Unspecified Bit Rate Plus and ATM Enhancements

Feature History

Release	Modification
12.2(2)XB	The UBR+ and ATM Enhancements for Service Provider Integrated Access feature was introduced for the Cisco 2600 series and Cisco MC3810.
12.2(8)T	This feature was integrated into the Cisco IOS Release 12.2(8)T

This document describes the Unspecified Bit Rate plus (UBR+) and ATM Enhancements for Service Provider (SP) Integrated Access feature in Cisco IOS Release 12.2(8)T. It includes the following sections:

- Glossary, page 14

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.

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.

Feature Overview

The UBR+ and ATM Enhancements for SP Integrated Access feature includes the following:

- UBR+ functionality
- Proportional allocation of excess bandwidth
- Oversubscription of the Cisco MC3810-MFT T1/E1 trunk and similar ATM-capable VWIC-1MFT-E1 and VWIC-1MFT-T1 interfaces offered on the Cisco 2600 series

Note This feature is not supported on the UBR+ and ATM Enhancements for SP Integrated Access non-VWIC WICs.

These enhancements permit the oversubscription of ATM trunks for UBR+ permanent virtual circuits (PVCs).

UBR+ supports a zero committed information rate (CIR) with infinite burst capabilities up to an entire T1/E1. It allows any available network bandwidth to be continuously usable by any data application. For this feature, all data traffic in the network uses UBR+ end to end. The zero CIR with infinite burst feature is exclusive to data traffic and is implemented for AAL5 only.

When UBR CPE to ATM switch (not the UBR+ and ATM Enhancements for SP Integrated Access feature) is configured, a file transfer from one virtual circuit (VC) utilizes the entire trunk bandwidth when no other VCs (data or voice) are active. When other VCs become active with fixed CIRs, because UBR+ is not configured, the new VCs are not guaranteed their intended CIR. UBR+ resolves this by reallocating the configured CIRs to guarantee that all VCs achieve the appropriate throughput. If there is any remaining bandwidth, bursting up to that availability is still permitted.

Because UBR allows for a continuous burst, bandwidth could be conserved by assigning a UBR class of service (CoS) to the VC. However, UBR has a variable bit rate (VBR) that constrains the burst period to a maximum burst size (MBS), rather than allowing a continuous burst. The UBR+ and ATM Enhancements for SP Integrated Access feature does not have an MBS constraint.

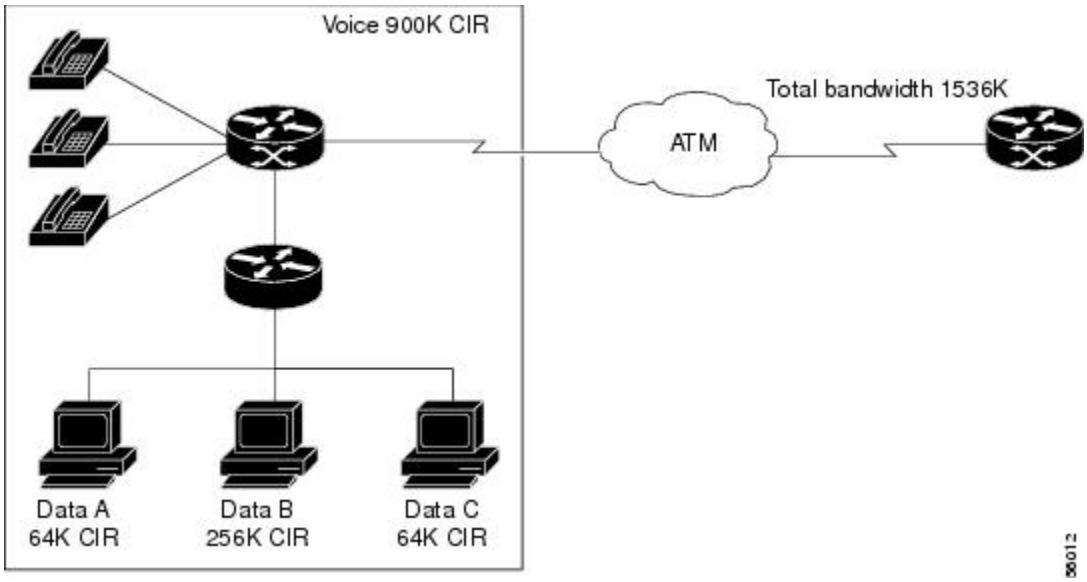
Policing and Shaping for Guaranteed Bandwidth

