



Configuring ATM SNMP Trap and OAM Enhancements

The ATM SNMP Trap and OAM Enhancements feature provides the ability to send Simple Network Management Protocol (SNMP) notifications for ATM permanent virtual circuits (PVCs) when the PVC state changes and when Operations, Administration and Maintenance (OAM) loopback fails for a PVC. This feature also provides information about the virtual path identifier/virtual channel identifier (VPI/VCI) in the ATM PVC traps.

The ATM OAM AIS-RDI Monitoring feature extends the existing ATM virtual circuit OAM functionality to include monitoring of the Alarm Indication Signal-Remote Defect Indication (AIS-RDI).

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see [Bug Search Tool](#) and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for ATM SNMP Trap and OAM Enhancements

Before you enable ATM PVC trap support, you must configure SNMP support and an IP routing protocol on your router. For more information about configuring SNMP support, refer to the chapter "Configuring SNMP Support" in the *Cisco IOS Network Management Configuration Guide*.

To receive PVC failure notification and to allow access to PVC status tables on your router, you must have the Cisco extended ATM PVC trap MIB called CISCO-IETF-ATM2-PVCTRAP-MIB-EXTN.mib compiled in your Network Management System (NMS) application. You can find this MIB on the Web at Cisco's MIB website that has the URL: <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

The legacy ATM PVC trap must be disabled by using the **no snmp-server enable traps atm pvc** command before configuring extended ATM PVC traps.

Restrictions for ATM SNMP Trap and OAM Enhancements

- Extended ATM PVC 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 configuring extended ATM PVC traps.
- ATM PVC UP traps are not generated for newly created PVCs. They are only generated for PVCs that go from the DOWN state to the UP state.

Information About ATM SNMP Trap and OAM Enhancements

The ATM SNMP Trap and OAM Enhancements feature introduces the following enhancements to the SNMP notifications for ATM permanent virtual circuits (PVCs) and to OAM functionality:

- ATM PVC traps will be generated when the operational state of a PVC changes from the DOWN to UP state.
- ATM PVC traps will be generated when OAM loopback fails and the PVC will remain in the UP state, rather than going down.
- The ATM PVC traps are now extended to include virtual path identifier/virtual channel identifier (VPI/VCI) information, the number of state transitions a PVC goes through in an interval, and the time stamp of the first and the last PVC state transition.

Before configuring ATM SNMP traps and OAM VC enhancements, you should understand the following concepts:

Benefits of Configuring ATM SNMP Trap and OAM Enhancements

The ATM SNMP Trap and OAM Enhancements and the ATM OAM AIS-RDI Monitoring features have the following benefits:

- Enables you to use SNMP to detect the recovery of PVCs that are down.
- Enables you to use SNMP to detect when OAM loopback fails for a PVC.

- Keeps the PVC in the UP state when OAM loopback fails, to allow continuous flow of data.
- Provides VPI/VCI information in the ATM PVC traps, to let you know the PVC that changed operational state or encountered an OAM loopback failure.
- Provides statistics on the number of state transitions a PVC goes through.
- Provides flexibility to control the status change of PVC when a faulty condition is detected on VC and OAM VC-AIS cells are generated.

ATM OAM AIS-RDI Monitoring

The ATM OAM AIS-RDI Monitoring feature extends the existing ATM VC OAM functionality to include monitoring of the AIS-RDI. Once the feature is enabled, OAM AIS-RDI is monitored on the VCs. If the number of consecutive OAM AIS-RDI cells received is greater than a configurable number, the VC is brought down. The VC is brought up when there are no OAM AIS-RDI cells received within a configurable interval.

ATM PVC Up Trap

Before the introduction of the ATM SNMP trap and OAM enhancements, the only SNMP notifications for ATM PVCs were the ATM PVC failure traps that were generated when a PVC failed or left the UP operational state. The ATM SNMP trap and OAM enhancements introduce ATM PVC up traps, which are generated when a PVC changes from the DOWN to the UP state.

