PA-A2 ATM-CES Port Adapter Enhancements

Description

The ATM-CES port adapters (PA-A2-4T1C-OC3SM, PA-A2-4T1C-T3ATM, PA-A2-4E1XC-OC3SM, PA-A2-4E1XC-E3ATM, PA-A2-4E1YC-OC3SM, and PA-A2-4E1YC-E3ATM) available on Cisco 7200 series routers now support the following new features:

- Available Bit Rate (ABR)—The ABR service category as specified in the ATM Forum Traffic Management Specification Version 4.0.
- Virtual Path Shaping—A virtual path (VP) is a logical association or bundle of virtual circuits (VCs).

In addition, all traffic shaping features available with the **atm pvc** interface command (*peak average burst*) are supported, and you can now configure the number of transmit channels for the interface with the **atm max-channels** interface configuration command.

The ATM-CES has four T1 (1.544 Mbps) or four E1 (2.048 Mbps) ports (75- or 120-ohm) that can support both structured (N x 64 kbps) and unstructured ATM Forum-compliant circuit emulation services (CES), and one port that supports an OC-3 (155 Mbps) single-mode intermediate reach interface or a T3 (45 Mbps) or E3 (34 Mbps) standards-based ATM interface. The target application of the ATM-CES port adapter is access to a broadband public or private ATM network where multiservice consolidation of voice, video, and data traffic over a single ATM link is a requirement.

Platforms

This feature is supported on the Cisco 7200 series routers.

Configuration Tasks

The following sections describe how to configure the new features or capabilities supported on the ATM-CES port adapter. The tasks described in these sections are optional:

- Configuring an Available Bit Rate Permanent Virtual Circuit
- Configuring Virtual Path Shaping
- Select Transmit Channels

Configuring an Available Bit Rate Permanent Virtual Circuit

Available bit rate (ABR) is a quality of service class defined by the ATM Forum for ATM networks. ABR is used for connections that do not require timing relationships between source and destination. ABR provides no guarantees in terms of cell loss or delay, providing only best-effort service. Traffic sources adjust their transmission rate in response to information they receive describing the status of the network and its capability to successfully deliver data.

In ABR transmission, the peak cell rate (PCR) specifies the maximum value of the allowed cell rate (ACR), and minimum cell rate (MCR) specifies the minimum value for the ACR. ACR varies between the MCR and the PCR and is dynamically controlled using congestion control mechanisms.

Also, you can optionally configure the amount that the cell transmission rate increases or decreases in response to flow control information from the network or destination for available bit rate (ABR) VCs.

To create an Available Bit Rate (ABR) permanent virtual circuit (PVC), perform the following task beginning in interface configuration mode:

Task		Command
Step 1	Configure an ABR PVC and optionally, specify the peak cell rate (PCR) and minimum cell rate values (MCR). The default PCR value is the line rate, and the default MCR value is 0.	**atm pvc** *vcd vpi vci aal-encap* **abr** [[*pcr*] [*mcr*]] [**oam** *seconds*]
Step 2	Optionally, specify the ABR rate factors. The default increase and decrease rate factor is 1/16.	**atm abr rate-factors** [*rate-increase-factor*] [*rate-decrease-factor*]
Step 3	Associate an existing map list to an interface.	**map-group** *name*

Note For more information on creating PVCs and information on mapping a protocol address to a PVC, refer to the "Configuring ATM" chapter of the *Wide-Area Networking Configuration Guide*.

To display information about the ABR PVC, use the **show atm vc** EXEC command.

For an ABR configuration example, see "Configuration Examples" later in this section.

Configuring Virtual Path Shaping

The ATM-CES port adapter supports multiplexing of one or more virtual circuits (VCs) over a virtual path (VP) that is shaped at a constant bandwidth. To use this feature, you configure a permanent virtual path (PVP) with a specific virtual path identifier (VPI). Any VCs that are created subsequently with the same VPI are multiplexed onto this VP; the traffic parameters of individual VCs are ignored.

The traffic shaping conforms to the peak rate that is specified when you create the VP. Any number of data VCs can be multiplexed onto a VP. However, the number of CES VCs that are multiplexed depends on the bandwidth requirement. Because of this requirement, the CES VCs cannot be oversubscribed.

Note The CES VC fails if there is no bandwidth available. Also, data VCs only get whatever bandwidth is unused by the CES VCs.