In addition to allowing data applications to burst without limitation up to entire T1/E1, a guaranteed minimum bandwidth per virtual circuit (VC) should be permitted for UBR sessions to ensure that the bandwidth of all

UBR+ VCs are equal to their relative configured minimum cell rate (MCR). Each VC should be able to have a defined amount of guaranteed bandwidth. The UBR+ and ATM Enhancements for SP Integrated Access feature supports a maximum total ATM bandwidth of 1536K on an ATM trunk. Many different configurations are allowable, such as the one shown in the figure below.

Note The policing and shaping for the guaranteed bandwidth enhancement is exclusive to UBR data traffic and is implemented for AAL5.

Figure 1: For UBR+ the Maximum Total ATM Bandwidth on an ATM Trunk Is 1536K



The table shown in the figure below shows the offered load and allocated bandwidth for three VCs using UBR+ called Data A, Data B, and Data C. During time 0 to time 2, there is no voice traffic and bandwidth is allocated for the three VCs as each requires. During time 3 to time 5, the voice VC carries traffic of 900 Kbps. Because voice traffic has a higher precedence over data traffic, 900 Kbps out of a total of 1536 Kbps are reserved for voice. The remaining 636 Kbps are shared by Data A, Data B, and Data C.

Bandwidth sharing begins with an allotment of CIRs to the individual data VCs. This is reflected in the Data A, Data B, and Data C "allocated bandwidth" columns in the figure below. Depending on the offered load, each event shows either the CIR or the total CIR and free bandwidth for the data VC. Next, the excess bandwidth

is computed by subtracting the sum of CIRs of data VCs from 636 Kbps. The excess bandwidth is then equally shared by all of the data VCs that are carrying traffic.

Figure 2: Offered Load and Allocated Load with and Without Voice Traffic

		UBR+		UBR+		UBR+							
Event		Data A		Data B		Data C		total Data		Voice		Total	
	CIR	64		256		64		384		900		1284	
		offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w
file transfer	time=0	1536	1536	0	0	0	0	1536	1536	0	0	1536	1536
inventory update	time=1	1280	1280	256	256	0	0	1536	1536	0	0	1536	1536
credit auth	time=2	1216	1216	256	256	64	64	1536	1536	0	0	1536	1536
20 G.726 calls	time=3	1172	316	256	256	64	64	1492	636	900	900	2392	1536
proporational share	time=4	960	190	512	382	64	64	1536	636	900	900	2436	1536
credit auth stops	time=5	992	222	544	414	0	0	1536	636	900	900	2436	1536

Each event time unit is described in further detail below:

Table 1: Time Event Table for Offered and Allocated Loads with and Without Voice Traffic

Time	Event
Time = 0	A file transfer occurs across VC A and occupies all trunk bandwidth. The VC is only guaranteed 64 Kbps, but because there is no competing traffic and the VC is allowed to burst, all of 1536K trunk bandwidth is allocated to VC A. Note that because VC A is a UBR+ circuit, it has a CIR.
Time = 1	In addition to the file transfer, an inventory update application occurs across VC B. The inventory application requires 256K and the VC is guaranteed 256K. In this case, the external router throttles the file transfer VC. Because the total offered load does not exceed the trunk bandwidth, the VCs are serviced at their offered load.
Time = 2	A credit authorization application occurs across VCC and uses 64 Kbps. Again, the external router throttles the offered load to fit within the trunk bandwidth. At this point, all offered loads are allocated.