ATM PVC OAM Failure Trap

The ATM SNMP trap and OAM enhancements feature introduces the ATM PVC OAM failure trap. OAM loopback is a mechanism that detects whether a connection is up or down by sending OAM end-to-end loopback command/response cells. An OAM loopback failure indicates that the PVC has lost connectivity. The ATM PVC OAM failure trap is generated when OAM loopback for a PVC fails and is sent at the end of the notification interval.

When OAM loopback for a PVC fails, the PVC is included in the `atmStatusChangePVCRangeTable` or `atmCurrentStatusChangePVCITable` and in the ATM PVC OAM failure trap.

Before this feature was introduced, if OAM loopback failed, the PVC was being placed in the DOWN state. When the ATM PVC OAM failure trap is enabled, the PVC remains up even if OAM loopback fails, and thus it ensures continuous flow of data.

**Note**

ATM PVC traps are generated at the end of the notification interval. It is possible to generate three types of ATM PVC traps (the ATM PVC failure trap, ATM PVC up trap, and ATM PVC OAM failure trap) at the end of the same notification interval. However, only one type of trap is generated for each PVC.

Extended ATM PVC Traps

The ATM SNMP Trap and OAM Enhancements feature introduces extended ATM PVC traps. The extended traps include VPI/VCI information for affected PVCs, the number of up-to-down and down-to-up state transitions a PVC goes through in an interval, and the time stamp of the first and the last PVC state transition.



Note

Extended ATM PVC 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 configuring extended ATM PVC traps.

Supported MIB Objects and Tables

The ATM PVC trap is defined in the ATM PVC trap MIB. The ATM SNMP trap and OAM enhancements introduce the following MIB objects and tables:

- The table atmInterfaceExt2Table displays the status of ATM PVCs and is indexed by ifIndex. This table contains the following objects:
 - atmIntfCurrentlyDownToUpPVcls
 - atmIntfOAMFailedPVcls
 - atmIntfCurrentlyOAMFailingPVcls
- The table atmCurrentStatusChangePVclTable displays information about ATM PVCs that undergo through an operational state change and is indexed by ifIndex, atmVclVpi, and atmVclVci. This table contains the following objects:
 - atmPVclStatusTransition
 - atmPVclStatusChangeStart
 - atmPVclStatusChangeEnd
- The table atmStatusChangePVclRangeTable displays information about ATM PVC ranges and is indexed by ifIndex, atmVclVpi, and rangeIndex. This table contains the following objects:
 - atmPVclLowerRangeValue
 - atmPVclHigherRangeValue
 - atmPVclRangeStatusChangeStart
 - atmPVclRangeStatusChangeEnd
- The ATM PVC Up Trap "atmIntfPvcUpTrap" contains the following objects:
 - ifIndex
 - atmIntfCurrentlyDownToUpPVcls
- The ATM PVC OAM Failure Trap "atmIntfPvcOAMFailureTrap" contains the following objects:

- ifIndex
- atmIntfOAMFailedPVcls
- atmIntfCurrentlyOAMFailingPVcls

How to Configure ATM SNMP Trap and OAM Enhancements

Configuring Extended ATM PVC Trap Support

Perform the following steps to configure extended ATM PVC trap support.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server enable traps atm pvc extension {up| down| oam failure[aisrdi| endCC| loopback| segmentCC]}**
4. **end**

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	snmp-server enable traps atm pvc extension {up down oam failure[aisrdi endCC loopback segmentCC]} Example: Router(config)# snmp-server enable traps atm pvc extension oam failure loopback	Enables the sending of extended ATM PVC traps. The keywords are as follows: <ul style="list-style-type: none"> • up --Enables ATM PVC up traps that are generated when a PVC changes from the down to up state. • down --Enables ATM PVC failure traps that are generated when a PVC changes from the up to down state. • oam failure --Enables ATM PVC OAM failure traps that are generated when OAM failure occurs.

