. I have oam−pvc managed configured with older code. After upgrading the Cisco IOS to 12.0 many of the PVCs are down because of oam failures. Why does this happens?

A. In earlier Cisco IOS® software versions, OAM management could be configured but would not take the PVC and interface down in the event of a failure. So, it did not work properly. In Cisco IOS 12.0 and later the PVC will go down if there is a oam failure. This is the expected behavior.

Q. In addition to the show atm pvc command, what other show commands display the number of OAM cells received and the number of OAM cell drops?

A. The router counts OAM, AIS, and RDI cells in the following two input packet counters.

- **show atm interface atm** – See the "input" counter, which logs non−fast−switched input packets.

```
7200-1.3#show atm interface atm 6/0
Interface ATM6/0:
AAL enabled:  AAL5 , Maximum VCs: 4096, Current VCCs: 16
Maximum Transmit Channels: 0
Max. Datagram Size: 4528
PLIM Type: DS3 – 45000Kbps, Framing is C-bit PLCP,
DS3 lbo: short, TX clocking: LINE
Cell-payload scrambling: OFF
0 input, 0 output, 0 IN fast, 0 OUT fast, 0 out drop
Bandwidth distribution :  PVP: 45000VBR-NRT : 6400
Link oversubscribed by 6400 kbps
Config. is ACTIVE
```

- **show atm traffic** – See the "Input packets" counter.

```
7200#show atm traffic
```

```
0 Input packets
0 Output packets
0 Broadcast packets
0 Packets received on non-existent VC
0 Packets attempted to send on non-existent VC
0 OAM cells received
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
0 OAM cells sent
F5 OutEndloop: 0, F5 OutSegloop: 0,     F5 OutRDI: 0
F4 OutEndloop: 0, F4 OutSegloop: 0,     F4 OutRDI: 0
0 OAM cell drops
```

Q. The output of show atm pvc displays the OAM segment loopback counter. Do Cisco ATM router interfaces send segment OAM loopback cells?

A. Yes, but only when they receive a segment OAM loopback cell and then need to transmit a response.

```
Router# show atm pvc 0/99
ATM 2/0.2: VCD 102, VPI: 0, VCI: 60
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x1
OAM frequency: 3 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Sent
OAM VC state: Not Verified
ILMI VC state: Not Managed
VC is managed by OAM
InARP frequency: 15 minute(s)
InPkts: 1, OutPkts: 1, InBytes: 32, OutBytes: 32
InPRoc: 1, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast:0, InAS: 0, OutAS: 0
OAM cells received: 14
F5 InEndloop: 14, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
OAM cells sent: 25
F5 OutEndloop: 25, F5 OutSegloop: 0, F5 OutRDI: 0
OAM cell drops: 0
PVC Discovery: NOT_VERIFIED
Status: DOWN, State: NOT_VERIFIED
```

Q. Are OAM cells counted by the shaper on a PA−A3?

A. No. The shaper counts data cells and not OAM cells. ATM switches typically count both OAM cells and data cells in the peak cell rate (PCR) at which they apply policing and usage parameter control (UPC).

Note that the OAM recommendation specifies that no more than one OAM loopback cell be generated per second. (Note too that section 3.6.3.2.3.7 of the User to Network Interface (UNI) specification states that the PCR policed by the ATM switch must include the OAM cells.) One OAM cell per second equates to 424 bps; multiply this value by two if both ends transmit OAM cells to get an upper bound of about 1 kbps. To help ensure that the ATM switch does not declare any cells to be non−compliant, particularly when the switch applies a tight cell delay variation tolerance (CDVT) value, reduce the PCR and SCR values configured on the ATM router interface by 1 kbps.

Q. If an ATM PVC is congested, will OAM cells be dropped?

A. The PA−A3 ATM port adapter for the 7x00 series always assigns the highest priority to OAM cells. Thus, the scheduler always grants any cell timeslot to an OAM cell over a data cell, and OAM cells should not be affected by congestion. The 4xOC3 ATM line card for the GSR implements a similar priority scheme as of Cisco IOS software release 12.0(13)S1.