Time	Event
Time = 3	Twenty G.726 voice calls are initiated and use 900K. The external router is still offering 1536K. The combined data and voice offered load cannot fit across the ATM trunk, so the access device must throttle and shape the offered data load. Because Data B and Data C are offering load at their committed rate, they are not throttled. Data A is bursting above its minimum, and its throughput reduces to accommodate the voice load. At this point, a typical TCP/IP file transfer would throttle back to the delivered throughput, but the traffic might also be a User Datagram Protocol (UDP) stream that might not throttle back and instead offer a continuous load.
Time = 4	The inventory update application begins to offer more than 256 Kbps of load. The external router prioritizes the inventory application and adjusts its queuing. At this point, multiple PVCs are competing for excess unsubscribed bandwidth. There are only 252 Kbps of unsubscribed bandwidth, and it is allocated on a round-robin basis. Because two PVCs are competing for the excess bandwidth, they each get half of the excess. Each bursting PVC's throughput is its CIR plus half of the unsubscribed bandwidth. Data A gets 64K and 126K, for a total of 190K. Data B gets 256K and 126K, for a total of 382K.
Time = 5	The credit authorization application stops. The 64K bandwidth it was using goes back to the unsubscribed or unallocated pool, and is r-allocated to the bursting PVCs. Again, the allocation is round-robin, so Data A and Data B get another 32K each.

Fair Sharing of Unsubscribed and Non-Allocated Bandwidth

In addition to guaranteeing a minimum rate while allowing unlimited bursting, control over how excess bandwidth is applied to bursting PVCs must be exercised. Without the fair sharing of unsubscribed and unused bandwidth, bandwidth is allocated to bursting PVCs on a round-robin basis. PVCs are serviced at their minimum rate, and a traffic-shaping algorithm provides cells to each bursting PVC in sequence.

With the UBR+ and ATM Enhancements for SP Integrated Access feature, a weight is used for the allocation of bursting cells that is based on the CIR of each PVC. This fair sharing of unsubscribed bandwidth is applicable to AAL5-based data traffic.

The table in the figure below is essentially the same as the table in "Policing and Shaping for Guaranteed Bandwidth" section. The difference is the manner in which data VCs share excess bandwidth. Excess bandwidth is not shared equally among competing traffic. Instead, it is shared in proportion to the CIRs of the VCs. For example, if Data A has a CIR of 64 Kbps and Data B has a CIR of 256 Kbps, and there is 252 Kbps excess

bandwidth, then the excess bandwidth is shared 1:4 by the Data A and Data B VCs. Therefore, Data A is allocated 51 Kbps, and Data B is allocated 201 Kbps.

This application could still be addressed with constant bit rate plus (CBR+) CoS assigned to the PVCs. However, a special implementation of the traffic shaping algorithm would be responsible for the fair weighted allocation of unsubscribed and unused bandwidth to the bursting PVCs.

Note With a lower CIR, Data A in the table in the figure below receives proportionally less bandwidth than Data B. Variable Bit Rate real time (VBRrt) class Voice receives all the bandwidth required.

Figure 3: Offered Load and Allocated Load with Excess Bandwidth Shared in Proportion to the CIRs of the VCs

		UBR+		UBR+									
Event		Data A		Data B		Data C		total Data		Voice		Total	
	CIR	64		256		64		384		900		1284	
		offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allocate b/w
file transfer	time=0	1536	1536	0	0	0	0	1536	1536	0	0	1536	153
inventory update	time=1	1280	1280	256	256	0	0	1536	1536	0	0	1536	153
credit auth	time=2	1216	1216	256	256	64	64	1536	1536	0	0	1536	153
20 G.726 calls	time=3	1216	316	256	256	64	64	1536	636	900	900	2436	153
proporational share	time=4	960	115	512	457	64	64	1536	636	900	900	2436	153
credit auth stops	time=5	992	128	544	508	0	0	1536	636	900	900	2436	153

Each event time unit is described in further detail below:

