New VC Configuration

Functional Description

The New VC Configuration subfeature allows you to configure ATM PVCs, SVCs, static maps, and associated virtual circuit (VC) parameters using new ATM commands in new ATM VC command modes. The new configuration approach allows you to configure ATM parameters more easily and with fewer errors.

Backwards Compatibility

This subfeature is not intended to change the underlying functionality of the Cisco IOS ATM software. Only the method of creating ATM PVCs, SVCs, static maps, and associated VC parameters is changed.

The configuration commands used prior to this release are still available. However, you are encouraged to use the new command syntax introduced in this subfeature for easier configuration and access to improved functionality.

Configuration Tasks

This section describes how to configure ATM PVCs and SVCs using the new commands and command modes introduced in this document:

- Configure PVCs
- Configure SVCs
- Configure VC Classes

Refer to the "Enhanced ATM VC Configuration and Management Commands" chapter for command reference and debug command documentation.

Configure PVCs

To use a permanent virtual circuit (PVC), you must configure the PVC on both the router and the ATM switch. PVCs remain active until the circuit is removed from either configuration.

All virtual circuit characteristics listed in the sections "AIP Virtual Circuits," "ATM Port Adapter Virtual Circuits," and "NPM Virtual Circuits" in the "Wide-Area Networking Overview" chapter of Cisco IOS Release 11.3 *Wide-Area Networking Configuration Guide* apply to these PVCs. When a

PVC is configured, all the configuration options are passed on to the AIP, ATM port adapter, or NPM, respectively. These PVCs are writable into the nonvolatile RAM (NVRAM) as part of the Route Processor (RP) configuration and are used when the RP image is reloaded.

Some ATM switches might have point-to-multipoint PVCs that do the equivalent of broadcasting. If a point-to-multipoint PVC exists, then that PVC can be used as the sole broadcast PVC for all multicast requests.

To configure a PVC, perform the tasks in the following sections. The first two tasks are required; the other tasks are optional:

- Create a PVC
- Map a Protocol Address to a PVC
- Configure Communication with the ILMI (optional)
- Enable Inverse ARP (optional)
- Configure ATM UNI Version Override (optional)
- Configure Generation of End-to-End F5 OAM Loopback Cells to Verify Connectivity (optional)
- Configure Broadcast on a PVC (optional)
- Assign a VC Class to a PVC (optional)
- Monitor and Maintain ATM PVCs (optional)

Create a PVC

To create a PVC and enter interface-ATM-VC configuration mode, perform the following task in interface configuration mode:

Task	Command
Configure a new ATM PVC by assigning a name (optional) and VPI/VCI numbers. Enter interface-ATM-VC configuration mode. Optionally configure ILMI, QSAAL, or SMDS encapsulation.	**pvc** [*name*] *vpi***/***vci* [**ilmi** | **qsaal** | **smds**]
(Optional) Configure the ATM adaptation layer (AAL) and encapsulation type.	**encapsulation** *aal-encap*
(Optional) Configure one of the following bit rate options:	
• Unspecified Bit Rate (UBR)	**ubr** *output-pcr*
• UBR and a minimum guaranteed rate	**ubr+** *output-pcr output-mcr*
• Variable Bit Rate-Non Real Time (VBR-NRT) QOS	**vbr-nrt** *output-pcr output-scr output-mbs*

Note After configuring the parameters for an ATM PVC, you must exit the interface-ATM-VC configuration mode in order to create the PVC and enable the settings.

Once you specify a *name* for a PVC, you can re-enter the interface-ATM-VC configuration mode by simply entering **pvc** *name*.

For a list of AAL types and encapsulations supported for the *aal-encap* argument, refer to the **encapsulation** command in the "Enhanced ATM VC Configuration and Management Commands" chapter of this feature set. The global default is AAL5 with SNAP encapsulation.

See examples of PVC configurations in the section "PVC Configuration Examples" at the end of this chapter.

Map a Protocol Address to a PVC

The ATM interface supports a static mapping scheme that identifies the network address of remote hosts or routers. This section describes how to map a PVC to an address, which is a required task for configuring a PVC.

