ATM OAM Support for F5 Continuity Check

Feature History

Release	Modification
12.2(13)T	This feature was introduced.
12.0(24)S	This feature was integrated into Cisco IOS Release 12.0(24)S.

This document describes the ATM OAM Support for F5 Continuity Check feature in Cisco IOS Release 12.0(24)S. It includes the following sections:

Feature Overview

The ATM OAM Support for F5 Continuity Check feature introduces Operation, Administration, and Maintenance (OAM) support for the use of F5 segment and end-to-end continuity check (CC) cells to detect connectivity failures at the ATM layer. This feature also introduces new Simple Network Management Protocol (SNMP) notifications that are generated when CC cells indicate virtual circuit (VC) connectivity failure.

ATM OAM F5 CC cells provide an in-service tool optimized to detect connectivity problems at the VC level of the ATM layer. CC cells are sent between a router designated as the source location and a router designated as the sink location. The local router can be configured as the source, as the sink, or as both the source and the sink.

This feature implements two types of OAM cells: CC cells for fault management and CC cells for activation and deactivation. Fault management cells detect connectivity failures. Activation and deactivation cells initiate the activation or deactivation of continuity checking.

SNMP Support for ATM OAM F5 Continuity Checking

The ATM OAM Support for F5 Continuity Check feature introduces three new SNMP notifications that indicate CC segment, CC end-to-end, and alarm indication signal/remote defect indication (AIS/RDI) failures to the network management system (NMS). The notifications include information such as the number of OAM failures that occurred and time stamps showing when the first and last failures occurred during the notification interval for permanent virtual circuits (PVCs). In addition to notifications, MIB tables are maintained to provide information about the failures on PVCs.

For a complete description of the extended ATM PVC MIB, including the supported notifications and tables, see the MIB file called CISCO-ATM-PVCTRAP-EXTN-MIB.my, available through Cisco.com at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

Benefits

The ATM OAM Support for F5 Continuity Check feature enables network administrators to detect connectivity failures on a per-PVC basis. The feature also provides support for SNMP notifications that notify the administrator that continuity for a particular PVC has been lost while the PVC is still operationally up.

Restrictions

Cisco digital subscriber line access multiplexers (DSLAMs) and ATM switches (such as the Cisco LS1010) do not forward F5 OAM segment CC cells.

The ATM OAM Support for F5 Continuity Check feature is supported on ATM PVCs only.

Related Documents

For more information on configuring OAM and ATM PVC trap support, refer to the following documents:

- The “Configuring ATM” chapter of the *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.0
- The “ATM Commands” chapter of the *Cisco IOS Wide-Area Networking Command Reference*, Release 12.0

For information on configuring SNMP, refer to the following documents:

- The “Configuring SNMP Support” chapter of the *Cisco IOS Configuration Fundamentals Configuration Guide*, Release 12.0
- The “SNMP Commands” chapter of the *Cisco IOS Configuration Fundamentals Command Reference*, Release 12.0

Supported Platforms

- Cisco 7500 series
- Cisco 12000 series

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

http://www.cisco.com/go/fn

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

The MIB that supports ATM OAM F5 CC management is defined in the file CISCO-ATM-PVCTRAP-EXTN-MIB.my.

The MIB that supports legacy extended ATM PVC traps is defined in the file CISCO-IETF-ATM2-PVCTRAP-MIB.my.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://tools.cisco.com/ITDIT/MIBS/servlet/index

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

RFCs

No new or modified RFCs are supported by this feature.

Prerequisites

Extended ATM PVC and ATM OAM F5 CC traps cannot be used at the same time as the legacy ATM PVC trap. The legacy ATM PVC trap must be disabled by using the **no snmp-server enable traps atm pvc** command before extended ATM PVC traps and ATM OAM F5 CC traps can be configured. If the extended ATM PVC traps or ATM OAM F5 CC traps are enabled, you must disable them by using the **no snmp-server enable traps atm pvc extension** command before you can enable the legacy ATM PVC trap.

Configuration Tasks

See the following sections for configuration tasks for the ATM OAM Support for F5 Continuity Check feature. Each task in the list is identified as either required or optional.