Table 2: Time Event Table for Offered and Allocated Loads with Excess Bandwidth

Time	Event
Time = 0, 1, 2, 3	While only one PVC is bursting, it gets all remaining bandwidth.
Time = 4	Two PVC's (Data A and Data B) are bursting. The unsubscribed and unused bandwidth is shared among them with respect to their CIR. There is 252 Kbps of unsubscribed bandwidth. Data B gets four times as much of that excess bandwidth as does Data A. So Data B gets an additional 201K and Data A gets an additional 51K.
Time = 5	After the PVCs are serviced at their minimum rate, 316K of unsubscribed and unused bandwidth is available. So Data B gets 252K and Data A gets 64K of additional bandwidth.

Oversubscription of WAN Uplink

Another element to consider is the oversubscription of the Frame Relay service. The intent of all oversubscription schemes is to assign a relative ranking between PVCs that are offering load. If all PVCs offer load, then their allocated bandwidths reflect their relative CIRs, even if they cannot be met. If there is a mix of PVCs offering load and PVCs not offering load, then the relative committed rates of the PVCs not offering load are sustained.

In the table in the figure below, the cumulative CIR of the VCs' exceed line rate is 1536 Kbps. However, the total bandwidth of the WAN link cannot exceed the line rate of 1536 Kbps. If all the VCs are carrying load and the data VCs cannot get bandwidth equal to their CIR, then the bandwidth allotted to the data VCs will be reduced relative to their CIR values.

The implementation of the oversubscription of the WAN uplink is configurable on a per-VC basis and is applicable to voice (VBRrt, CBR/AAL2) and data (UBR, UBR+, CBR, Variable Bit Rate non real time (VBRnrt)/AAL5) traffic.

Note For the UBR+ and ATM Enhancements for SP Integrated Access feature, voice VC is allotted 900 Kbps, and the total available bandwidth of the WAN uplink can never be exceeded.

Figure 4: Offered Load and Allocated Load with Oversubscription Frame Relay

		UBR+		UBR+		UBR+							
Event		Data A		Data B		Data C		total Data		Voice		Total	
	CIR	64		256		512		832		900		1732	
		offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allocated b/w	offered load	allo b
file transfer	time=0	1536	1536	0	0	0	0	1536	1536	0	0	1536	
inventory update	time=1	1280	1280	256	256	0	0	1536	1536	0	0	1536	
credit auth	time=2	1216	1216	256	256	64	64	1536	1536	0	0	1536	
20 G.726 calls	time=3	1172	316	256	256	64	64	1492	636	900	900	2392	
proporational share	time=4	960	115	512	457	64	64	1536	636	900	900	2436	
credit auth stops	time=5	992	128	544	508	0	0	1536	636	900	900	2436	
inventory ends/credit increases	time=6	1024	124	0	0	512	512	1536	636	900	900	2436	
credit bursts above CIR	time=7	768	70	0	0	768	566	1536	636	900	900	2436	
all pvc burst	time=8	384	48	384	196	768	392	1536	636	900	900	2436	

Each event time unit is described in further detail below:

Table 3: Time Event Table for Offered and Allocated Loads with Oversubscription Frame Relay

Time	Event
Time = 0, 1, 2, 3, 4, 5	The same conditions as previously described exist. The guaranteed minimums are oversubscribed, but because Data C is offering load at much less than its CIR, all PVCs are serviced by at least their CIRs, and unused bandwidth is "fairly weighted" among the bursting PVCs. Because Data B has a higher CIR, it gets more of the unused bandwidth than Data A does.9
Time = 6	The inventory update application ends, and the credit authorization application increases its offered load to 512K. At this point, each PVC can be serviced at its CIR. Only Data A PVC is bursting, and it gets the unused bandwidth. If Data C PVC had been provisioned without oversubscription, it would have been assigned 316K and would have been allocated unused bandwidth at five times the rate of Data A.
Time = 7	The credit authorization bursts above its CIR and takes excess bandwidth from Data A.
Time = 8	All data PVCs are bursting above their CIR, and the combined CIR cannot be met. The voice PVC is serviced first because it is a higher class of service (VBRrt versus UBR+). When the voice PVC is serviced, 636K of bandwidth has to be shared by data PVCs with a combined CIR of 832K. Because the CIR minimum cannot be met, the PVCs are serviced at a rate that reflects their relative CIRs.

