



# ATM SNMP Trap and OAM Enhancements

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## Feature History

Release	Modification
12.2(4)T	This feature was introduced.
12.2(4)T3	Support for Cisco 7500 series routers was added.

This document describes the ATM SNMP Trap and OAM Enhancements feature in Cisco IOS Release 12.2(4)T. It includes the following sections:

- [Feature Overview, page 1](#)
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- [Supported Standards, MIBs, and RFCs, page 5](#)
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- [Configuration Tasks, page 5](#)
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## Feature Overview

The ATM SNMP Trap and OAM Enhancements feature introduces the following enhancements to the Simple Network Management Protocol (SNMP) notifications for ATM permanent virtual circuits (PVCs) and to Operation, Administration, and Maintenance (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. Additionally, when OAM loopback fails, the PVC will now 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.

The ATM SNMP trap and OAM enhancements are described in the following sections:

- [ATM PVC Up Trap](#)
- [ATM PVC OAM Failure Trap](#)
- [Extended ATM PVC Traps](#)
- [Supported MIB Objects and Tables](#)

## 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, which 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 introduce 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 `atmStatusChangePvcIRangeTable` or `atmCurrentStatusChangePvcITable` and in the ATM PVC OAM failure trap.

Before the introduction of this feature, if OAM loopback failed, the PVC would be placed in the down state. When the ATM PVC OAM failure trap is enabled, the PVC remains up when OAM loopback fails so that the flow of data will still be possible.



### Note

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ATM PVC traps are generated at the end of the notification interval. It is possible to generate all 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 will be generated for each PVC.

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## 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

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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 extended ATM PVC traps can be configured.

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## 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 `atmCurrentStatusChangePvcTable` displays information about ATM PVCs that have gone through an operational state change and is indexed by `ifIndex`, `atmVclVpi`, and `atmVclVci`. This table contains the following objects:
  - `atmPvcStatusTransition`
  - `atmPvcStatusChangeStart`
  - `atmPvcStatusChangeEnd`
- The table `atmStatusChangePvcRangeTable` displays information about ATM PVC ranges and is indexed by `ifIndex`, `atmVclVpi`, and `rangeIndex`. This table contains the following objects:
  - `atmPvcLowerRangeValue`
  - `atmPvcHigherRangeValue`
  - `atmPvcRangeStatusChangeStart`
  - `atmPvcRangeStatusChangeEnd`
- 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`

For a complete description of the extended ATM PVC MIB, see the MIB file called `CISCO-IETF-ATM2-PVCTRAP-MIB-EXTN.my`, available through Cisco.com at the following URL:  
<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

## Benefits

The ATM SNMP Trap and OAM enhancements

- Enable you to use SNMP to detect the recovery of PVCs that have gone down.
- Enable you to use SNMP to detect when OAM loopback for a PVC has failed.
- Keep the PVC in the up state when OAM loopback has failed, allowing for the continued flow of data.

- Provide VPI/VCI information in the ATM PVC traps, letting you know which PVC has changed operational state or has had an OAM loopback failure.
- Provide statistics on the number of state transitions a PVC goes through.

## Restrictions

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 extended ATM PVC traps can be configured.

ATM PVC UP traps are not generated for newly created PVCs. They are generated only for PVCs that go from the down state to the up state.

## Related Documents

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

- The “Configuring ATM” chapter of the *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.2.
- The “ATM Commands” chapter of the *Cisco IOS Wide-Area Networking Command Reference*, Release 12.2.

For information on configuring SNMP, see the following documents:

- The “Configuring SNMP Support” chapter of the *Cisco IOS Configuration Fundamentals Configuration Guide*, Release 12.2
- The “SNMP Commands” chapter of the *Cisco IOS Configuration Fundamentals Command Reference*, Release 12.2

## Supported Platforms

- Cisco 2600 series
- Cisco 3660
- Cisco 7200 series
- Cisco 7500 series (Cisco IOS Release 12.2(4)T3 and later)

### Platform Support Through Feature Navigator

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

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.

To access 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](mailto: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 at <http://www.cisco.com/register>.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. As of May 2001, Feature Navigator supports M, T, E, S, and ST releases. You can access Feature Navigator at the following URL:

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

## Supported Standards, MIBs, and RFCs

### Standards

No new or modified standards are supported by this feature.

### MIBs

This feature provides enhancements to the ATM PVC trap MIB. The MIB file CISCO-IETF-ATM2-PVCTRAP-MIB-EXTN.my can be downloaded from the Cisco MIB website on Cisco.com at

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

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

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

### RFCs

No new or modified RFCs are supported by this feature.

## Prerequisites

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 Configuration Fundamentals Configuration Guide*. For information about configuring IP routing protocols, refer to the section “IP Routing Protocols” in the *Cisco IOS IP 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.my 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 extended ATM PVC traps can be configured.

## Configuration Tasks

See the following sections for configuration tasks for the ATM SNMP trap and OAM enhancements. Each task in the list is identified as either optional or required.

