



OAM Segment Endpoint

The OAM Segment Endpoint feature terminates segment Operation, Administration and Maintenance (OAM) cells arriving on the Layer 2 transport virtual circuit (VC). The OAM Segment Endpoint feature helps in checking the segment connectivity. This feature can be used with Any Transport over MPLS (AToM) and Layer 2 Tunnel Protocol Version 3 (L2TPv3).

Feature History for the OAM Segment Endpoint Feature

Release	Modification
12.0(30)S	This feature was introduced.

Finding Support Information for Platforms and Cisco IOS Software Images

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.

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Prerequisites for OAM Segment Endpoint

This feature can be enabled under Layer 2 transport permanent virtual circuit (PVC) submode and virtual circuit (VC) class configuration mode.

Restrictions for OAM Segment Endpoint

The following restrictions apply to the OAM Segment Endpoint feature:

- The OAM attachment circuit (AC) segment endpoint configuration is applicable only in the case of Layer 2 transport virtual circuits (VCs)/virtual paths (VPs).
- In Cisco 7200 routers, by default the segment cells for VPs are handled in the provider edge (PE) and are not transported on the pseudowire transparently.
- In Cisco 12000 series Internet routers, the segment OAM cells in VCs with encapsulation ATM adaptation layer 5 (AAL5) are handled in the PE and are not transported on the pseudowire transparently.
- If OAM cell emulation is configured, OAM segment endpoint is redundant.

Information About OAM Segment Endpoint

To configure the OAM Segment Endpoint feature, you should understand the following concept:

- [VP/VC Segment Endpoint, page 2](#)

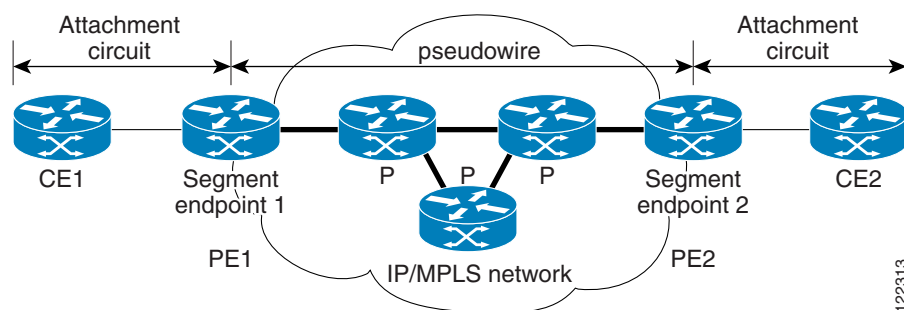
VP/VC Segment Endpoint

The Cisco 12000 series Internet router or Cisco 7200 router responds to the incoming segment cells, if the OAM Segment Endpoint feature is configured; otherwise they are transferred on the pseudowire.

Irrespective of whether is feature is enabled or not, End OAM cells for both VPs and VCs are transferred on the pseudowire. To terminate End OAM cells, you need to enable oam-emulation.

[Figure 1](#) shows ATM transport over MPLS.

Figure 1 ATM Transport over MPLS



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How to Configure OAM Segment Endpoint

See the following sections for tasks that use the **oam-ac segment endpoint** command to terminate the segment OAM cells on a VC:

- [Configuring OAM Segment Endpoint, page 3](#) (required)
- [Verifying OAM Segment Endpoint, page 4](#) (optional)

Configuring OAM Segment Endpoint

This feature coexists with OAM emulation for Layer 2 VCs. If OAM emulation is already enabled, segment endpoint configuration is redundant. On the Cisco 12000 series router, F4/F5 distributed Operations, Administration and Maintenance (dOAM) is enabled by default.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface atm** *slot/port.subinterface-number*
4. **pvc** *vpi/vci l2transport*
5. **oam-ac segment endpoint**
6. **encapsulation aal5**
7. **xconnect** *peer-router-id vcid encapsulation mpls*

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface atm <i>slot/port.subinterface-number</i> Example: Router(config)# interface atm1/1	Enters ATM interface mode.
Step 4	pvc <i>vpi/vci l2transport</i> Example: Router(config)-if)# pvc 0/100 l2transport	Creates an ATM PVC and enters Layer 2 transport ATM virtual circuit configuration submode.

	Command or Action	Purpose
Step 5	oam-ac segment endpoint Example: Router(config-if-atm-l2trans-pvc)# oam-ac segment endpoint	Terminates segment cells arriving on the Layer 2 transport VC.
Step 6	encapsulation aal5 Example: Router(config-if-atm-l2trans-pvc)# encapsulation aal5	Specifies ATM AAL5 encapsulation for the PVC. <ul style="list-style-type: none"> Make sure you specify the same encapsulation type on the PE and CE routers.
Step 7	xconnect peer-router-id vcid encapsulation mpls Example: Router(config-if-atm-l2trans-pvc)# xconnect 13.13.13.13 100 encapsulation mpls	Binds the attachment circuit to a pseudowire VC.