Benefits

- Provides unique class of service (CoS) categories for service product differentiation
- Optimizes excess bandwidth
- Permits overprovisioning and oversubscription of available bandwidth
- Provides ATM as a WAN technology. Among the many fundamental benefits of deploying ATM and its applications in a WAN are:
    - Advanced statistical multiplexing
    - Bandwidth optimization
    - Multiservice traffic aggregation

Restrictions

This feature must be used with the ATM software segmentation and reassembly (SAR) feature. It cannot be ported to the following interfaces:

- ATM SAR Advanced Integration Module (AIM)
- SAR and Digital Signal Processor (DSP) AIM
- Multiport T1/E1 ATM network modules with inverse multiplexing over ATM on Cisco 2600 and Cisco 3600 series routers
- ATM OC-3 network module for Cisco 3600 series routers
- Cisco IOS release 12.2(2)XB or higher

Related Features and Technologies

ATM segmentation and reassembly (SAR)

Related Documents

- *ATM Segmentation and Reassembly (SAR)*
- Cisco IOS Voice, Video, and Fax Configuration Guide, Release 12.2
- Cisco IOS Voice, Video, and Fax Command Reference, Release 12.2
- Cisco IOS Interface Command Reference, Release 12.2
- Cisco IOS Interface Configuration Guide, Release 12.2

Supported Platforms

- Cisco 2600 series
- Cisco MC3810

Supported Standards and MIBs and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

No new or modified MIBs are supported by this feature.

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 PVC trap support, you must configure SNMP support and an IP routing protocol on your router. See the "ATM Configuration Examples" section.

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 *Cisco IOS IP Routing Protocols Configuration Guide*.

To receive PVC failure notification and access to PVC status tables on your router, you must have the Cisco PVC trap MIB called CISCO-IETF-ATM2-PVCTRAP-MIB.my compiled in your NMS application. You can find this MIB on the Web at Cisco's MIB websiteat the URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

Configuration Tasks

Configuring UBR Plus PVCs

SUMMARY STEPS

1. Router(config)# **interface atm0** [*subinterface-number* [**multipoint** | **point-to-point**]]
2. Router(config-subif)# **pvc** *name vpi/vci*[**ilmi**| **qsaal**| **smds**]
3. Router(config-if-atm-vc)# **ubr+** *output-pcr output-mcr*[*input-pcr*] [*input-mcr*]
4. Router(config-if-atm-vc)# **no shutdown**

DETAILED STEPS

	Command or Action	Purpose
Step 1	Router(config)# **interface atm0** [*subinterface-number* [**multipoint** | **point-to-point**]]	Enters interface configuration mode to configure ATM interface or an ATM subinterface, such as 0/0.1. The default for subinterfaces is **multipoint.**
Step 2	Router(config-subif)# **pvc** *name vpi/vci*[**ilmi**| **qsaal**| **smds**]	Creates a signaling PVC that carries signaling to establish an switched virtual circuit (SVC). For example: Router(config-if)# **pvc atm1 100/100**