- Configuring ATM OAM F5 CC Support (required)
- Configuring Denial of ATM OAM F5 CC Activation Requests (optional)
- Configuring ATM OAM F5 CC Deactivation Requests to Be Sent upon PVC Failure (optional)
- Configuring SNMP Notification Support for ATM OAM F5 CC Management (required)
- Verifying ATM OAM Support for F5 CC Management (optional)

Configuring ATM OAM F5 CC Support

To configure ATM OAM F5 CC support on an ATM PVC, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface atm number`	Specifies an interface for configuration and enters interface configuration mode.
Step 2	`Router(config-if)# ip address ip-address mask`	Sets a primary or secondary IP address for an interface.

	Command	Purpose
Step 3	`Router(config-if)# pvc [name] vpi/vci`	Creates an ATM PVC and enters ATM virtual circuit configuration mode.
Step 4	`Router(config-if-atm-vc)# oam-pvc manage cc {end | segment} [direction {both | sink | source}] [keep-vc-up [end aisrdi failure | seg aisrdi failure]]`	Configures ATM OAM F5 CC management.
Step 5	`Router(config-if-atm-vc)# oam retry cc {end | segment} [activation-count [deactivation-count [retry-frequency]]]`	Sets the retry count and the frequency at which CC activation and deactivation requests are sent to the device at the other end of the PVC or the segment.

Configuring Denial of ATM OAM F5 CC Activation Requests

To disable ATM OAM F5 CC support on an ATM PVC and to configure the PVC to deny OAM F5 CC activation requests, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface atm number`	Specifies an interface for configuration and enters interface configuration mode.
Step 2	`Router(config-if)# ip address ip-address mask`	Sets a primary or secondary IP address for an interface.
Step 3	`Router(config-if)# pvc [name] vpi/vci`	Creates an ATM PVC and enters ATM virtual circuit configuration mode.
Step 4	`Router(config-if-atm-vc)# oam-pvc manage cc {end | segment} deny`	Disables ATM OAM F5 CC support by configuring the VC to deny CC activation requests.

Configuring ATM OAM F5 CC Deactivation Requests to Be Sent upon PVC Failure

To configure a PVC to send ATM OAM F5 CC deactivation requests when the PVC is already down, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface atm number`	Specifies an interface for configuration and enters interface configuration mode.
Step 2	`Router(config-if)# ip address ip-address mask`	Sets a primary or secondary IP address for an interface.
Step 3	`Router(config-if)# pvc [name] vpi/vci`	Creates an ATM PVC and enters ATM virtual circuit configuration mode.
Step 4	`Router(config-if-atm-vc)# no oam-pvc manage cc {end | segment} [deactivate-down-vc]`	Configures the PVC to send deactivation requests if the PVC is already in down state.

Configuring SNMP Notification Support for ATM OAM F5 CC Management

To enable the MIB and the sending of SNMP notifications that support ATM OAM F5 CC management, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# snmp-server enable traps atm pvc extension mibversion 2`	Specifies the MIB that supports the SNMP notifications for ATM OAM F5 CC management.
Step 2	`Router(config)# snmp-server enable traps atm pvc extension {up | down | oam failure [aisrdi | endCC | loopback | segmentCC]}`	Enables the sending of extended ATM PVC, ATM OAM F5 CC, ATM OAM F5 AIS/RDI, and ATM OAM F5 Loopback SNMP notifications.

Verifying ATM OAM Support for F5 CC Management

To verify the configuration and operation of ATM OAM F5 CC management, perform the following steps:

Step 1 Use the **show running-config** command to verify configuration. The following is sample output for the **show running-config** command:

```
Router# show running-config interface atm0

Building configuration...

Current configuration :152 bytes
!
interface ATM0
 no ip address
 shutdown
 no atm ilmi-keepalive
 pvc 1/40
  oam-pvc manage cc segment direction both
 !
 dsl operating-mode auto
end
```

Step 2 Use the **show atm pvc** command to verify that ATM OAM F5 CC management is enabled and to display the activation and deactivation retry counts and retry frequency values. This command also displays the CC state of the PVC.