To map a protocol address to a PVC, perform the following task in interface-ATM-VC configuration mode:

Task	Command
Map a protocol address to a PVC.	**protocol** *protocol protocol-address* [[**no**] **broadcast**]

Note If you enable or disable broadcasting directly on a PVC using the **protocol** command, this configuration will take precedence over any direct configuration using the **broadcast** command.

See examples of PVC configurations in the section "PVC Configuration Examples" at the end of this chapter.

Configure Communication with the ILMI

You can configure a PVC for communication with the Interim Local Management Interface (ILMI) so the router can receive SNMP traps and new network prefixes. The recommended *vpi* and *vci* values for the ILMI PVC are 0 and 16, respectively. To configure ILMI communication, complete the following task in interface-ATM-VC configuration mode:

Task	Command
Create an ILMI PVC on an ATM main interface.	**pvc** [*name*] *vpi*/*vci* **ilmi**

Note This ILMI PVC can be set up only on an ATM main interface, not on ATM subinterfaces.

Enable Inverse ARP

To enable Inverse ARP on a PVC, perform the following task in interface-ATM-VC configuration mode:

Task	Command
Enable Inverse ARP on a PVC.	**protocol** *protocol* **inarp** [[**no**] **broadcast**]
(Optional) Adjust the Inverse ARP time period.	**inarp** *minutes*

Note Inverse ARP is only supported for IP and IPX and is enabled by default.

Configure ATM UNI Version Override

Depending on the router platform configuration you are using, refer to the section "Configure ATM UNI Version Override" in one of the following chapters in the Cisco IOS Release 11.3 *Wide-Area Networking Configuration Guide*:

- Configuring ATM on the AIP for Cisco 7500 Series Routers
- Configuring ATM on the ATM Port Adapter for Cisco 7200 and 7500 Series Routers
- Configuring ATM on the NPM for Cisco 4500 and 4700 Routers

Configure Generation of End-to-End F5 OAM Loopback Cells to Verify Connectivity

You can optionally configure the PVC to generate end-to-end F5 OAM loopback cells to verify connectivity on the virtual circuit. The remote end must respond by echoing back such cells. If OAM response cells are missed (indicating the lack of connectivity), the PVC state goes down. If all the PVCs on a subinterface go down, the subinterface goes down. For more information, refer to the "VC Integrity Management" chapter in the Enhanced ATM VC Configuration and Management feature set in Cisco IOS Release 11.3(2)T.

To configure transmission of end-to-end F5 OAM cells on a PVC, perform the following tasks in interface-ATM-VC configuration mode:

Task	Command
Configure transmission of end-to-end F5 OAM loopback cells on a PVC, specify how often loopback cells should be sent, and optionally enable OAM management of the connection.	**oam-pvc** [**manage**] *frequency*
(Optional) Specify OAM management parameters for verifying connectivity of a PVC connection. This command is only supported if OAM management is enabled.	**oam retry** *up-count down-count retry-frequency*

Use the *up-count* argument to specify the number of consecutive end-to-end F5 OAM loopback cell responses that must be received in order to change a PVC connection state to up. Use the *down-count* argument to specify the number of consecutive end-to-end F5 OAM loopback cell responses that are not received in order to tear down a PVC. Use the *retry-frequency* argument to specify the frequency (in seconds) that end-to-end F5 OAM loopback cells should be transmitted when a change in UP/DOWN state is being verified. For example, if a PVC is up and a loopback cell response is not received after the *frequency* (in seconds) specified using the **oam-pvc** command, then loopback cells are sent at the *retry-frequency* to verify whether or not the PVC is down.

Configure Broadcast on a PVC

To send duplicate broadcast packets for all protocols configured on a PVC, perform the following task in interface-ATM-VC configuration mode:

Task	Command
Send duplicate broadcast packets for all protocols configured on a PVC.	**broadcast**

Note If you enable or disable broadcasting directly on a PVC using the **protocol** command, this configuration will take precedence over any direct configuration using the **broadcast** command.

Assign a VC Class to a PVC

By creating a VC class, you can preconfigure a set of default parameters that you may apply to a PVC. To create a VC class, refer to the section "Configure VC Classes" later in this document.