	Command or Action	Purpose
		The arguments for this command have the following meanings: *name* --*(Optional)* The name of the PVC or map. The name can be up to 16 characters long. *vpi/* --ATM network virtual path identifier (VPI) for this PVC. The absence of the "/" and a vpi value defaults the vpi value to 0. The arguments vpi and vci cannot both be set to 0; if one is 0, the other cannot be 0. *vci* --ATM network virtual channel identifier (VCI) for this PVC. This value ranges from 0 to 1 less than the maximum value set for this interface by the atm vc-per-vp command. Typically, lower values 0 to 31 are reserved for specific traffic (for example, F4 OAM, SVC signaling, Interim Local Management Interface (ILMI), and so on) and should not be used. 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--because it has local significance only. The arguments vpi and vci cannot both be set to 0; if one is 0, the other cannot be 0. **ilmi** --*(Optional)* Used to set up communication with the ILMI; the associated vpi and vci values ordinarily are 0 and 16, respectively. **qsaal** --*(Optional)* A signaling-type PVC used for setting up or tearing down SVCs; the associated vpi and vci values ordinarily are 0 and 5, respectively.
Step 3	Router(config-if-atm-vc)# **ubr+** *output-pcr output-mcr*[*input-pcr*] [*input-mcr*]	Specifies the output peak cell rate (PCR) and output guaranteed minimum cell rate (MCR) for an ATM permanent virtual circuit (PVC), switched virtual circuit (SVC), VC class, or VC bundle member.
Step 4	Router(config-if-atm-vc)# **no shutdown**	Ensures that interface is activated.

Verifying the Addition of the UBR Plus PVC

To verify that the UBR+ PVC was created use the **show atm pvc** command. The following is an example output:

```
Router# show atm pvc
VCD/
Interface Name VPI VCI Type Encaps SC   Kbps Kbps Cells Sts
0/0.1     atm1 100 100 PVC  SNAP   UBR+ 1536 786  UP    ( 786)
```

Note The PVC is added with 768 Kbps of guaranteed bandwidth.

Troubleshooting Tips

To troubleshoot the ATM and IMA group configuration, enter the **ping** command, which checks host reachability and network connectivity. This command can confirm basic network connectivity on the AppleTalk, ISO CLNS, IP, Novell, Apollo, VINES, DECnet, or XNS networks.

For IP, the **ping** command sends ICMP (Internet Control Message Protocol) Echo messages. If a station receives an ICMP Echo message, it sends an ICMP Echo Reply message back to the source.

The extended command mode of the **ping** command permits you to specify the supported IP header options so that the router can perform a more extensive range of test options. To enter **ping** extended command mode, enter **yes** at the "extended commands" prompt of the **ping** command.

For detailed information on using the **ping** and extended **ping** commands, see the *Cisco IOS Configuration Fundamentals Command Reference*.

If a **ping** command fails, check the following possible reasons for the connectivity problem:

- The interface is down, causing a "no ip route" error message.
- The PVC or SVC does not include proper mapping configured for the destination address, causing an "encapsulation failure" error. For more information about configuring encapsulation, see the section "Configuring IMA Groups" earlier in this chapter and the **encapsulation aal5** command in the *Cisco IOS Asynchronous Transfer Mode Command Reference*.
- If there is a firmware problem, the **show controller atm**command shows whether an interface is able to transmit and receive cells. For sample output, see the earlier section "Verifying an ATM Interface Configured for IMA Operation."

Tip Use the **ping** command when the network is functioning properly to see how the command works under normal conditions and so to compare the results when troubleshooting.

If a communication session is closing when it should not be, an end-to-end connection problem can be the cause. The **debug ip packet** command is useful for analyzing the messages traveling between the local and remote hosts. IP debugging information includes packets received, generated, and forwarded. Because the **debug ip packet** command generates a significant amount of output, use it only when traffic on the IP network is low, so other activity on the system is not adversely affected.

Monitoring and Maintaining the UBR Plus VCs

The following **show**and **clear**commands are used to monitor and maintain UBR+ VCs:

Command	Purpose
`Router#` **show atm pvc** `[`*vpi*/*vci* `|` *name* `|` **interface atm** *interface-number*`]`	Displays all ATM permanent virtual circuits (PVCs) and traffic information. Note that *vpi*/*vci* is the *vpi*/*vci* of the UBR+ VC.
`Router#` **clear counters** `[`*type*`]`	Clears statistics on all the VCs that have been configured.