To create a PVP, perform the following task in interface configuration mode:

Task		Command
Step 1	Create a PVP and optionally specify the peak rate.	**atm pvp** *vpi* [*peak-rate*]
Step 2	Optionally, create a PVC with a VPI that matches the VPI specified in Step 1.	**atm pvc** *vcd vpi vci aal-encap* [*peak average burst*] [**oam** *seconds*]
Step 3	Exit interface configuration mode.	**exit**
Step 4	Optionally, create a CES PVC with a VPI that matches the VPI specified in Step 1.	**interface cbr** *slot/port* **ces circuit** *circuit-number* **ces pvc** *circuit-number* **interface atm** *slot/port* **vci** *number* **vpi** *number*

The VPI value is the virtual path identifier to be associated with the PVP (valid values are in the range 0 to 255 inclusive). The peak rate argument is the maximum rate (in kbps) at which the PVP is allowed to transmit data. Valid values are in the range 84 kbps to line rate. The default peak rate is the line rate.

When you create a PVP, two VCs are created (VCI 3 and 4) by default. These VCs are created for VP end-to-end loopback and segment loopback OAM support.

The **atm pvc** command is rejected if a non-multiplexed VC with the specified VPI value already exists. This could happen if you first create a VC with a given VPI value and then you subsequently enter this command.

To display information about the PVP, use the **show atm vp** EXEC command.

Note If you change the peak rate online, the ATM port will go down and then back up.

For an VP configuration example, see “Configuration Examples” later in this section.

Select Transmit Channels

You can select the number of transmit channels used by the interface. The **atm max-channels** command can be used to divide the available number (fixed) of transmit descriptors across the configured number of transmit channels.Typically, you think of a one-to-one association between a transmit channel and a VC; however the ATM-CES port adapter supports other types of VCs than data VCs (for example CES VCs). Also, the ATM-CES port adapter can multiplex one or more VCs over a single virtual path (VP) that is shaped, and the VP only requires a single transmit channel. Therefore, the term *transmit channel* is used rather then *virtual circuit*.

To set the number of transmit channels, perform the following task in interface configuration mode:

Task	Command
Select the number of transmit channels.	**atm max-channels** *number*

The maximum burst of packets that are allowed per VC is limited by the number of transmit descriptors allocated per VC. Because the total number of transmit descriptors available is limited by the available SRAM space, configuration of the number of transmit channels for the interface

determines the number of transmit descriptors for each transmit channel. Hence the burst size for each transmit channel is determined by the **atm max-channels** command. For example, for 64 (default) numbers of transmit channels for the interface, 255 transmit descriptors are associated per transmit channel and for 512 numbers of transmit channels for the interface, 31 transmit descriptors are associated per transmit channel.

To display information on the transmit channels, use the **show atm interface atm** EXEC command.

Configuration Examples

The following examples show a typical configuration for an ABR PVC and a PVP.

Available Bit Rate PVC Example

The following example shows a typical ABR PVC configuration for the ATM-CES port adapter on a Cisco 7200 series router. In this example, the default peak cell rate and minimum cell rate is used (default PCR is the line rate and MCR is 0), and the ABR rate increase and decrease factor is set to 32.

```
router(config)# interface atm 4/0
router(config-if)# ip address 1.1.1.1 255.255.255.0
router(config-if)# atm pvc 13 1 13 aal5snap abr
router(config-if)# atm abr rate-factor 32 32
router(config-if)# map-group sanjose1
router(config-if)# no shutdown
router(config-if)# exit
router(config)# exit
```