Once you have created a VC class, perform the following task in interface-ATM-VC configuration mode to apply the VC class to a PVC:

Task	Command
Apply a VC class to a PVC.	**class** *vc-class-name*

The *vc-class-name* is the same as the *name* you specified when you created a VC class using the **vc-class atm** command. Refer to the section "Configure VC Classes" later in this document for a description of how to create a VC class.

Monitor and Maintain ATM PVCs

After configuring an ATM PVC, you can display its status. To show current PVC settings and statistics, perform the following tasks in privileged EXEC mode:

Task	Command
Display entries in the ARP table.	**show arp**
Display PVC parameter configurations and where the parameter values are inherited from.	**show atm class-links** [*vpi*/*vci* | *name*]
Display the list of all configured ATM static maps to remote hosts on an ATM network.	**show atm map**
Display all active ATM PVCs and traffic information.	**show atm pvc** {*vpi*/*vci* | *name* | **interface** *interface_number*}
Display all active ATM virtual circuits (PVCs and SVCs) and traffic information.	**show atm vc** [*vcd* | **interface** *interface_number*]

Configure SVCs

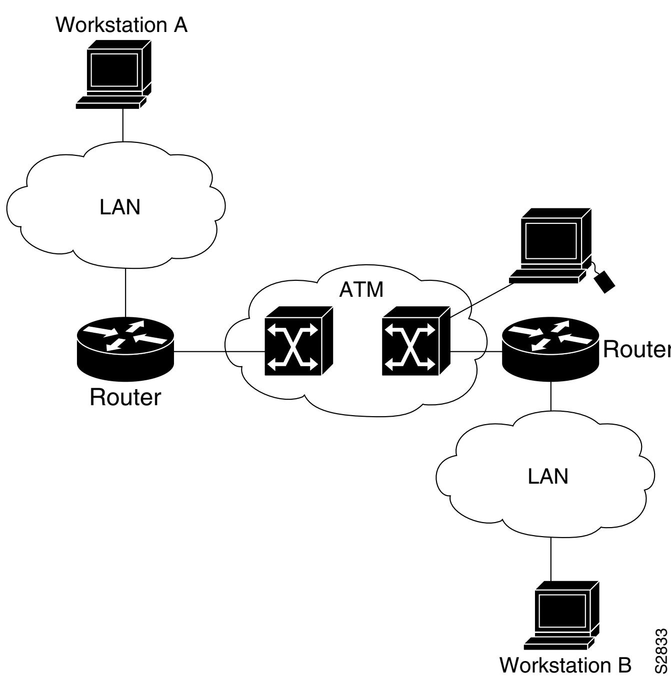
ATM switched virtual circuit (SVC) service operates much like X.25 SVC service, although ATM allows much higher throughput. Virtual circuits are created and released dynamically, providing user bandwidth on demand. This service requires a signaling protocol between the router and the switch.

The ATM signaling software provides a method of dynamically establishing, maintaining, and clearing ATM connections at the User-Network Interface (UNI). The ATM signaling software conforms to ATM Forum UNI 3.0 or ATM Forum UNI 3.1 depending on what version is selected by ILMI or configuration.

In UNI mode, the user is the router and the network is an ATM switch. This is an important distinction. The Cisco router does not perform ATM-level call routing. Instead, the ATM switch does the ATM call routing, and the router routes packets through the resulting circuit. The router is viewed as the user and the LAN interconnection device at the end of the circuit, and the ATM switch is viewed as the network.

Figure 1 illustrates the router position in a basic ATM environment. The router is used primarily to interconnect LANs over an ATM network. The workstation connected directly to the destination ATM switch illustrates that you can connect not only routers to ATM switches, but also any computer with an ATM interface that conforms to the ATM Forum UNI specification.

Figure 1 Basic ATM Environment



You must complete the tasks in the following sections to use SVCs:

- Configure the PVC that Performs SVC Call Setup
- Configure the NSAP Address
- Create an SVC

The tasks in the following sections are optional SVC tasks for customizing your network. These tasks are considered advanced; the default values are almost always adequate. You should not have to perform these tasks unless you need to customize your particular SVC connection.