The following is sample output for the **show atm pvc** command:

```
Router# show atm pvc 1/40

ATM0:VCD:1, VPI:1, VCI:40
UBR, PeakRate:0
AAL5-LLC/SNAP, etype:0x0, Flags:0xC20, VCmode:0x0
OAM frequency:0 second(s), OAM retry frequency:1 second(s)
OAM up retry count:3, OAM down retry count:5
OAM END CC Activate retry count:3, OAM END CC Deactivate retry count:3
OAM END CC retry frequency:30 second(s),
OAM SEGMENT CC Activate retry count:3, OAM SEGMENT CC Deactivate retry count:3
OAM SEGMENT CC retry frequency:30 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:Verified
OAM SEGMENT CC status:OAM CC Active
OAM SEGMENT CC VC state:Verified
InARP frequency:15 minutes(s)
InPkts:0, OutPkts:0, InBytes:0, OutBytes:0
InPRoc:0, OutPRoc:0, Broadcasts:0
InFast:0, OutFast:0, InAS:0, OutAS:0
Giants:0
OAM cells received:20
F5 InEndloop:0, F5 InSegloop:0,
F5 InEndcc:0, F5 InSegcc:20, F5 InAIS:0, F5 InRDI:0
F4 InEndloop:0, F4 InSegloop:0, F4 InAIS:0, F4 InRDI:0
OAM cells sent:20
F5 OutEndloop:0, F5 OutSegloop:0,
F5 OutEndcc:0, F5 OutSegcc:20, F5 OutRDI:0
F4 OutEndloop:0, F4 OutSegloop:0, F4 OutRDI:0
OAM cell drops:1
Status:UP
```

Monitoring and Maintaining ATM OAM F5 CC Management

To monitor and maintain ATM OAM F5 continuity checking, use the following command in privileged EXEC mode:

Command	Purpose
`Router# debug atm oam cc`	Displays ATM OAM F5 continuity checking activity.

Configuration Examples

This section provides the following configuration examples:

- ATM OAM F5 CC Support on a PVC Configuration Example
- Denial of ATM OAM F5 CC Activation Requests Configuration Example
- Deactivation of ATM OAM F5 CC upon PVC Failure Example
- Support for ATM OAM F5 CC SNMP Notifications Configuration Example

ATM OAM F5 CC Support on a PVC Configuration Example

The following example shows how to configure ATM OAM CC support over the segment and configure the router to function as the source. The frequency at which CC activation and deactivation requests will be sent over the segment is also configured.

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  oam-pvc manage cc segment direction source
  oam retry cc segment 10 10 30
```

Denial of ATM OAM F5 CC Activation Requests Configuration Example

The following example shows how to disable ATM OAM F5 CC support and configure the VC to deny CC activation requests:

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  oam-pvc manage cc segment deny
```

Deactivation of ATM OAM F5 CC upon PVC Failure Example

The following example shows how to send a CC deactivation request across the segment when PVC 0/40 goes down:

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  no oam-pvc manage cc segment deactivate-down-vc
```

Support for ATM OAM F5 CC SNMP Notifications Configuration Example

In the following example, the ATM OAM F5 CC notifications and an extended ATM PVC notification are enabled. If CC cells detect connectivity failures on PVC 0/40, host 172.16.61.90 will receive the SNMP notifications.

```
! Configure SNMP support on your router:
snmp-server community public
snmp-server host 172.16.61.90 public
!
! Enable SNMP notifications:
snmp-server enable traps atm pvc extension mibversion 2
snmp-server enable traps atm pvc extension oam failure aisrdi
snmp-server enable traps atm pvc extension oam failure endcc
snmp-server enable traps atm pvc extension oam failure segmentcc
snmp-server enable traps atm pvc extension oam failure loopback
snmp-server enable traps atm pvc extension up
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command reference publications.

- **debug atm oam cc**
- **oam-pvc manage cc**
- **oam-pvc manage cc deny**
- **oam retry cc**
- **snmp-server enable traps atm pvc extension**
- **snmp-server enable traps atm pvc extension mibversion**

debug atm oam cc

To display ATM operation, administration, and maintenance (OAM) F5 continuity check (CC) management activity, use the **debug atm oam cc** command in privileged EXEC mode. To disable OAM CC debugging, use the **no** form of this command.

debug atm oam cc [**interface atm** *number*]

no debug atm oam cc [**interface atm** *number*]

Syntax Description

interface atm *number*	(Optional) Number of the ATM interface.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(13)T	This command was introduced.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Examples