Virtual Path Shaping Example

The following example shows a typical configuration for the ATM-CES port adapter with VP shaping on a Cisco 7200 series router. In this example, a VP is created with the VPI value of 1 and with a peak rate of 2000 kbps. The subsequent VCs created, one data VC and one CES VC, are multiplexed onto this VP.

```
router(config)# interface atm 6/0
router(config-if)# ip address 2.2.2.2 255.255.255.0
router(config-if)# atm pvp 1 2000
router(config-if)# atm pvc 13 1 13 aal5snap
router(config-if)# map-group sanjose2
router(config-if)# no shutdown
router(config-if)# exit
router(config)# interface cbr 6/1
router(config-if)# ces circuit 0
router(config-if)# ces pvc 0 interface atm6/0 vpi 1 vci 100
router(config-if)# exit
router(config)# exit
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.1 command references.

- **atm abr rate-factor**
- **atm pvc**
- **atm pvp**
- **atm tx-channels**
- **atm max-channels**
- **show atm interface atm**
- **show atm vc**
- **show atm vp**

atm abr rate-factor

To configure the amount that the cell transmission rate increases or decreases in response to flow control information from the network or destination for available bit rate (ABR) virtual circuits (VCs), use the **atm abr rate-factor** interface configuration command. To return to the default, use the **no** form of this command.

atm abr rate-factor [*rate-increase-factor*] [*rate-decrease-factor*]
no atm abr rate-factor [*rate-increase-factor*] [*rate-decrease-factor*]

Syntax Description

rate-increase-factor	(Optional) Factor by which to increase the data rate. The rate increase factor is specified in powers of 2 from 1 to 32768. The default is 16.
rate-decrease-factor	(Optional) Factor by which to decrease the data rate. The rate decrease factor is specified in powers of 2 from 1 to 32768. The default is 16.

Default

ABR rate increase and decrease factor is 16.

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

To configure an ABR VC, use the **atm pvc** command with the **abr** keyword.

To verify the ABR rate factor, use the **show atm interface atm** EXEC command.

Examples

The following example sets the ABR rate factor to 32 for the next cell that is transferred on ATM interface 4/0:

```
interface atm 4/0
 atm abr rate-factor 32 32
```

Related Commands

atm pvc
show atm interface atm

atm pvc

To create a permanent virtual circuit (PVC) and optionally to generate Operation, Administration, and Maintenance (OAM) F5 loopback cells, enable inverse ATM ARP, or configure Available Bit Rate (ABR) mode, use the **atm pvc** interface configuration command. To remove the specified PVC, use the **no** form of this command.

atm pvc *vcd vpi vci aal-encap* [*peak average burst*] | [**abr** [[*pcr*] [*mcr*]]]
[**oam** *seconds*] [**inarp** *minutes*]
no atm pvc *vcd vpi vci aal-encap* [*peak average burst*] | [**abr** [[*pcr*] [*mcr*]]]
[**oam** *seconds*] [**inarp** *minutes*]

Syntax Description

vcd — Virtual circuit descriptor. A unique number that identifies to the processor which VPI-VCI pair to use for a particular packet. Values range from 1 to the value set with the **atm maxvc** command. This feature is required to manage packet transmission. The *vcd* value is not associated with the VPI-VCI pair used for the ATM network cells.

vpi — ATM network virtual path identifier (VPI) of this PVC. This value ranges from 0 through 255. The VPI is an 8-bit field in the header of the ATM cell. The VPI value is unique only on a single link, not throughout the ATM network because it has local significance only. The VPI value must match that of the switch.

Both *vpi* and *vci* cannot be specified as 0; if one is 0, the other cannot be 0.

vci — ATM network virtual channel identifier (VCI) of this PVC, in the range of 0 through one less than the maximum value set for this interface by the **atm vc-per-vp** command. The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network (it has local significance only).

Both *vpi* and *vci* cannot be specified as 0; if one is 0, the other cannot be 0.

aal-encap — ATM adaptation layer (AAL) and encapsulation type.

For the ATM-CES, the values are: **aal5mux**, **aal5nlpid**, **aal5snap**, **ilmi**, and **qsaal**. When specifying **aal5mux**, you must also select one of the following protocols: **apollo**, **appletalk**, **decnet**, **ip**, **ipx**, **vines**, or **xns**.

peak — (Optional) Maximum rate (in kbps) at which this virtual circuit can transmit data. Valid values are in the range from 1 to the line rate.

average — (Optional) Average rate (in kbps) at which this virtual circuit will transmit data. Valid values are in the range from 1 to the peak rate.

burst — (Optional) Value (in the range 1 through 2047) that relates to the maximum number of ATM cells the virtual circuit can transmit to the network at the *peak* rate of the PVC. The actual burst cells equals *burst* * 32 cells, thereby allowing for a burst size of 32 cells to 65504 cells. The largest practical value of *burst* is the maximum transmission unit (MTU) size of the AIP card.

abr *pcr mcr*	(Optional) Configure this PVC as an Available Bit Rate (ABR) PVC with the peak cell rate (PCR) and minimum cell rate (MCR) values specified in kbps. The PCR range is 1 to line rate. The MCR range is 0 to the PCR value. The default PCR value is the line rate, and the default MCR value is 0.
oam *seconds*	(Optional) Specifies how often to generate an OAM F5 loopback cell from this virtual circuit. The default value is 10 seconds.
inarp *minutes*	(Optional) Specifies how often Inverse ARP datagrams will be sent on this virtual circuit. The default value is 15 minutes.

Defaults

If *peak* and *average* rates are omitted, the PVC defaults to the line rate. *Peak* and *average* rates are then equal. By default, the virtual circuit is configured to run as fast as possible.

If the **abr** keyword is selected with no arguments, the default *pcr* value is the line rate, and the default *mcr* value is 0.

If the **oam** keyword is omitted, OAM cells are not generated. If the **oam** keyword is present but the *seconds* value is omitted, the default value of **oam** *seconds* is 10 seconds.

If the **inarp** keyword is missing, inverse ARPs are not generated. If the **inarp** keyword is present, but the timeout value is not given, then inverse ARPs are generated every 15 minutes.

Command Mode

Interface or subinterface configuration

Usage Guidelines

This command was modified in Cisco IOS Release 11.1 CA to support the ATM-CES port adapter and to add the **abr** keyword.

Available bit rate (ABR) is a quality of service class defined by the ATM Forum for ATM networks. ABR is used for connections that do not require timing relationships between source and destination. ABR provides no guarantees in terms of cell loss or delay, providing only best-effort service. Traffic sources adjust their transmission rate in response to information they receive describing the status of the network and its capability to successfully deliver data. In ABR transmission, the PCR specifies the maximum value of the allowed cell rate (ACR), and MCR specifies the minimum value for the ACR. ACR varies between the MCR and the PCR and is dynamically controlled using congesting control mechanisms. If you select the **abr** keyword *peak*, *average*, and *burst* arguments are not available. Also refer to the **atm abr rate-factor** interfaces command to configure the amount that the cell transmission rate increases or decreases in response to flow control information from the network or destination.

The order of command options is important. The **inarp** keyword can be specified either separately or after **oam** has been enabled. The *peak*, *average*, and *burst* arguments cannot be specified after either the **inarp** or the **oam** keywords.

The **atm pvc** command creates a PVC and attaches it to the specified VPI and VCI. Both *vpi* and *vci* cannot be specified as 0; if one is 0, the other cannot be 0. The *aal-encap* argument determines the AAL mode and the encapsulation method used.

Use one of the **aal5mux** encapsulation options to dedicate the specified virtual circuit to a single protocol; use the **aal5snap** encapsulation option to multiplex two or more protocols over the same virtual circuit. Whether you select **aal5mux** or **aal5snap** encapsulation might depend on practical considerations, such as the type of network and the pricing offered by the network. If the network's pricing depends on the number of virtual circuits set up, **aal5snap** might be the appropriate choice. If pricing depends on the number of bytes transmitted, **aal5mux** might be the appropriate choice because it has slightly less overhead.

If you are configuring an SVC, this command is required to configure the PVC that handles the SVC call setup and termination. In this case, specify **qsaal** for the *aal-encap* argument.

The router generates and echoes OAM F5 loopback cells, which verify connectivity. After OAM cell generation is enabled, a cell is transmitted periodically. The remote end must respond by echoing back the cells.

The router does not generate alarm indication signal (AIS) cells, which are used for alarm surveillance functions. However, if it receives an AIS cell, it responds by sending an OAM Far-end Remote Failure (FERF) cell.

Example

The following example configures the PVC as an ABR using the default the peak cell rate (the line rate) and the default minimum cell rate:

```
interface atm 2/0
atm pvc 13 1 13 all5snap abr
```

Related Commands

atm abr rate-factor

atm pvp

To create a permanent virtual path (PVP) used to multiplex (or bundle) one or more VCs (especially CES and data VCs), use the **atm pvp** interface command. To remove a permanent virtual path, use the **no** form of this command.

atm pvp *vpi* [*peak-rate*]
no atm pvp *vpi*

Syntax Description

vpi	ATM network virtual path identifier (VPI) of the VC to multiplex on the permanent virtual path. The range is 0 to 255. The VPI is an 8-bit field in the header of the ATM cell. The VPI value is unique only on a single link, not throughout the ATM network because it has local significance only. The VPI value must match that of the switch. The number specified for the *vpi* must not already exist. If the number specified for the *vpi* is already being used by an existing VC, this command is rejected.
peak-rate	Maximum rate in kbps at which the PVP can transmit data. The range is 84 kbps to line rate. The default is the line rate.

Default

PVP is not configured.

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

The ATM-CES port adapter supports multiplexing of one or more VCs over a virtual path that is shaped at a constant bandwidth. For example, you can buy a virtual path service from an ATM service provider and multiplex both the CES and data traffic over the virtual path.

All subsequently created VCs with a *vpi* matching the *vpi* specified with the **atm pvp** command are multiplexed onto this PVP. This PVP connection is an ATM connection where switching is performed on the VPI field of the cell only. A PVP is created and left up indefinitely. All VCs that are multiplexed over a PVP share and are controlled by the traffic parameters associated with the PVP.

Changing the *peak-rate* causes the ATM-CES port adapter to go down and then back up.

When you create a PVP, two VC are created (VCI 3 and 4) by default. These VCs are created for VP end-to-end loopback and segment looback OAM support.

To verify the configuration of a PVP, use the **show atm vp** EXEC command.

Examples

The following example creates a permanent virtual path with a peak rate of 2000 kbps. The subsequent VC created are multiplexed onto this virtual path.

```
interface atm 6/0
 atm pvp 1 2000
 atm pvc 13 1 13 aal5snap
 exit
interface cbr 6/1
 ces circuit 0
 ces pvc 9 interface atm6/0 vpi 1 vci 100
 exit
```

Related Commands

show atm vp

atm tx-channels

The **atm max-channels** command replaces this command.

atm max-channels

To configure the number of transmit channels for the interface, use the **atm max-channels** interface configuration command. To return to the default, use the **no** form of this command.

atm max-channels *number*
no atm max-channels

Syntax Description

number	Maximum number of transmit channels for the interface. The range is 8 to 2048 channels.

Default

64 channels

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

Note The **atm max-channels** command replaces the **atm tx-channels** command.

The **atm max-channels** command can be used to divide the available number (fixed) of transmit descriptors across the configured number of transmit channels.Typically, you think of a one-to-one association between a transmit channel and a VC; however, the ATM-CES port adapter supports other types of VCs than data VCs (for example CES VCs). Also, the ATM-CES port adapter can multiplex one or more VCs over a single virtual path (VP) that is shaped, and the VP only requires a single transmit channel. Therefore, the term *transmit channel* is used rather then *virtual circuit*.

The maximum burst of packets that are allowed per VC is limited by the number of transmit descriptors allocated per VC. Because the total number of transmit descriptors available is limited by the available SRAM space, configuration of the number of transmit channels for the interface determines the number of transmit descriptors for each transmit channel. Hence the burst size for each transmit channel is determined by the **atm max-channels** command. For example, for 64 (default) numbers of transmit channels for the interface, 255 transmit descriptors are associated per transmit channel and for 512 numbers of transmit channels for the interface, 31 transmit descriptors are associated per transmit channel.

To display information about the transmit descriptors, use the **show atm interface atm** EXEC command.

Examples

The following example sets the number of transmit descriptors for the interface to 120.

```
interface atm 2/0
 atm max-channels 120
```

Related Commands

show atm interface atm

show atm interface atm

To display ATM-specific information about an ATM interface, use the **show atm interface atm** privileged EXEC command.

show atm interface atm *slot/port*

Syntax Description

slot/port	Slot number and port number of the interface.

Command Mode

Privileged EXEC

Usage Guidelines

This command was modified in Cisco IOS Release 11.1 CA to include sample output from the ATM-CES port adapter.

Sample Display

The following is sample output from the **show atm interface atm** command to display statistics on slot 6, port 0:

```
Router# show atm interface atm 6/0
ATM interface ATM6/0:
AAL enabled:  AAL5, Maximum VCs: 2048, Current VCCs: 3
Maximum Transmit Channels: 64
Tx buffers 256, Rx buffers 256, Exception Queue: 32, Raw Queue: 32
VP Filter: 0x7B, VCIs per VPI: 1024, Max. Datagram Size:4496
PLIM Type:SONET - 155Mbps, TX clocking: INTERNAL
0 input, 59 output, 0 IN fast, 0 OUT fast
ABR parameters, rif: 16 rdf: 16
Config. is ACTIVE
```

Table 12 describes the fields shown in the display.

Table 12 Show ATM Interface ATM Field Descriptions

Field	Description
ATM interface	Slot and port number of the interface.
AAL enabled	Type of AAL. If both AAL5 and AAL3/4 are enabled on the interface, the output will include both AAL5 and AAL3/4.
Maximum VCs	Maximum number of virtual circuits this interface can support.
Current VCs	Number of active virtual circuits.
Maximum Transmit Channels	Number of transmit channels for this interface.
Tx buffers, Rx buffers	Number of transmit and receive buffers.
Exception Queue	Number of exception buffers.
Raw Queue	Queue size.
VP Filter	Hexadecimal value of the VP filter.

Table 12 Show ATM Interface ATM Field Descriptions (Continued)

Field	Description
VCIs per VPI	Maximum number of VCIs to support per VPI.
Max Datagram Size	The configured maximum number of bytes in the largest datagram.
PLIM Type	Physical Layer Interface Module (PLIM) type (SONET).
TX clocking	Clocking on the router. This might be INTERNAL indicating that the interface generates the clock, or LINE indicating that the ATM switch provides the clocking.
input	Number of packets received and process-switched.
output	Number of packets sent from process switch.
IN fast	Number of input packets fast-switched.
OUT fast	Number of output packets fast-switched.
ABR parameters, rif rdf	The amount that the cell transmission rate increases or decreases in response to flow control information form the network or destination for Available Bit Rate PVCs. The rate increase factor (RIF) and rate decrease factor (RDF) in this example are 16, the default.
Config. is	ACTIVE or VALID in *n* SECONDS. ACTIVE indicates that the current configuration has been loaded into the interface and is being used. There is a 5-second window when a user changes a configuration and the configuration is sent to the interface.

Related Commands

atm pvc

show atm vc

To display all active ATM virtual circuits (PVCs and SVCs) and traffic information, use the **show atm vc** privileged EXEC command.

show atm vc [*vcd*]

Syntax Description

vcd	(Optional) Specifies which virtual circuit to display information about.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 10.0.

This command was modified in Cisco IOS Release 11.1 CA to include a sample display for the ATM-CES port adapter.

If no *vcd* value is specified, the command displays information for all PVCs and SVCs. The output is in summary form (one line per virtual circuit).

Sample Displays

The following is sample output from the **show atm vc** command when no *vcd* value is specified, displaying statistics for all PVCs for an ATM-CES port adapter on a Cisco 7200 series router. The status field is either ACTIVE or INACTIVE.

```
Router# show atm vc
                                        AAL /         Peak   Avg.  Burst
Interface     VCD   VPI   VCI Type  Encapsulation  Kbps   Kbps  Cells Status
ATM6/0          1     0    16  PVC  AAL5-ILMI     155000 155000    94 ACTIVE
ATM6/0          2     0     5  PVC  AAL5-SAAL     155000 155000    94 ACTIVE
ATM6/0.1      303     0   282  SVC  LANE-LES      155000 155000    32 ACTIVE
ATM6/0.1      304     0   281  SVC  LANE-LEC      155000 155000    32 ACTIVE
ATM6/0.1      307     0   286 MSVC  LANE-LEC      155000 155000    32 ACTIVE
ATM6/0.1      308     0   285 MSVC  LANE-LES      155000 155000    32 ACTIVE
ATM6/0.1      309     0   288  SVC  LANE-BUS      155000 155000    32 ACTIVE
ATM6/0.1      310     0   287  SVC  LANE-LEC      155000 155000    32 ACTIVE
ATM6/0.1      311     0   290 MSVC  LANE-LEC      155000 155000    32 ACTIVE
ATM6/0.1      312     0   289 MSVC  LANE-BUS      155000 155000    32 ACTIVE
ATM6/0.1      314     0   292  SVC  LANE-LES      155000 155000    32 ACTIVE
ATM6/0.1      315     0   293  SVC  LANE-BUS      155000 155000    32 ACTIVE
```

The following is sample output from the **show atm vc** command when a *vcd* value *is* specified, displaying statistics for that virtual circuit only.