Verifying OAM Segment Endpoint

To verify that the OAM Segment Endpoint feature is working correctly, use the following steps to monitor the segment cells (arriving on the Layer 2 transport VC) that are being terminated on ATM links in a network.

SUMMARY STEPS

- enable
- attach *slot-number*
- enable
- show atm pvc [*vpi/vci* | **name** | **interface atm** *interface-number*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	attach slot-number Example: Router# attach 1	Connects to the line card in slot 1.

	Command or Action	Purpose
Step 3	enable Example: Lc-Slot1> enable	Enables privileged EXEC mode in the line card. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 4	show atm pvc [<i>vpi/vci</i> <i>name</i> interface atm <i>interface-number</i>] Example: Router# show atm pvc 0/100	Displays all ATM PVCs and traffic information.

Configuration Examples for OAM Segment Endpoint

This section contains the following configuration and verification examples:

- [OAM Segment Endpoint Configuration: Example, page 5](#)
- [Verification Examples, page 6](#)

OAM Segment Endpoint Configuration: Example

VC Layer 2 Transport

```
Router(config)# interface atm1/1
Router(config-if)# pvc 0/100 l2transport
Router(cfg-if-atm-l2trans-pvc)# oam-ac segment endpoint
Router(cfg-if-atm-l2trans-pvc)# end
```

VP Layer 2 Transport

```
Router(config)# interface atm1/1
Router(config-if)# atm pvp 40 l2transport
Router(cfg-if-atm-l2trans-pvp)# oam-ac segment endpoint
Router(cfg-if-atm-l2trans-pvp)# end
```

VC-Class Configuration

```
Router(config)# vc-class atm test
Router(config-vc-class)# oam-ac segment endpoint
Router(config-vc-class)# end
```

The following is sample output for the **show running-config interface** command:

```
Router# show running-config interface atm1/1
```

```
Building configuration...
```

```
Current configuration : 177 bytes
!
interface ATM1/1
 no ip address
 no ip directed-broadcast
 atm pvp 40 l2transport
 oam-ac segment endpoint
```

```

no atm enable-ilmi-trap
no atm ilmi-keepalive
pvc 0/100 l2transport
    oam-ac segment endpoint
end

Router# show running-config
Building configuration...

Current configuration : 4251 bytes
!

vc-class atm test
    oam-ac segment endpoint
    oam-pvc manage
!
```

Verification Examples

The following is sample output from the **show atm pvc** command. It provides the segment OAM cell configuration and status information.

```

Router# show atm pvc 0/100

AVC 0/100 doesn't exist on interface ATM1/0 - cannot display
ATM1/1: VCD: 47, VPI: 0, VCI: 100
UBR, PeakRate: N/A (UBR VC)
AAL5 L2transport, etype:0xF, Flags: 0x10000C2E, VCmode: 0x0
OAM Cell Emulation: not configured
OAM Segment Endpoint: enabled ! The OAM Segment Endpoint feature is enabled here.
Interworking Method: Not Configured
Remote Circuit Status = No Alarm, Alarm Type = None
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InProc: 0, OutProc: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
Out CLP=1 Pkts: 0
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0,
F5 InEndcc: 0, F5 InSegcc: 0, F5 InAIS: 0, F5 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0,
F5 OutEndcc: 0, F5 OutSegcc: 0, F5 OutAIS: 0, F5 OutRDI: 0
OAM cell drops: 0
Status: UP

Router# show atm pvc 40/3

ATM1/1: VCD: 48, VPI: 40, VCI: 3
UBR, PeakRate: N/A (UBR VC)
AAL5-MUX, etype:0x0, Flags: 0xD2C, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 0 second(s) OAM up retry count: 0, OAM
down retry count: 0 OAM Segment Endpoint: enabled OAM END CC Activate retry count: 0, OAM
END CC Deactivate retry count: 0 OAM END CC retry frequency: 0 second(s), OAM SEGMENT CC
Activate retry count: 0, OAM SEGMENT CC Deactivate retry
count: 0
OAM SEGMENT CC retry frequency: 0 second(s),
OAM Loopback status: OAM Disabled
OAM VC state: Not Managed
ILMI VC state: Not Managed
OAM END CC status: OAM CC Ready
OAM END CC VC state: Not Managed
OAM SEGMENT CC status: OAM CC Ready
```

```
OAM SEGMENT CC VC state: Not Managed
InARP DISABLED
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InProc: 0, OutProc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
Out CLP=1 Pkts: 0
OAM cells received: 0
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
OAM cells sent: 0
F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OutAIS: 0, F4 OutRDI: 0 OAM cell drops: 0
Status: UP
```

Additional References

The following sections provide references related to the OAM Segment Endpoint feature.