The following sample output for the **debug atm oam cc** command records activity beginning with the entry of the **oam-pvc manage cc** command and ending with the entry of the **no oam-pvc manage cc** command. The ATM 0 interface is specified, and the "both" segment direction is specified. The output shows an activation request sent and confirmed, a series of CC cells sent by the routers on each end of the segment, and a deactivation request and confirmation.

```
Router# debug atm oam cc interface atm0

Generic ATM:
  ATM OAM CC cells debugging is on
Router#
00:15:05: CC ACTIVATE MSG (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM
Type:8 OAM Func:1 Direction:3 CTag:5
00:15:05: CC ACTIVATE CONFIRM MSG (ATM0) O:VCD#1 VC 1/40 OAM Cell
Type:4 OAM Type:8 OAM Func:1 Direction:3 CTag:5
00:15:06: CC CELL (ATM0) O:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1
00:15:07: CC CELL (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:08: CC CELL (ATM0) O:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:09: CC CELL (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:10: CC CELL (ATM0) O:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:11: CC CELL (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:12: CC CELL (ATM0) O:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:13: CC CELL (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:14: CC CELL (ATM0) O:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:15: CC CELL (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:16: CC CELL (ATM0) O:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:17: CC CELL (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:18: CC CELL (ATM0) O:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
00:15:19: CC CELL (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM Type:1 OAM Func:4
```

```
00:15:19: CC DEACTIVATE MSG (ATM0) I:VCD#1 VC 1/40 OAM Cell Type:4 OAM
Type:8 OAM Func:1 Direction:3 CTag:6
00:15:19: CC DEACTIVATE CONFIRM MSG (ATM0) O:VCD#1 VC 1/40 OAM Cell
Type:4 OAM Type:8 OAM Func:1 Direction:3 CTag:6
```

Table 1 describes the significant fields shown in the display.

Table 1 debug atm oam cc Field Descriptions

Field	Description
00:15:05	Time stamp.
CC ACTIVATE MSG (ATM0)	Message type and interface.
0	Source.
1	Sink.
VC 1/40	Virtual circuit identifier.
Direction:3	Direction in which the cells are traveling. May be one of the following values: 1— local router is the sink. 2— local router is the source. 3— both routers operate as the source and sink.

Related Commands

Command	Description
oam-pvc manage cc	Configures ATM OAM F5 CC management.
show atm pvc	Displays all ATM PVCs and traffic information.

oam-pvc manage cc

To configure ATM Operation, Administration, and Maintenance (OAM) F5 continuity check (CC) management, use the **oam-pvc manage cc** command in ATM virtual circuit configuration mode. To disable OAM F5 continuity checking, use the **no** form of this command.

oam-pvc manage cc {**end** | **segment**} [**direction** {**both** | **sink** | **source**}] [**keep-vc-up** [**end aisrdi failure** | **seg aisrdi failure**]]

no oam-pvc manage cc {**end** | **segment**} [**deactivate-down-vc**] [**direction** {**both** | **sink** | **source**}] [**keep-vc-up** [**end aisrdi failure** | **seg aisrdi failure**]]

Syntax Description

end	End-to-end continuity checking. Monitoring occurs on the entire VC between two ATM end stations.
segment	Segment continuity checking. Monitoring occurs on a VC segment between a router and a first-hop ATM switch.
direction	(Optional) Direction of CC cell transmission.
both	(Optional) CC cells transmit toward and away from the activator.
sink	(Optional) CC cells transmit toward the activator. This is the default direction.
source	(Optional) CC cells transmit away from the activator.
keep-vc-up	(Optional) VC will be kept in the UP state when CC cells detect connectivity failure.
end aisrdi failure	(Optional) If end AIS/RDI cells are received, the VC will not be brought down because of segment CC failure.
seg aisrdi failure	(Optional) If segment AIS/RDI cells are received, the VC will not be brought down because of end CC failure or loopback failure.
deactivate-down-vc	(Optional) OAM F5 CC deactivation message will be sent when the VC is operationally down and in the CC active state.This keyword is available only when the **no** form of this command is used.

Defaults

The default direction is **sink**.

Command Modes

ATM virtual circuit configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Usage Guidelines

ATM OAM F5 continuity checking enables OAM to support the use of F5 segment and end-to-end CC cells to detect connectivity failures.

It is not necessary to enter a CC configuration on the router at the other end of a segment. The router on which CC management has been configured sends a CC activation request to the router at the other end of the segment, directing it to act as either a source or a sink.

Use the **oam-pvc manage cc deny** command to configure a permanent virtual circuit (PVC) to respond to activation requests from a peer device with "activation denied" messages. The **oam-pvc manage cc deny** command prevents ATM OAM F5 CC management from being activated on the PVC.

Use the **no oam-pvc manage cc** command to send a deactivation request to the peer device. The **no oam-pvc manage cc** command will disable ATM OAM F5 CC management on the PVC until the PVC receives an activation request. When the PVC receives an activation request, ATM OAM F5 CC management will be reenabled.