	Command or Action	Purpose
		<ul style="list-style-type: none"> • aisrdi --Enables AIS/RDI OAM failure traps that are generated when AIS/RDI OAM failure occurs. • endCC --Enables end-to-end OAM CC failure traps that are generated when end-to-end CC failures occur. • loopback --Enables OAM failure loopback traps that are generated when OAM loopback failure occurs. • segmentCC --Enables segment OAM CC failure traps that are generated when segment CC failures.
Step 4	end Example: Router (config) # end	Exits global configuration mode and returns to privileged EXEC mode.

Enabling OAM Management

When you configure PVC trap support, you must also enable OAM management on the PVC. Perform the following steps to enable OAM management.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Do one of the following:
 - **interface atm slot /0** [*.subinterface-number* {**multipoint** | **point-to-point**}]
 -
 -
 -
 - **interface atm slot / port-adaptor /0** [*.subinterface-number* {**multipoint** | **point-to-point**}]
 -
 -
 -
 - **interface atm interface-number** [*.subinterface-number* {**multipoint** | **point-to-point**}]
4. **pvc** [*name*] *ypl/vci*
5. **oam-pvc manage**
6. **end**

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	Do one of the following: <ul style="list-style-type: none"> • interface atm slot /0 [<i>.subinterface-number</i> {multipoint point-to-point}] • • • • interface atm slot / port-adapter /0 [<i>.subinterface-number</i> {multipoint point-to-point}] • • • • interface atm interface-number [<i>.subinterface-number</i> {multipoint point-to-point}] Example: Router(config)# interface atm 2/0	Specifies the ATM interface using the appropriate form of the interface atm command. ¹ The command syntax is as follows: <ul style="list-style-type: none"> • <i>interface-number</i> --Specifies a (physical) ATM interface (for example, 2/0). • <i>. subinterface-number</i> --Specifies a subinterface number. A dot (.) must be used to separate the interface-number from the subinterface-number (for example, 2/0.1). • multipoint --Specifies multipoint as the interface type for which a subinterface is to be created. • point-to-point --Specifies point-to-point as the interface type for which a subinterface is to be created.
Step 4	pvc [<i>name</i>] <i>vpi/vci</i> Example: Router(config-if)# pvc oam 0/5	Enables the PVC and enters ATM VC configuration mode.
Step 5	oam-pvc manage Example: Router(config-if-atm-vc)# oam-pvc manage	Enables end-to-end OAM management for an ATM PVC.

	Command or Action	Purpose
Step 6	end Example: Router(config-if-atm-vc)# end	Exits ATM VC configuration mode and returns to interface configuration mode.

¹ To determine the correct form of the interface atm command, consult your ATM network module, port adapter, or router documentation.

Enabling OAM AIS-RDI Monitoring

Perform the following task to enable OAM AIS-RDI Monitoring on VCs.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface atm** *interface-number* [*.subinterface-number* {**multipoint** | **point-to-point**}]
4. **pvc** [*name*] *vpi* / *vci*
5. **oam ais-rdi** [*down-count* [*up-count*]]
6. **end**

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>interface-number</i> [<i>.subinterface-number</i> { multipoint point-to-point }] Example: Router(config)# interface atm 2/0	Specifies the ATM interface and enters interface configuration mode.

	Command or Action	Purpose
Step 4	<p><code>pvc [name] vpi / vci</code></p> <p>Example:</p> <pre>Router(config-if)# pvc 0/400</pre>	Enables the PVC and enters ATM VC configuration mode.
Step 5	<p><code>oam ais-rdi [down-count [up-count]]</code></p> <p>Example:</p> <pre>Router(config-if-atm-vc)# oam ais-rdi 1 3</pre>	Configures an ATM PVC to be brought down after a specified number of OAM AIS/RDI cells have been received on the PVC or brought up if no OAM AIS/RDI cells have been received in a specified interval.
Step 6	<p><code>end</code></p> <p>Example:</p> <pre>Router(config-if-atm-vc)# end</pre>	Exits ATM VC configuration mode and returns to privileged EXEC mode.

Verifying ATM PVC Traps

To verify the configuration of ATM PVC traps, use the **show running-config** command. To view the status of ATM VCs, use the **show atm vc** command.