- [Configuring Extended ATM PVC Trap Support](#) (required)
- [Enabling OAM Management](#) (required)

- [Verifying ATM PVC Traps](#) (optional)

## Configuring Extended ATM PVC Trap Support

To configure extended ATM PVC trap support, use the following command in global configuration mode:

Command	Purpose
<pre>Router(config)# snmp-server enable traps atm pvc extension {up   down   oam failure loopback}</pre>	<p>Enables the sending of extended ATM PVC traps. The keywords are as follows:</p> <ul style="list-style-type: none"> <li>• <b>up</b>—Enables ATM PVC up traps, which are generated when a PVC changes from the down to up state.</li> <li>• <b>down</b>—Enables ATM PVC failure traps, which are generated when a PVC changes from the up to down state.</li> <li>• <b>oam failure loopback</b>—Enables ATM PVC OAM failure traps, which are generated when OAM loopback fails.</li> </ul>

## Enabling OAM Management

When you configure PVC trap support, you must also enable OAM management on the PVC. To enable OAM management, use the following commands beginning in global configuration mode:

	Command	Purpose
<b>Step 1</b>	<pre>Router(config)# interface atm slot/0[.subinterface-number {multipoint   point-to-point}]  or  Router(config)# interface atm slot/port-adapter/0[.subinterface-number {multipoint   point-to-point}]  or  Router(config)# interface atm number[.subinterface-number {multipoint   point-to-point}]</pre>	Specifies the ATM interface using the appropriate form of the <b>interface atm</b> command. <sup>1</sup>
<b>Step 2</b>	<pre>Router(config-if)# pvc [name] vpi/vci</pre>	Enables the PVC.
<b>Step 3</b>	<pre>Router(config-if-atm-vc)# oam-pvc manage</pre>	Enables end-to-end OAM management for an ATM PVC.

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

## 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.

## Monitoring and Maintaining ATM PVC Traps

To monitor ATM PVC trap performance, use the following commands in EXEC mode:

Command	Purpose
Router# <b>debug atm errors</b>	Displays ATM errors.
Router# <b>debug atm oam</b>	Displays information about ATM OAM events.
Router# <b>debug snmp packets</b>	Displays information about every SNMP packet sent or received by the router.

## Configuration Examples

This section provides the following configuration example:

- [Configuring Extended ATM PVC Trap Support: Example](#)
- [Extended ATM PVC Traps Output: Examples](#)

### Configuring Extended ATM PVC Trap Support: 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
```

### Extended ATM PVC Traps Output: Examples

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

**Extended ATM PVC Failure Trap Output: Example**

The following example shows 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, which generates a separate trap for each PVC). The VPI/VCI information and timing information 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
atmPVclStatusChangeEnd.19.1.100 = 140636
00:23:56:SNMP:Packet sent via UDP to 1.1.1.1
```

**Extended ATM PVC Up Trap Output: Example**

The following example shows 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
00:31:30:SNMP:Packet sent via UDP to 1.1.1.1
```

## Command Reference

This section documents the new command that configures the ATM SNMP Trap and OAM Enhancements feature. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications:

- [snmp-server enable traps atm pvc extension](#)

## snmp-server enable traps atm pvc extension

To enable the sending of extended ATM permanent virtual circuit (PVC) Simple Network Management Protocol (SNMP) notifications, use the **snmp-server enable traps atm pvc extension** command in global configuration mode. To disable extended ATM PVC-specific SNMP notifications, use the **no** form of this command.

**snmp-server enable traps atm pvc extension { up | down | oam failure loopback }**

**no snmp-server enable traps atm pvc extension { up | down | oam failure loopback }**

Syntax Description	up	down	oam failure loopback
	Enables extended ATM PVC up traps, which are generated when a PVC changes from the down to the up state.	Enables extended ATM PVC failure traps, which are generated when a PVC changes from the up to the down state.	Enables extended ATM PVC OAM failure traps, which are generated when OAM loopback fails.

**Defaults** SNMP notifications are disabled by default.  
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.

**Usage Guidelines** For PVCs that are not part of a range, extended ATM PVC traps include virtual path identifier/virtual channel identifier (VPI/ VCI) information, the number of state transitions a PVC goes through in an interval, and the timestamp for the start and end of the transitions. For PVCs that are part of a range, extended ATM PVC traps include the first and last VPI/VCI of the range and the timestamp for the first failure and the last failure within the same range.

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 extended ATM PVC traps can be configured.

The extended ATM PVC failure trap (which is enabled by the **snmp-server enable traps atm pvc extension down** command) is the same trap as the legacy ATM PVC failure trap (which is enabled by the **snmp-server enable traps atm pvc** command), but with the the following differences:

- The extended ATM PVC failure trap contains information in the form of VPI/VCI ranges.
- The extended ATM PVC failure trap contains timestamps for when PVCs go down.
- The legacy ATM PVC failure trap contains only one VPI/VCI per trap.

When the ATM PVC OAM failure trap is enabled, the PVC remains in the up state when OAM loopback fails so that the flow of data will still be possible. If the ATM PVC OAM failure trap is not enabled, the PVC will be placed in the down state when OAM loopback fails.

OAM management must be enabled on the PVC by using the **oam-pvc manage** command before you can use ATM PVC traps.

SNMP notifications can be sent as traps or inform requests. This command enables both traps and inform requests for the specified notification types. ATM notifications are defined in the CISCO-IETF-ATM2-PVCTRAP-MIB.my file, available from the Cisco FTP site at <ftp://www.cisco.com/public/mibs/v2/>.

ATM PVC traps are generated at the end of the notification interval. It is possible to generate all 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 will be generated for each PVC.

The **snmp-server enable traps atm pvc** 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.

## Examples

### Configuring Extended ATM PVC Traps: 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
```

### Extended ATM PVC Failure Trap Output: Example

The following example shows output for 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, which generates a separate trap for each PVC). The VPI/VCI information and timing information are 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
atmPVclStatusChangeEnd.19.1.100 = 140636
00:23:56:SNMP:Packet sent via UDP to 1.1.1.1

```

### Extended ATM PVC Up Trap Output: Example

The following example shows 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
00:31:30:SNMP:Packet sent via UDP to 1.1.1.1

```

### Related Commands

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

# 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 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.

**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.