The **no oam-pvc manage cc** {**end** | **segment**} **deactivate-down-vc** command does not disable ATM OAM F5 CC support. This command causes OAM F5 CC deactivation messages to be sent over the VC when the VC goes down.

To enable the SNMP notifications that support ATM OAM F5 continuity checking, use the **snmp-server enable traps atm pvc extension** command.

Examples

ATM OAM F5 CC Support on a PVC Configuration Example

The following example shows how to configure ATM OAM F5 CC support over the segment and configure the router to function as the source. The frequency at which CC activation and deactivation requests will be sent over the segment is also configured.

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  oam-pvc manage cc segment direction source
  oam retry cc segment 10 10 30
```

Deactivation of ATM OAM F5 CC Upon VC Failure Example

The following example shows how to configure OAM to send a CC deactivation request across the segment when PVC 0/1 goes down:

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  no oam-pvc manage cc segment deactivate-down-vc
```

Related Commands

Command	Description
debug atm oam cc	Displays ATM OAM F5 CC management activity.
oam-pvc manage cc deny	Disables ATM OAM F5 CC support and configures the PVC to deny CC activation requests.
oam retry cc	Sets the frequency at which ATM OAM F5 CC activation and deactivation requests are sent to the device at the other end of the segment or PVC.
show atm pvc	Displays all ATM PVCs and traffic information.

Command	Description
snmp-server enable traps atm pvc extension	Enables the sending of extended ATM PVC SNMP notifications and SNMP notifications for ATM OAM F5 CC, ATM OAM F5 AIS/RDI, and loopback failures.
snmp-server enable traps atm pvc extension mibversion	Specifies the MIB that supports extended ATM PVC SNMP notifications or the MIB that supports SNMP notifications for ATM OAM F5 CC management, ATM OAM F5 AIS/RDI management, and F5 loopback failure management.

oam-pvc manage cc deny

To disable ATM Operation, Administration, and Maintenance (OAM) F5 continuity check (CC) support and configure the PVC to deny CC activation requests, use the **oam-pvc manage cc deny** command in ATM virtual circuit configuration mode. To reenable OAM F5 CC support and allow CC activation requests, use the **no** form of this command.

oam-pvc manage cc {**end** | **segment**} **deny**

no oam-pvc manage cc {**end** | **segment**} **deny**

Syntax Description

end	End-to-end continuity checking.
segment	Segment continuity checking.

Defaults

If the peer device sends the activation message, F5 CC management will be enabled on the PVC.

Command Modes

ATM virtual circuit configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Usage Guidelines

Use the **oam-pvc manage cc deny** command to configure a permanent virtual circuit (PVC) to respond to activation requests from a peer device with "activation denied" messages. The **oam-pvc manage cc deny** command prevents ATM OAM F5 CC management from being activated on the PVC.

Use the **no oam-pvc manage cc** command to send a deactivation request to the peer device. The **no oam-pvc manage cc** command will disable ATM OAM F5 CC management on the PVC until the PVC receives an activation request. When the PVC receives an activation request, ATM OAM F5 CC management will be reenabled.

Examples

The following example shows how to disable ATM OAM F5 CC support and configure the VC to deny CC activation requests:

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  oam-pvc manage cc segment deny
```

Related Commands

Command	Description
oam-pvc manage cc	Configures ATM OAM F5 CC management.
oam retry cc	Sets the frequency at which ATM OAM F5 CC activation and deactivation requests are sent to the device at the other end of the segment or PVC.

oam retry cc

To set the frequency at which ATM Operation, Administration, and Maintenance (OAM) F5 continuity check (CC) activation and deactivation requests are sent to the device at the other end of the segment or permanent virtual circuit (PVC), use the **oam retry cc** command in ATM virtual circuit configuration mode. To remove the retry settings, use the **no** form of this command.

oam retry cc {**end** | **segment**} [*activation-count* [*deactivation-count* [*retry-frequency*]]]

no oam retry cc {**end** | **segment**} [*activation-count* [*deactivation-count* [*retry-frequency*]]]

Syntax Description

end	End-to-end continuity check.
segment	Segment continuity check.
activation-count	(Optional) Maximum number of times the activation request will be sent before the receipt of an acknowledgment. The range is from 3 to 600. The default is 3.
deactivation-count	(Optional) Maximum number of times the deactivation request will be sent before the receipt of an acknowledgment. The range is from 3 to 600. The default is 3.
retry-frequency	(Optional) Interval between retries, in seconds. The default is 30 seconds.

Defaults

The default *activation-count* is 3.
The default *deactivation-count* is 3.
The default *retry-frequency* is 30 seconds.

Command Modes

ATM virtual circuit configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Examples

The following example shows how to configure ATM OAM F5 CC support over the segment and configure the router to function as the source. The frequency at which CC activation and deactivation requests will be sent over the segment is also configured.

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  oam-pvc manage cc segment direction source
  oam retry cc segment 10 10 30
```