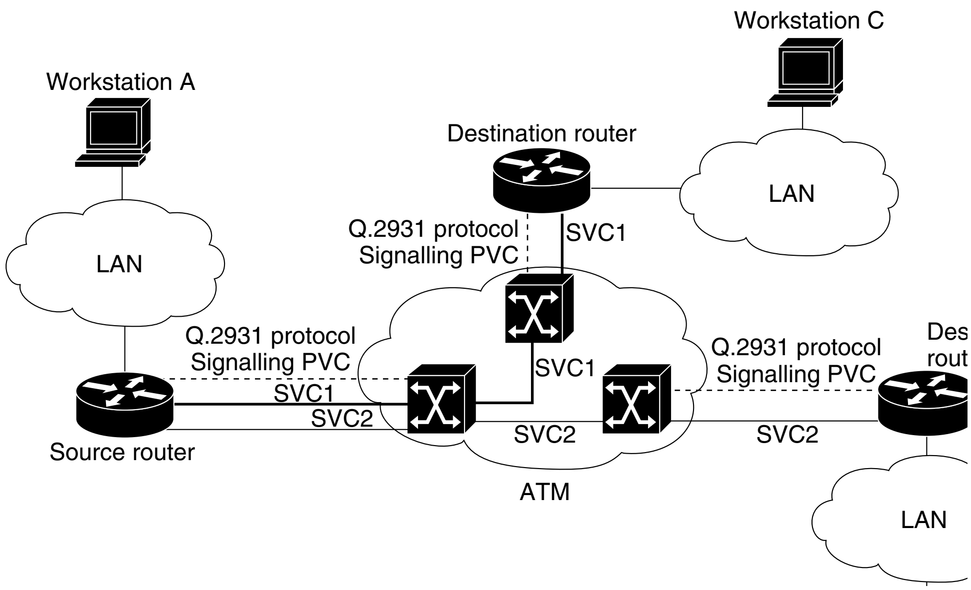
- Configure the Idle Timeout Interval (optional)
- Configure Point-to-Multipoint Signaling (optional)
- Configure IP Multicast over ATM Point-to-Multipoint Virtual Circuits (optional)
- Configure SSCOP (optional)
- Configure Generation of End-to-End F5 OAM Loopback Cells to Verify Connectivity (optional)
- Configure Broadcast on an SVC (optional)
- Assign a VC Class to an SVC (optional)
- Monitor and Maintain ATM SVCs (optional)

Configure the PVC that Performs SVC Call Setup

Unlike X.25 service, which uses in-band signaling (connection establishment done on the same circuit as data transfer), ATM uses out-of-band signaling. One dedicated PVC exists between the router and the ATM switch, over which all SVC call establishment and call termination requests flow. After the call is established, data transfer occurs over the SVC, from router to router. The signaling that accomplishes the call setup and teardown is called *Layer 3 signaling* or the *Q.2931 protocol*.

For out-of-band signaling, a signaling PVC must be configured before any SVCs can be set up. Figure 2 illustrates that a signaling PVC from the source router to the ATM switch is used to set up two SVCs. This is a fully meshed network; workstations A, B, and C all can communicate with each other.

Figure 2 One or More SVCs Require a Signaling PVC



To configure the signaling PVC for all SVC connections, perform the following task in interface configuration mode:

Task	Command
Configure the signaling PVC for an ATM main interface that uses SVCs.	**pvc** [*name*] *vpi***/***vci* **qsaal**

Note This signaling PVC can be set up only on an ATM main interface, not on ATM subinterfaces.

The VPI and VCI values must be configured consistently with the local switch. The standard values for VPI and VCI are 0 and 5, respectively.