```
Router# show atm vc 8

ATM4/0: VCD: 8, VPI: 8, VCI: 8, etype:0x0, AAL5 - LLC/SNAP, Flags: 0x30
PeakRate: 0, Average Rate: 0, Burst: 0 *32cells, VCmode: 0xE000
InPkts: 181061, OutPkts: 570499, InBytes: 757314267, OutBytes: 2137187609
InPRoc: 181011, OutPRoc: 10, Broadcasts: 570459
InFast: 39, OutFast: 36, InAS: 11, OutAS: 6
```

The following is sample output from the **show atm vc** command when a *vcd* value is specified for a CES circuit:

```
Router# show atm vc 2
ATM6/0: VCD: 2, VPI: 10, VCI: 10, etype:0x0, CES - AAL1, Flags: 0x20138
PeakRate: 2310, Average Rate: 2310, Burst Cells: 94, VCmode: 0x0
OAM DISABLED, InARP DISABLED
Received Cells: 0, Transmit Cells: 334272
Status: ACTIVE
```

The following is sample output from the **show atm vc** command when generation of OAM F5 loopback cells has been enabled.

```
Router# show atm vc 7
ATM4/0: VCD: 7, VPI: 7, VCI: 7, etype:0x0, AAL5 - LLC/SNAP, Flags: 0x30
PeakRate: 0, Average Rate: 0, Burst: 0 *32cells, VCmode: 0xE000
OAM frequency: 10, InARP DISABLED
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc:0, Broadcast:0
InFast:0, OutFast:0, InAS:0, OutAS:0
OAM F5 cells sent: 1, OAM cells received: 0
```

The following is sample output from the **show atm vc** command for an incoming multipoint virtual circuit.

```
Router# show atm vc 3
ATM2/0: VCD: 3, VPI: 0, VCI: 33, etype:0x809B, AAL5 - MUX, Flags: 0x53
PeakRate: 0, Average Rate: 0, Burst: 0, VCmode: 0xE000
OAM DISABLED, InARP DISABLED
InPkts: 6646, OutPkts: 0, InBytes: 153078, OutBytes: 0
InPRoc: 6646, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
interface =  ATM2/0, call remotely initiated, call reference = 18082
vcnum = 3, vpi = 0, vci = 33, state = Active
 aal5mux vc, multipoint call
Retry count: Current = 0, Max = 10
timer currently inactive, timer value = never
Root Atm Nsap address: DE.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
```

The following is sample output from the **show atm vc** command for an outgoing multipoint virtual circuit.

```
Router# show atm v 6
ATM2/0: VCD: 6, VPI: 0, VCI: 35, etype:0x800, AAL5 - MUX, Flags: 0x53
PeakRate: 0, Average Rate: 0, Burst: 0, VCmode: 0xE000
OAM DISABLED, InARP DISABLED
InPkts: 0, OutPkts: 818, InBytes: 0, OutBytes: 37628
InPRoc: 0, OutPRoc: 0, Broadcasts: 818
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
interface =  ATM2/0, call locally initiated, call reference = 3
vcnum = 6, vpi = 0, vci = 35, state = Active
 aal5mux vc, multipoint call
Retry count: Current = 0, Max = 10
timer currently inactive, timer value = never
Leaf Atm Nsap address: DE.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
Leaf Atm Nsap address: CD.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
```

Table 13 describes the fields shown in the displays.

Table 13 Show ATM VC Field Descriptions

Field	Description
Intfc.	Interface slot and port.
VCD	Virtual circuit descriptor (virtual circuit number).
VPI	Virtual path identifier.
VCI	Virtual channel identifier.
Type	Type of virtual circuit, either PVC or SVC.
AAL/Encaps	Type of ATM adaptation layer (AAL) and encapsulation.
etype	Ethernet type.
Flags	Bit mask describing virtual circuit information. The flag values are summed to result in the displayed value. 0x40 SVC 0x20 PVC 0x10 ACTIVE 0x1 AAL5-SNAP 0x2 AAL5-NLPID 0x3 AAL5-FRNLPID 0x4 AAL5-MUX 0x5 AAL3/4-SMDS 0x6 QSAAL
PeakRate	Number of packets transmitted at the peak rate.
Average Rate	Number of packets transmitted at the average rate.
Burst	Value that, when multiplied by 32, equals the maximum number of ATM cells the virtual circuit can transmit at the peak rate of the virtual circuit.
VCmode	AIP-specific or NPM-specific register describing the usage of the virtual circuit. Contains values such as rate queue, peak rate, and AAL mode, which are also displayed in other fields.
InPkts	Total number of packets received on this virtual circuit. This number includes all silicon-switched, fast-switched, autonomous-switched, and process-switched packets.
OutPkts	Total number of packets sent on this virtual circuit. This number includes all silicon-switched, fast-switched, autonomous-switched, and process-switched packets.
InBytes	Total number of bytes received on this virtual circuit. This number includes all silicon-switched, fast-switched, autonomous-switched, and process-switched bytes.
OutBytes	Total number of bytes sent on this virtual circuit. This number includes all silicon-switched, fast-switched, autonomous-switched, and process-switched bytes.
InPRoc	Number of process-switched input packets.
OutPRoc	Number of process-switched output packets.
Broadcast	Number of process-switched broadcast packets.
InFast	Number of fast-switched input packets.

Table 13 Show ATM VC Field Descriptions (Continued)

Field	Description
OutFast	Number of fast-switched output packets.
InAS	Number of autonomous-switched or silicon-switched input packets.
OutAS	Number of autonomous-switched or silicon-switched output packets.
OAM frequency: 10	OAM cells are sent every 10 seconds.
OAM F5 cells sent: 1	Number of OAM cells sent on this virtual circuit.
OAM cells received: 0	Number of OAM cells received on this virtual circuit.

Related Command

atm pvc

show atm vp

To display the statistics for all virtual paths (VP) on an interface or for a specific VP, use the **show atm vp** privileged EXEC command.

show atm vp [*vpi*]

Syntax Description

vpi	(Optional) ATM network virtual path identifier (VPI) of the permanent virtual path. The range is 0 to 255. The VPI is an 8-bit field in the header of the ATM cell.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

Example

The following is sample output from the **show atm vp** command. This output shows the interface name, the status of the interface, the administrative status of the interface, the port type, and the number of channels in use on the interface. The status of the interface can be UP (in operation) or DOWN (not in operation).