Related Documents

Related Topic	Document Title
Detecting failures when using OAM cells and PVC management	Troubleshooting PVC Failures When Using OAM Cells and PVC Management , ATM Technical Support, Cisco IOS Release 12.1
WAN configuration	Cisco IOS Wide-Area Networking Configuration Guide , Cisco IOS Release 12.2
Any Transport over MPLS	Any Transport over MPLS , Cisco IOS Release 12.0(28)S
Any Transport over MPLS Overview	Any Transport over MPLS Overview , Cisco IOS Release 12.0(30)S
Layer 2 Tunnel Protocol Version 3	Layer 2 Tunnel Protocol Version 3 , Cisco IOS Release 12.0(30)S

Standards

Standards ¹	Title
IETF Specification	Encapsulation Methods for Transport of Layer 2 Frames over MPLS
IETF Specification	Layer Two Tunneling Protocol (Version 3)
IETF Specification	Transport of Layer 2 Frames over MPLS
ITU-T Specification I.610 (ITU-T specification for B-ISDN operation and maintenance principles and functions)	I.610 Series I: B-ISDN Operation and Maintenance Principles and Functions

1. Not all supported standards are listed.

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has 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
RFC 2661	Layer Two Tunneling Protocol "L2TP"
RFC 3032	MPLS Label Stack Encoding

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 a new command.

New Command

- [oam-ac segment endpoint](#)

oam-ac segment endpoint

To terminate segment Operation Administration Maintenance (OAM) cells on the virtual circuit (VC), use the **oam-ac segment endpoint** command in ATM VC configuration mode or VC-class configuration mode. To disable this functionality, use the **no** form of this command.

oam-ac segment endpoint

no oam-ac segment endpoint

Syntax Description This command has no arguments or keywords.

Defaults All OAM cells are transparently switched on to the pseudowire, if this command is not enabled.

Command Modes L2 transport VC mode (for ATM VCs)
L2 transport VP mode (for ATM VPs)
VC-class configuration mode (for VC-class configuration)

Command History	Release	Modification
	12.0(30)S	This command was introduced.

Usage Guidelines The segment OAM cells arriving on a VC are terminated in the Layer 2 transport circuits. This is done by using the **oam-ac segment endpoint** command in ATM VC configuration mode.

Examples The following examples show how segment OAM cells are monitored to detect failures on the provider's edge in the ATM VC mode.

VC Layer 2 Transport

```
Router(config)# interface atm1/1
Router(config-if)# pvc 0/100 l2transport
Router(cfg-if-atm-l2trans-pvc)# oam-ac segment endpoint
Router(cfg-if-atm-l2trans-pvc)# end
```

VP Layer 2 Transport

```
Router(config)# interface atm1/1
Router(config-if)# atm pvp 40 l2transport
Router(cfg-if-atm-l2trans-pvp)# oam-ac segment endpoint
Router(cfg-if-atm-l2trans-pvp)# end
```

VC-Class Configuration

```
Router(config)# vc-class atm test
Router(config-vc-class)# oam-ac segment endpoint
Router(config-vc-class)# end
```

Related Commands

Command	Description
atm oam distributed	Distributes the OAM processing to the line cards.
debug atm event	Displays debugging information about OAM events.
debug atm oam	Displays debugging output for ATM OAM distributed processes.
debug atm packet	Displays debugging information about OAM cell contents.
debug atm xdr	Displays debugging information about the transfer of OAM configuration information from the RP to the line card and OAM status change notification from the line card to the RP.
show atm oam	Displays the OAM status information in the line card.
show atm pvc	Displays all ATM PVCs and traffic information.
show atm vc summary	Displays the number of VCs in different OAM VC states on a particular interface.

Glossary

customer edge (CE) router—A router that belongs to a customer network, which connects to a provider edge (PE) router to utilize Multiprotocol Label Switching (MPLS) Virtual Private Network (VPN) network services.

provider edge (PE) router—Entry point into the service provider network. The PE router is typically deployed on the edge of the network and is administered by the service provider. The PE router is the redistribution point between Enhanced Interior Gateway Routing Protocol (EIGRP) and Border Gateway Protocol (BGP) in PE to CE networking.

pseudowire (PW)—A mechanism that carries the elements of an emulated service from one provider edge (PE) to one or more PEs over a packet-switched network (PSN).

VPN—virtual private network. Allows IP traffic to travel securely over public TCP/IP networks and the Internet by encapsulating and encrypting all IP packets. VPN uses a tunnel to encrypt all information at the IP level.



Note

Refer to [Internetworking Terms and Acronyms](#) for terms not included in this glossary.

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