Configure the NSAP Address

This section describes how to configure the source NSAP address of the SVC connection. Depending on the router platform configuration you are using, refer to "Configure the NSAP Address" in one of the following chapters in the Cisco IOS Release 11.3 *Wide-Area Networking Configuration Guide*:

- Configuring ATM on the AIP for Cisco 7500 Series Routers
- Configuring ATM on the ATM Port Adapter for Cisco 7200 and 7500 Series Routers
- Configuring ATM on the NPM for Cisco 4500 and 4700 Routers

Create an SVC

To create an SVC, perform the following tasks starting in interface configuration mode:

Task	Command
Create an SVC and specify the destination NSAP address.	**svc** [*name*] **nsap** *address*
(Optional) Configure the ATM adaptation layer (AAL) and encapsulation type.	**encapsulation** *aal-encap*
Map a protocol address to an SVC.	**protocol** *protocol protocol-address* [[**no**] **broadcast**]
(Optional) Configure one of the following bit rate options:	
• Unspecified Bit Rate (UBR)	**ubr** *output-pcr* [*input-pcr*]
• UBR and a minimum guaranteed rate	**ubr+** *output-pcr output-mcr* [*input-pcr*] [*input-mcr*]
• Variable Bit Rate-Non Real Time (VBR-NRT) QOS	**vbr-nrt** *output-pcr output-scr output-mbs* [*input-pcr*] [*input-scr*] [*input-mbs*]

Once you specify a *name* for an SVC, you can re-enter the interface-ATM-VC configuration mode by simply entering **svc** *name*; You can remove an SVC configuration by entering **no svc** *name*.

For a list of AAL types and encapsulations supported for the *aal-encap* argument, refer to the **encapsulation** command in the command reference section of this document. The default is AAL5 with SNAP encapsulation.

Configure the Idle Timeout Interval

You can specify an interval of inactivity after which any idle SVC on an interface is torn down. This timeout interval might help control costs and free router memory and other resources for other uses.

To change the idle timeout interval, perform the following tasks in interface-ATM-VC configuration mode:

Task	Command
Configure the interval of inactivity after which an idle SVC will be torn down.	**idle-timeout** *seconds* [*minimum-rate*]

In addition to configuring the interval of inactivity, you can optionally specify the *minimum-rate* in kilobits per second (Kbps). This is the minimum traffic rate required on an ATM SVC to maintain the connection.

Configure Point-to-Multipoint Signaling

Point-to-multipoint signaling (or multicasting) allows the router to send one packet to the ATM switch and have the switch replicate the packet to the destinations. It replaces pseudobroadcasting on specified virtual circuits for protocols configured for broadcasting.

You configure multipoint signaling on an ATM interface after you have mapped protocol addresses to NSAPs and configured one or more protocols for broadcasting.

After multipoint signaling is set, the router uses existing static map entries that have the **broadcast** keyword set to establish multipoint calls. The call is established to the first destination with a Setup message. Additional parties are added to the call with AddParty messages each time a multicast packet is sent. One multipoint call will be established for each logical subnet of each protocol that has the **broadcast** keyword set.

To configure multipoint signaling on an ATM interface, complete the following tasks starting in global configuration mode:

Task		Command
Step 1	Specify the ATM main interface or for one of the following:	
	• AIP on Cisco 7500 series routers and ATM port adapter on the Cisco 7200 series routers	**interface atm** *slot*/**0**
	• NPM on Cisco 4500 and 4700 routers	**interface atm** *number*
	• ATM port adapter on Cisco 7500 series routers	**interface atm** *slot*/*port-adapter*/**0**
Step 2	Configure the signaling PVC for an ATM main interface that uses SVCs.	**pvc** [*name*] *vpi*/*vci* **qsaal**
Step 3	Re-enter interface configuration mode.	**exit**
Step 4	(Optional) Configure an ILMI PVC on an ATM main interface and re-enter interface configuration mode. This task is required if you configure the ATM NSAP address in Step 5 by configuring the ESI and selector fields.	**pvc** [*name*] **0/16 ilmi** and **exit**
Step 5	Configure an ATM NSAP address for the interface in one of the following ways:	
	• Configure the complete NSAP address manually.	**atm nsap-address** *nsap-address*
	• Configure the ESI and selector fields. To use this method, you must configure Step 4 first.	**atm esi-address** *esi.selector*
Step 6	Create an SVC and specify the destination NSAP address. Enter interface-ATM-VC mode.	**svc** [*name*] **nsap** *address*
Step 7	Provide a protocol address for the interface and enable broadcasting.	**protocol** *protocol protocol-address* **broadcast**
Step 8	Re-enter interface configuration mode.	**exit**
Step 9	Enable multipoint signaling to the ATM switch.	**atm multipoint-signalling**
Step 10	Limit the frequency of sending AddParty messages (optional).	**atm multipoint-interval** *interval*

If multipoint virtual circuits are closed, they are reopened with the next multicast packet. Once the call is established, additional parties are added to the call when additional multicast packets are sent. If a destination never comes up, the router constantly attempts to add it to the call by means of multipoint signaling.