Configuration Examples

show run Command Example

The following is output from a **show run** command on a Cisco MC3810 router:

```
Router# show run
Current configuration :73 bytes
!
interface ATM0.1 multipoint
 pvc atm1 101/101
  ubr+ 1536 768
!
end
```

show atm pvc Command Example

The following is output from a show **atm pvc command on** a Cisco MC3810 router:

```
Router# sh atm pvc
            VCD /                                          Peak  Avg/Min Burst
Interface   Name       VPI   VCI  Type   Encaps   SC   Kbps   Kbps   Cells  Sts
0.1         atm1       101   101   PVC    SNAP     UBR+   1536    768         UP (   768)
```

show atm pvc Command Example

The following is output from a show **atm pvc 101/101**on a Cisco MC3810 router:

```
Router# show atm pvc 101/101
ATM0.1: VCf: 131, VPI: 101, VCI: 101, Connection Name: atm1
UBR+, PeakRate: 1536, Minimum Guaranteed Rate: 768
AAL5-LLC/SNAP, etype:0x0, Flags: 0x20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC state: Not Managed
```

Command Reference

No new commands were introduced with this feature. All the commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

For further information on related documentation, see the "Related Documents" section.

Glossary

AAL-- ATM adaptation layer. The standards layer that allows multiple applications to have data converted to and from the ATM call. A protocol used that translates higher layer services into the size and format of an ATM cell. ATM Adaptation Layer sits above ATM and converts non-ATM bit streams - end user data - into ATM cells. The AAL accepts data from different applications and presents it to the ATM layer in the form of 48-byte ATM payload segments. AALs consist of two sublayers: CS and SAR. The AAL is the protocol used on top of ATM to support higher-layer service requirements. For data communications services, the AAL defines a segmentation/re-assembly protocol for mapping large data packets into the 48-octet payload field of an ATM cell. AALs differ on the basis of the source-destination timing used, whether they use CBR or VBR, and whether they are used for connection-oriented or connectionless mode data transfer. At present, the four types of AAL recommended by the ITU-T are AAL1, AAL2, AAL3/4, and AAL5.

AAL2 --ATM adaptation layer 2. One of four AALs recommended by the ITU-T. AAL2 is used for connection-oriented services that support a variable bit rate, such as some isochronous video and voice traffic. See also AAL and ATM.

AAL5 --ATM adaptation layer 5. One of four AALs recommended by the ITU-T. AAL5 supports connection-oriented VBR services and is used predominantly for the transfer of classical IP over ATM and LANE traffic. AAL5 uses SEAL and is the least complex of the current AAL recommendations. It offers low bandwidth overhead and simpler processing requirements in exchange for reduced bandwidth capacity and error-recovery capability. See also AAL, ATM, and SEAL.

ACR-- 1. actual cell rate. The rate at which the source is transmitting cells in an asynchronous transfer mode (ATM) available bit rate (ABR) connection. 2. allowed cell rate: An ABR service parameter, ACR is the current rate, in cells/sec, at which the source is allowed to transmit cells in an asynchronous transfer mode (ATM) available bit rate (ABR) connection. In other words, the available bandwidth, in cells per seconds, for a given quality of service (QoS) class, which is dynamically controlled by the network.

ATM --Asynchronous Transfer Mode. International standard for cell relay in which multiple service types (such as voice, video, or data) are conveyed in fixed-length (53-byte) cells. Fixed-length cells allow cell processing to occur in hardware, thereby reducing transit delays. ATM is designed to take advantage of high-speed transmission media such as E2, SONET, and T3.

CBR--constant bit rate. QoS class defined by the ATM forum for ATM networks. CBR is used for connections that depend on precise clocking to ensure undistorted delivery.

CIR --committed information rate. In a Frame Relay network, each PVC is assigned a Committed Information Rate, measured in bits per second. The CIR represents the average capacity that the Port Connection should allocate to the PVC. This rate should be consistent with the expected average traffic volume between the two sites that the PVC connects. The CIR that is assigned to a PVC cannot exceed the speed of either the originating or terminating Port Connection. The rate is averaged over a minimum increment of time.

CoS --class of service. Telephone service distinctions that include rate differences between individual and party lines, flat rate and message rate, and restricted and extended area service.