Related Commands

Command	Description
oam-pvc manage cc	Configures ATM OAM F5 CC management.
oam-pvc manage cc deny	Disables ATM OAM F5 CC support and configures the PVC to deny CC activation requests.

snmp-server enable traps atm pvc extension

To enable the sending of extended ATM permanent virtual circuit (PVC) Simple Network Management Protocol (SNMP) notifications and SNMP notifications for ATM Operation, Administration, and Maintenance (OAM) F5 continuity check (CC), ATM OAM F5 alarm indication signals/remote defect indications (AIS/RDI), and loopback failures, use the **snmp-server enable traps atm pvc extension** command in global configuration mode. To disable these SNMP notifications, use the **no** form of this command.

snmp-server enable traps atm pvc extension {**up** | **down** | **oam failure** [**aisrdi** | **endCC** | **loopback** | **segmentCC**]}

no snmp-server enable traps atm pvc extension{**up** | **down** | **oam failure** [**aisrdi** | **endCC** | **loopback** | **segmentCC**]}

Syntax Description

up	Enables ATM PVC up traps. These notifications are generated when a PVC changes from the DOWN to the UP state.
down	Enables ATM PVC down traps. These notifications are generated when a PVC changes from the UP to the DOWN state.
oam failure	Enables ATM PVC OAM failure traps. These notifications are generated when any type of OAM failure occurs on the PVC.
aisrdi	(Optional) Enables AIS/RDI OAM failure traps. These notifications are generated when AIS/RDI OAM failure occurs on the PVC.
endCC	(Optional) Enables end-to-end OAM CC failure traps. These notifications are generated when end-to-end CC failures occur on the PVC.
loopback	(Optional) Enables OAM failure loopback traps. These notifications are generated when OAM loopback failure occurs on the PVC.
segmentCC	(Optional) Enables segment OAM CC failure traps. These notifications are generated when segment CC failures occur on the PVC.

Defaults

SNMP notifications are disabled.

The interval between successive traps is 30 seconds.

Command Modes

Global configuration

Command History

Release	Modification
12.2(4)T	This command was introduced for those platforms that support ATM PVC Management.
12.2(13)T	This command was modified to configure SNMP notification support for ATM OAM F5 CC and ATM OAM F5 AIS/RDI failures.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Usage Guidelines

Extended ATM PVC and ATM OAM F5 CC traps cannot be used at the same time as the legacy ATM PVC trap. The legacy ATM PVC trap must be disabled by using the **no snmp-server enable traps atm pvc** command before extended ATM PVC traps can be configured.

Note You must configure the **snmp-server enable traps atm pvc extension mibversion 2** command before you can enable the ATM OAM F5 AIS/RDI failure traps, the end-to-end ATM OAM F5 CC failure traps, the OAM failure loopback traps, and the segment ATM OAM F5 CC failure traps. This command enables the MIB that supports these traps.

OAM management must be enabled on the PVC before you can use ATM PVC traps. To generate F5 loopback failure traps, enable OAM management using the **oam-pvc manage** command. To generate segment F5 CC failure traps, enable segment OAM CC management by using the **oam-pvc manage cc segment** command. To generate end-to-end F5 CC failure traps, enable end-to-end OAM CC management by using the **oam-pvc manage cc end** command. To generate OAM F5 AIS/RDI failure traps, enable any of the three types of OAM management listed above.

SNMP notifications can be sent as traps or inform requests. This command enables both traps and inform requests for the specified notification types.

The extended ATM PVC notifications for MIB version 1 are defined in the CISCO-IETF-ATM2-PVCTRAP-MIB.my file.The extended ATM PVC notifications for MIB version 2 are defined in the CISCO-ATM-PVCTRAP-EXTN-MIB.my file. Both of these MIB files are available from the Cisco FTP site at ftp://www.cisco.com/public/mibs/v2/.