Q. What versions of Cisco IOS® support OAM management?

A. OAM and PVC management are supported since Cisco IOS Software Release 11.1(22)CC and in Cisco IOS Software Release 12.0 and later. In previous versions of Cisco IOS, only OAM cell handling was enabled. By cell handling, we mean that the router generated F5 OAM loopback cells, but would not bring down the VC if it didn't receive a configured number of adjacent loopback response cells.

Q. Do Catalyst 5000 and 6000 ATM modules support OAM PVC management?

A. No. These modules support only the old−style **atm pvc** command. This command supports setting the interval between OAM loopback cells.

Q. I executed the "no" form of the "oam−pvc manage" command and now I see "oam−pvc manage 0" in my configuration. Is there a problem?

A. No. This output is the expected output.

Q. Is OAM management available on switched virtual circuits (SVCs)?

A. Yes, as of Cisco IOS Software Release 12.2, with the **oam−svc manage** command. Please see the configuration guides for a detailed explanation. Normally, SVCs are torn down if there is a problem in the end−to−end path.

Q. Do Cisco router interfaces support OAM ping?

A. Yes. This feature was introduced in Cisco IOS Software Release 12.2T (Cisco bug ID CSCdt24476 (registered customers only)) for a select number of platforms. Use the following command.

```
ping atm <atm interface> <vpi> <vci> {seg-loopback | end-loopback}
 [<repeat>] [<timeout>]
```

Q. How do I enable OAM on ATM switch routers like the Catalyst 8500 series and the LS1010?

A. The **atm oam** global configuration command enables OAM for all VCs.

```
switch#show atm vc interface atm 0/0/1 7 187

        Interface: ATM0/0/1, Type: oc3suni
        VPI = 7  VCI = 187
        Status: UP
        Time-since-last-status-change: 00:07:49
        Connection-type: PVC
```

```
                    Cast-type: point-to-point
                    Packet-discard-option: disabled
                    Usage-Parameter-Control (UPC): pass
                    Wrr weight: 2
                    Number of OAM-configured connections: 19
                    OAM-configuration: Seg-loopback-on End-to-end-loopback-on Ais-on Rdi-on
                    OAM-states:  OAM-Up
```

!--- Ensure the state is OAM-UP.

```
                    OAM-Loopback-Tx-Interval: 5
                    Cross-connect-interface: ATM-P1/1/0, Type: ATM-PSEUDO
                    Cross-connect-VPI = 1
                    Cross-connect-VCI = 219
                    Cross-connect-UPC: pass
                    Cross-connect OAM-configuration: Seg-loopback-on Ais-on
                    Cross-connect OAM-state:  OAM-Up Segment-loopback-failed
                    OAM-Loopback-Tx-Interval: 5
                    Threshold Group: 3, Cells queued: 0
                    Rx cells: 8, Tx cells: 155
                    Tx Clp0:143,  Tx Clp1: 12
                    Rx Clp0:8,  Rx Clp1: 0
                    Rx Upc Violations:0, Rx cell drops:0
                    Rx Clp0 q full drops:0, Rx Clp1 qthresh drops:0
                    Rx connection-traffic-table-index: 703
                    Rx service-category: VBR-NRT (Non-Realtime Variable Bit Rate)
                    Rx pcr-clp01: 2605
                    Rx scr-clp0 : 2605
                    Rx mcr-clp01: none
                    Rx      cdvt: 1024 (from default for interface)
                    Rx       mbs: 50
                    Tx connection-traffic-table-index: 703
                    Tx service-category: VBR-NRT (Non-Realtime Variable Bit Rate)
                    Tx pcr-clp01: 2605
                    Tx scr-clp0 : 2605
                    Tx mcr-clp01: none
                    Tx      cdvt: none
                    Tx       mbs: 50
```

Q. Does a Cisco ATM edge device like a router send an RDI cell on the transmit line when it detects loss of signal at the receive line?