CS--convergence sublayer. One of the two sublayers of the AAL common part convergence sublayer (CPCS), which is responsible for padding and error-checking. PDUs passed from the SSCS are appended with an 8-byte trailer (for error checking and other control information) and padded, if necessary so that the protocol data unit (PDU) is divisible by 48. These PDUs are then passed to the SAR sublayer of the CPCS for further processing. See also AAL, and SAR.

ELAN--emulated LAN. ATM network in which an Ethernet or Token ring LAN is emulated using a client-server model. Multiple ELANs can exist simultaneously on a single ATM network. ELANS are defined by the LANE specification.

LAN--local area network.

LANE--LAN emulation. Technology that allows an ATM network to function as a LAN backbone. The ATM network must provide multicast and broadcast support, address mapping (MAC-to-ATM), SVC management, and a usable packet format. LANE also defines Ethernet and Token Ring ELANs.

maximum burst --Specifies the largest burst of data above the insured rate that is allowed temporarily on an ATM PVC, but is not dropped at the edge by the traffic policing function--even if it exceeds the maximum rate. This amount of traffic is allowed only temporarily; in general, the traffic source needs to be within the maximum rate. Specified in bytes or cells.

MBS --maximum burst size. See maximum burst.

MCR --minimum cell rate. ATM term for an ABR (Available Bit Rate) service traffic descriptor, in cells/sec, that is the rate at which the source is always allowed to send. This parameter is defined by the ATM Forum for ATM traffic management. MCR is defined only for ABR transmissions, and specifies the minimum value for the ACR. See ACR.

PCR --peak cell rate. Parameter defined by The ATM Forum for ATM traffic management. In CBR transmissions, PCR determines how often data samples are sent. In ABR transmissions, PCR determines the maximum value of the ACR. See ACR.

PVC --permanent virtual circuit. A circuit or channel through an ATM network provisioned by a carrier between two endpoints; used for dedicated long-term information transport between locations. Also virtual connection (VPC/ VCC) provisioned for indefinite use in an ATM network, established by the network management system (NMS). This is a link with static route defined in advance, usually by manual setup. Virtual circuit that is permanently established. PVCs save bandwidth associated with circuit establishment and tear down in situations where certain virtual circuits must exist all the time. Called a permanent virtual connection in ATM terminology. Compare with SVC.

SEAL--simple and efficient AAL. Scheme used by AAL5 in which the SAR sublayer segments CS protocol data units without adding additional fields. See AAL, AAL5, CS, and SAR.

SVC --switched virtual circuit. Virtual circuit that is dynamically established on demand and is torn down when transmission is complete. SVCs are used in situations where data transmission is sporadic.

UBR --unspecified bit rate. Traffic class defined by the ATM Forum. UBR is an ATM service category that does not specify traffic related service guarantees. UBR allows any amount of data up to a specified maximum to be sent across the network, but there are no guarantees in terms of cell loss rate and delay. Specifically, UBR does not include the notion of a per-connection negotiated bandwidth. No numerical commitments are made with respect to the cell loss ratio experienced by a UBR connection, or as to the cell transfer delay experienced by cells on the connection.

UBR+ --UBR with early packet discard (EPD) or partial packet discard (PPD).

VCC --virtual channel connection. As an ATM term, it is a concatenation of VCLs that extends between the points where the ATM service users access the ATM layer. The points at which the ATM cell payload is passed to, or received from, the users of the ATM Layer (that is, a higher layer or ATM entity) for processing signify the endpoints of a VCC. VCCs are unidirectional. ATM VCC can have one of two services types: 1) connection-oriented-path established before data is sent or 2) Connectionless data sent as datagrams. The connection-oriented path is typically used for AAL 1, 2, 3, 5 circuits. The connectionless VCC is for AAL4 is usually associated with Switched Multimegabit Data Service (SMDS).

VCL --virtual channel link. A means of unidirectional transport of ATM cells between the point where a VCI value is assigned and the point where that value is translated or removed.