```
Router# show atm vp 1
ATM6/0  VPI: 1, PeakRate: 155000, CesRate: 1742, DataVCs: 1, CesVCs:1, Status: ACTIVE

     VCD    VCI   Type   InPkts   OutPkts   AAL/Encap     Status
     1      100   PVC    n/a      n/a       CES-AAL1      ACTIVE
     13     13    PVC    0        0         AAL5-SNAP     ACTIVE
     409    3     PVC    0        0         F4 OAM        ACTIVE
     410    4     PVC    0        0         F4 OAM        ACTIVE

   TotalInPkts: 0, TotalOutPkts: 0, TotalInFast: 0, TotalOutFast: 0, TotalBroadcasts: 0
```

Table 14 describes the fields shown in the display.

Table 14 Show ATM VP Field Descriptions

Field	Description
ATM6/0	Interface type, slot, and port number of the VP.
VPI	Virtual path identifier of the VP.
PeakRate	Maximum rate in kbps at which the VP can transmit data. Range is 84 kbps to line rate. The default is the line rate.
CesRate	Total CES bandwidth allocated for the VP.
DataVCs	Number of data VCs on the VP.
CesVCs	Number of CES VC on the VP.
Status	Current status of the VP. Values are ACTIVE or INACTIVE.

Table 14 Show ATM VP Field Descriptions (Continued)

Field	Description
VCD	Virtual circuit descriptor of the VC associated with this VP.
VCI	Virtual channel identifier of the VC associated with this VP.
Type	Type of VC associated with this VP. Values are PVC or SVC.
InPkts	Number of packets received on the VP.
OutPkts	Number of packets transmitted on the VP.
AAL/Encap	Type of encapsulation used on the VC associated with this VP.
Status	Status of the VP (ACTIVE or INACTIVE).
TotalInPkts:	Total number of input packets process-switched and fast-switched on the VP.
TotalOutPkts:	Total number of output packets process-switched and fast-switched on the VP.
TotalInFast	Total number of input packets fast-switched.
TotalOutFast:	Total number of output packets fast-switched.
TotalBroadcasts:	Total number of broadcast packets fast-switched.

Related Commands

atm pvp

What to Do Next

For more information on the ATM-CES port adapter, refer to the *PA-A2 ATM-CES Port Adapter Installation and Configuration* publication. Also refer to the "PA-A1 ATM-CES Port Adapter" section in this document.