A. Cisco bug ID CSCdm37634 (registered customers only) implements a hidden command only on the PA−A3 port adapter to enable generation of an AIS alarm on the transmit line when loss of signal is detected on the receive line. This command implements a workaround for interoperability with third−party switches that do not generate F4/F5 OAM AIS cells when F3 RDI is received.

Q. My customer needed to configure the no atm oam intercept command to pass encrypted traffic. Why might that be?

A. Some encryptors use OAM cells to pass information between them, so the cells must be passed end−to−end. Without the command, a Cisco ATM campus switch such as an LS1010 redirects OAM loopback cells to the CPU for processing. This command is not relevant for the 8540 MSR since end−to−end loopback cells always will pass unchanged through the switch on transit connections.

Q. If I seem to be experiencing a problem with OAM, what show commands are recommended for troubleshooting?

A. Cisco ATM campus switches support two **debug** commands.

- ♦ **debug atm oam–all** – Uses generic OAM cells.
- ♦ **debug atm oam–pkt** – Uses OAM packets.

Please refer to Troubleshooting Switch Router ATM Interface Connections for a detailed explanation. Please also refer to Troubleshooting PVC Failures When Using OAM Cells and PVC Management.

Q. What are some of the known issues related to OAM?

A. The following table lists Cisco bug IDs related to OAM issues.

Cisco Bug ID	Release Notes
CSCdt03498 (registered customers only)	Outbound OAM loopback response uses wrong correlation tag. The output of **debug atm oam** on a 7x00 ATM interface shows the router responding to an OAM loopback command cell with its own CTAG value in the loopback response rather than echoing back the value in the received command cell. The problem is in the debug output only. The correct value is returned in the actual cells. This same problem was seen while troubleshooting Cisco bug IDs CSCdt41215 (registered customers only) and CSCdt03498 (registered customers only) . The fix is integrated in Cisco IOS Software Releases 12.2(0.18)S, 12.1(7)EC, 12.2(1)PI, 12.2(1), 12.2(1)T, and 12.1(7)A.

CSCdp01411 (registered customers only)	OAM loopback cells are not being responded to. When OAM loopback cells pass through an ATM network with Cisco Stratacom WAN switches, an AUSM IMA card that receives a correlation tag with the third byte set to 1 (in other words, value > 65535) forwards a response cell to the ATM cloud. The receiving router, expecting a command cell, drops the response cell, causing OAM PVC management to bring down the connection. Below is the topology in which this condition may occur.
	
	`Router A --  AUSM A --  ATM Cloud -- AUSM B -- Router B`
	`  Command cell -->`
	`                    |`
	`                    +-- Response cell -----------> Drops cell`
	
	Also see CSCds68007 (registered customers only) .

CSCds68007 (registered customers only)	Incorrect Source ID field in OAM F5 loopback cells (R). Cisco router ATM interfaces may experience interoperability issues with third–party ATM switches that use the format from a different version of the OAM standard. Specifically, this bug resolves a problem with the value of the source ID field in OAM loopback cells and is integrated in the following Cisco IOS software releases. ♦ Cisco IOS Software Release 12.2(1) ♦ Cisco IOS Software Release 12.2(1)T ♦ Cisco IOS Software Release 12.1(7) ♦ Cisco IOS Software Release 12.2(0.7)PI1 ♦ Cisco IOS Software Release 12.1(6.5)EC

	♦ Cisco IOS Software Release 12.2(0.18)S
CSCdr92682 (registered customers only)	OAM−pvc manage breaks the VC assignment in the controller. A router creates PVC data structures in memory when initializing the main interface. When a subinterface is up and a PVC becomes active, the OAM loopback process starts. Since the main interface is not yet up, the OAM cells cannot possibly be transmitted, and the subinterface comes down when the router reaches the configured number of missed OAM loopback cells to declare a PVC as down. As a workaround, remove the **oam−pvc manage** command or use the **oam retry** command to increase the number of back−to−back loopback cells that the ATM interface sends before declaring the VC down.

Related Information

- **Using OAM for PVC Management**
- **ATM Technology Support Pages**
- **More ATM Information**
- **Technical Support − Cisco Systems**

Updated: Dec 18, 2007   Document ID: 9202