ATM PVC traps are generated only at the end of the notification interval. It is possible to generate multiple types of ATM PVC traps at the end of the same notification interval.

The **snmp-server enable traps atm pvc extension** command is used in conjunction with the **snmp-server host** command. Use the **snmp-server host** command to specify which host or hosts receive SNMP notifications. In order to send notifications, you must configure at least one **snmp-server host** command.

When the ATM OAM F5 loopback, AIS/RDI, or CC failure trap is enabled, the PVC remains in the UP state when an OAM loopback, AIS/RDI, or CC failure is detected, so that the flow of data will still be possible. If one of these traps is not enabled, the PVC will be placed in the DOWN state when an OAM loopback, AIS/RDI, or CC failure is detected.

Examples

Extended ATM PVC Notifications Example

The following example shows all three of the extended ATM PVC traps enabled on a router. If PVC 0/1 leaves the UP state, leaves the DOWN state, or has an OAM loopback failure, host 172.16.61.90 will receive the SNMP notifications:

```
! Configure SNMP support and an IP routing protocol on your router:
Router(config)# snmp-server community public ro
Router(config)# snmp-server host 172.16.61.90 public
Router(config)# ip routing
Router(config)# router igrp 109
Router(config-router)# network 172.16.0.0
!
! Enable extended ATM PVC trap support and OAM management:
Router(config)# snmp-server enable traps atm pvc extension down
Router(config)# snmp-server enable traps atm pvc extension up
Router(config)# snmp-server enable traps atm pvc extension oam failure loopback
Router(config)# interface atm 1/0.1
Router(config-if)# pvc 0/1
Router(config-if-atm-vc)# oam-pvc manage
```

ATM OAM F5 CC Notifications Example

In the following example, the ATM OAM CC notifications and an extended ATM PVC notification are enabled. If connectivity failures are detected on PVC 0/1, host 172.16.61.90 will receive the SNMP notifications:

```
! Configure SNMP support and an IP routing protocol on your router:
Router(config)# snmp-server community public ro
Router(config)# snmp-server host 172.16.61.90 public
Router(config)# ip routing
Router(config)# router igrp 109
Router(config-router)# network 172.16.0.0
!
! Enable extended ATM PVC trap support and OAM management:
Router(config)# snmp-server enable traps atm pvc extension mibversion 2
Router(config)# snmp-server enable traps atm pvc extension oam failure aisrdi
Router(config)# snmp-server enable traps atm pvc extension oam failure endcc
Router(config)# snmp-server enable traps atm pvc extension oam failure segmentcc
Router(config)# snmp-server enable traps atm pvc extension oam failure loopback
Router(config)# snmp-server enable traps atm pvc extension up
Router(config)# interface atm 0
Router(config-if)# pvc 0/1
Router(config-if-atm-vc)# oam-pvc manage cc end
```

Related Commands

Command	Description
oam-pvc manage	Enables end-to-end F5 OAM loopback cell generation and OAM management.
oam-pvc manage cc	Configures ATM OAM F5 CC management.
show atm pvc	Displays all ATM PVCs and traffic information.
snmp-server enable traps	Enables all available SNMP notifications on your system.
snmp-server enable traps atm pvc	Enables the sending of legacy ATM PVC DOWN traps.
snmp-server host	Specifies the recipient of an SNMP notification operation.
snmp-server trap-source	Specifies the interface from which an SNMP trap should originate.

snmp-server enable traps atm pvc extension mibversion

To specify the MIB that supports extended ATM permanent virtual circuit (PVC) Simple Network Management Protocol (SNMP) notifications or the MIB that supports SNMP notifications for ATM Operation, Administration, and Maintenance (OAM) F5 continuity check (CC) management, ATM OAM F5 AIS/RDI management, and F5 loopback failure management, use the **snmp-server enable traps atm pvc extension mibversion** command in global configuration mode. To remove the MIB specification, use the **no** form of this command.

snmp-server enable traps atm pvc extension mibversion {**1** | **2**}

no snmp-server enable traps atm pvc extension mibversion {**1** | **2**}

Syntax Description

1	Specifies the MIB that supports the extended ATM permanent virtual circuit (PVC) SNMP notifications. This is the default.
2	Specifies the MIB that supports ATM OAM F5 CC and ATM OAM F5 AIS/RDI SNMP notifications, in addition to the notifications supported by MIB version 1.