Following is an example of the **show atm vc** command:

```
Router# show atm vc
Codes: DN - DOWN, IN - INACTIVE
      VCD /
Interface Name      VPI  VCI  Type  Encaps  SC      Peak Av/Min Burst  St
         /          /    /    /    /        /      Kbps  Kbps  Cells
2/0      oam        0    5    PVC   SNAP    UBR     0      0      0      IN
2/0      7          0    10   PVC   SNAP    UBR     0      0      0      IN
2/0      2          0    40   PVC   SNAP    UBR     0      0      0      IN
2/0      1          0    100  PVC   SNAP    UBR     0      0      0      IN
2/0      name        1    1    PVC   SNAP    UBR     0      0      0      IN
2/0      4          2    200  PVC   SNAP    UBR     0      0      0      IN
2/0      vpi/vci     3    100  PVC   SNAP    UBR     0      0      0      IN
2/0      8          4    100  PVC   SNAP    UBR     0      0      0      IN
```

Configuration Examples for ATM SNMP Traps and OAM Enhancements

Configuring Extended ATM PVC Trap Support Example

The following example shows the three extended ATM PVC traps enabled on a router. If PVC 0/1 either leaves the up state, or down state, or encounters an OAM loopback failure, then the host 172.16.61.90 receives 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
```

Extended ATM PVC Traps Output Examples

This section contains examples of output for the extended ATM PVC traps.

Extended ATM PVC Failure Trap Output

The following example shows the output for the extended ATM PVC failure trap for PVCs 1/100, 1/102, and 1/103. Note that only one trap is generated for all the PVCs associated with the same interface or subinterface (in contrast to the legacy ATM PVC failure trap that generates separate trap for each PVC). The VPI/VCI information and timing is located in the objects associated with the trap.

```
00:23:56:SNMP:Queuing packet to 1.1.1.1
00:23:56:SNMP:V2 Trap, reqid 2, errstat 0, erridx 0
sysUpTime.0 = 143636
snmpTrapOID.0 = atmIntfPvcFailuresTrap
ifEntry.1.19 = 19
atmIntfPvcFailures.2 = 7
atmIntfCurrentlyFailingPVcls.2 = 3
atmPVclLowerRangeValue.19.1.2 = 102
atmPVclHigherRangeValue.19.1.2 = 103
atmPVclRangeStatusChangeStart.19.1.2 = 140643
atmPVclRangeStatusChangeEnd.19.1.2 = 140698
atmPVclStatusTransition.19.1.100 = 1
atmPVclStatusChangeStart.19.1.100 = 140636
00:23:56:SNMP:Packet sent via UDP to 1.1.1.1
```

Extended ATM PVC Up Trap Output

The following example shows the output for the extended ATM PVC up trap for PVCs 1/100, 1/102, and 1/103:

```
00:31:29:SNMP:Queuing packet to 1.1.1.1
00:31:29:SNMP:V2 Trap, reqid 2, errstat 0, erridx 0
sysUpTime.0 = 188990
snmpTrapOID.0 = atmIntfPvcUpTrap
ifEntry.1.19 = 19
atmIntfCurrentlyDownToUpPVcls.2 = 3
atmPVclLowerRangeValue.19.1.2 = 102
atmPVclHigherRangeValue.19.1.2 = 103
atmPVclRangeStatusChangeStart.19.1.2 = 186005
atmPVclRangeStatusChangeEnd.19.1.2 = 186053
atmPVclStatusTransition.19.1.100 = 1
atmPVclStatusChangeStart.19.1.100 = 185990
atmPVclStatusChangeEnd.19.1.100 = 185990
```

Enabling OAM AIS-RDI Monitoring Example

The following example shows how to enable OAM ASI-RDI monitoring in ATM VC configuration mode:

```
Router> enable
Router# configure terminal
Router(config)# interface atm 2/0
Router(config-if)# pvc 0/400
Router(config-if-atm-vc)# oam ais-rdi 25 5
Router(config-if-atm-vc)# end
```

The following example shows how to enable OAM ASI-RDI monitoring in ATM VC-Class configuration mode:

```
Router> enable
Router# configure terminal
Router(config)# vc-class atm vctest
Router(config-vc-class)# oam ais-rdi 14 5
Router(config-if-atm-vc)# end
```

Additional References

Related Documents

Related Topic	Document Title
Configuring ATM	"Configuring ATM"
ATM commands: complete command syntax, defaults, command mode, command history, usage guidelines, and examples.	<i>Cisco IOS Asynchronous Transfer Mode Command Reference</i>
Configuring SNMP support	"Configuring SNMP Support"
SNMP commands	<i>Cisco IOS Network Management Command Reference</i>

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases

Standards

Standard	Title
No new or modified standards are supported by this feature.	--

MIBs

MIB	MIBs Link
<ul style="list-style-type: none"> • ATM PVC MIB • CISCO-IETF-ATM2-PVCTRAP-MIB-EXTN 	<p>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:</p> <p>http://www.cisco.com/go/mibs</p>

RFCs

RFC	Title
No new or modified RFCs are supported by this feature.	--

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<p>http://www.cisco.com/cisco/web/support/index.html</p>

Feature Information for ATM SNMP Trap and OAM Enhancements

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for ATM SNMP Trap and OAM Enhancements

Feature Name	Releases	Feature Information
ATM SNMP Trap and OAM Enhancements	12.2(4)T 12.2(4)T3	<p>The feature provides enhancements to the Simple Network Management Protocol (SNMP) notifications for ATM permanent virtual circuits (PVCs) and to Operation, Administration, and Maintenance (OAM) functionality. In Cisco IOS Release 12.2(4)T this feature was implemented on the Cisco 2600 series routers, the Cisco 3660 series routers and the Cisco 7200 series routers. The following sections provide information about this feature:</p> <p>The following commands were introduced or modified: snmp-server enable traps atm pvc extension, oam-pvc manage.</p> <p>In Release 12.2(4)T3, support was added for the Cisco 7500 series routers.</p>

Feature Name	Releases	Feature Information
ATM OAM AIS-RDI Monitoring	15.0(1)M 12.0(28)S 12.2(33)SRE	<p>The ATM OAM AIS-RDI Monitoring feature extends the existing ATM virtual circuit OAM functionality to include monitoring of the AIS-RDI.</p> <p>This feature was introduced in Cisco IOS Release 12.0(28)S.</p> <p>The following commands were introduced or modified: oam ais-rdi.</p> <p>This feature was integrated into Cisco IOS Release 12.2(33)SRE and Cisco IOS Release 15.0(1)M.</p>

Glossary

inform --SNMP trap message that includes a delivery confirmation request.

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). MIB objects are organized in a tree structure that includes public (standard) and private (proprietary) branches.

NMS --Network Management System. An application or suite of applications designed to monitor networks using SNMP. CiscoView is one example of an NMS.

OAM --Operation, Administration, and Maintenance. ATM Forum specifies OAM cells used to monitor virtual circuits. 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. PVCs save bandwidth associated with circuit establishment and teardown in situations where certain virtual circuits must exist all the time. In ATM terminology, PVC also stands for permanent virtual connection.

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

trap --A message from an SNMP agent alerting the SNMP manager to a condition on the network.

VCI --Virtual Channel Identifier. 16-bit field in the header of an ATM cell. The VCI, together with the VPI, is used to identify the next destination of a cell as it passes through a series of ATM switches on its way to its destination. ATM switches use the VPI/VCI fields to identify the next network VCL that a cell needs to transit on its way to its final destination.

VCL --Virtual Channel Link. Connection between two ATM devices.

VPI --Virtual Path Identifier. Eight-bit field in the header of an ATM cell. The VPI, together with the VCI, is used to identify the next destination of a cell as it passes through a series of ATM switches on its way to

its destination. ATM switches use the VPI/VCI fields to identify the next VCL that a cell needs to transit on its way to its final destination. The function of the VPI is similar to that of the DLCI in Frame Relay.