Defaults

MIB version: **1**

Command Modes

Global configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.

Usage Guidelines

MIB version 1 specifies the MIB that supports legacy extended ATM PVC traps and is defined in the file CISCO-IETF-ATM2-PVCTRAP-MIB-EXTN.my. MIB version 1 is implemented by default. Use the **snmp-server enable traps atm pvc extension mibversion 1** command or the **no snmp-server enable traps atm pvc extension mibversion 2** command to reenable this MIB if it was previously disabled with the **snmp-server enable traps atm pvc extension mibversion 2** command.

Use the **snmp-server enable traps atm pvc extension mibversion 2** command to specify the MIB that supports ATM OAM F5 CC and ATM OAM AID/RDI failure notifications. This MIB is defined in the file CISCO-ATM-PVCTRAP-EXTN-MIB.my.

To enable the SNMP notifications that support ATM OAM F5 continuity checking, use the **snmp-server enable traps atm pvc extension** command in global configuration mode. These SNMP notifications are defined in the file CISCO-ATM-PVCTRAP-EXTN-MIB.my, available from the Cisco FTP site at ftp://www.cisco.com/public/mibs/v2/.

OAM management and support for OAM F5 continuity checking must be enabled on the PVC by using the **oam-pvc manage cc** command before you can use the ATM OAM continuity check SNMP notifications.

Examples

In the following example, the MIB that supports the SNMP notifications for ATM OAM continuity checking is implemented, and the ATM OAM continuity checking notifications are enabled. Support for end-to-end OAM F5 continuity checking is enabled on PVC 0/1:

```
Router(config)# snmp-server enable traps atm pvc extension mibversion 2
Router(config)# snmp-server enable traps atm pvc extension oam failure aisrdi
Router(config)# snmp-server enable traps atm pvc extension oam failure endcc
Router(config)# snmp-server enable traps atm pvc extension oam failure segmentcc
Router(config)# snmp-server enable traps atm pvc extension oam failure loopback
Router(config)# snmp-server enable traps atm pvc extension up
Router(config)# interface atm 0
Router(config-if)# pvc 0/40
Router(config-if-atm-vc)# oam-pvc manage cc end
```

Related Commands

Command	Description
debug atm oam cc	Displays ATM OAM F5 CC management activity.
oam-pvc manage cc	Configures ATM OAM F5 CC management.
snmp-server enable traps	Enables all available SNMP notifications on your system.
snmp-server enable traps atm pvc extension	Enables the sending of extended ATM PVC SNMP notifications and SNMP notifications for ATM OAM F5 CC, ATM OAM F5 AIS/RDI, and loopback failures.
snmp-server enable traps atm pvc extension mibversion	Specifies the MIB that supports extended ATM PVC SNMP notifications or the MIB that supports SNMP notifications for ATM OAM F5 CC, F5 AIS/RDI, and F5 loopback failures.

Glossary

AIS—alarm indication signal. In a T1 transmission, an all-ones signal transmitted in lieu of the normal signal to maintain transmission continuity and to indicate to the receiving terminal that there is a transmission fault that is located either at or upstream from the transmitting terminal.

MIB—Management Information Base. Database of network management information that is used and maintained by a network management protocol such as SNMP. The value of a MIB object can be changed or retrieved using SNMP commands, usually through a network management system (NMS).

NMS—network management system. An application or suite of applications designed to monitor networks using SNMP.

OAM—Operation, Administration, and Maintenance. OAM cells provide a virtual-circuit-level loopback in which a router responds to the cells, demonstrating that the circuit is up and the router is operational.

PVC—permanent virtual circuit. Virtual circuit that is permanently established. In ATM terminology, PVC also stands for permanent virtual connection.

RDI—remote defect indication. In ATM, when the physical layer detects loss of signal or cell synchronization, RDI cells are used to report a virtual path connection/virtual channel connection (VPC/VCC) failure. RDI cells are sent upstream by a VPC/VCC endpoint to notify the source VPC/VCC endpoint of the downstream failure.

SNMP—Simple Network Management Protocol. An application-layer protocol that provides a message format for communication between SNMP managers and agents and is used almost exclusively in TCP/IP networks. SNMP provides a means to monitor and control network devices and to manage configurations, statistics collection, performance, and security.

SNMP trap—Message from an SNMP agent alerting the SNMP manager to a condition on the network.