For an example of configuring multipoint signaling on an interface that is configured for SVCs, see the "SVCs with Multipoint Signaling Example" later in this chapter.

Configure IP Multicast over ATM Point-to-Multipoint Virtual Circuits

This task is documented in the "Configuring IP Multicast Routing" chapter of the Cisco IOS Release 11.3 *Network Protocols Configuration Guide, Part 1*.

Configure SSCOP

Depending on the router platform configuration you are using, refer to the section "Configure SSCOP" in one of the following chapters in the Cisco IOS Release 11.3 *Wide-Area Networking Configuration Guide*:

- Configuring ATM on the AIP for Cisco 7500 Series Routers
- Configuring ATM on the ATM Port Adapter for Cisco 7200 and 7500 Series Routers
- Configuring ATM on the NPM for Cisco 4500 and 4700 Routers

Configure Generation of End-to-End F5 OAM Loopback Cells to Verify Connectivity

You can optionally configure the SVC to generate end-to-end F5 OAM loopback cells to verify connectivity on the virtual circuit. The remote end must respond by echoing back such cells. If OAM response cells are missed (indicating the lack of connectivity), the SVC is torn down. For more information, refer to the "VC Integrity Management" chapter in the Enhanced ATM VC Configuration and Management feature set in Cisco IOS Release 11.3(2)T.

To configure transmission of end-to-end F5 OAM loopback cells on an SVC, perform the following tasks in interface-ATM-VC configuration mode:

Task	Command
Configure transmission of end-to-end F5 OAM loopback cells on an SVC, specify how often loopback cells should be sent, and optionally enable OAM management of the connection.	**oam-svc** [**manage**] *frequency*
(Optional) Specify OAM management parameters for verifying connectivity of an SVC connection. This command is only supported if OAM management is enabled.	**oam retry** *up-count down-count retry-frequency*

The *up-count* argument does not apply to SVCs, but it must be specified in order to configure the *down-count* and *retry-frequency*. Use the *down-count* argument to specify the number of consecutive end-to-end F5 OAM loopback cell responses that are not received in order to tear down an SVC. Use the *retry-frequency* argument to specify the frequency (in seconds) that end-to-end F5 OAM loopback cells should be transmitted when a change in UP/DOWN state is being verified. For example, if an SVC is up and a loopback cell response is not received after the *frequency* (in seconds) specified using the **oam-svc** command, then loopback cells are sent at the *retry-frequency* to verify whether or not the SVC is down.

Note Generally, ATM signaling manages ATM SVCs. Configuring the **oam-svc** command on an SVC verifies the inband integrity of the SVC.

Configure Broadcast on an SVC

To send duplicate broadcast packets or send a single broadcast packet using multipoint signaling for all protocols configured on an SVC, perform the following task in interface-ATM-VC configuration mode:

Task	Command
Send duplicate broadcast packets for all protocols configured on an SVC.	**broadcast**

Note If you enable or disable broadcasting directly on an SVC using the **protocol** command, this configuration will take precedence over any direct configuration using the **broadcast** command.

Assign a VC Class to an SVC

By creating a VC class, you can preconfigure a set of default parameters that you may apply to an SVC. To create a VC class, refer to the section "Configure VC Classes" later in this document.

Once you have created a VC class, perform the following task in interface-ATM-VC configuration mode to apply the VC class to an SVC:

Task	Command
Apply a VC class to an SVC.	**class** *vc-class-name*

The *vc-class-name* is the same as the *name* you specified when you created a VC class using the **vc-class atm** command. Refer to the section "Configure VC Classes" later in this document for a description of how to create a VC class.

Monitor and Maintain ATM SVCs

After configuring an ATM SVC, you can display its status. To show current SVC settings and statistics, perform the following tasks in privileged EXEC mode:

Task	Command
Display entries in the ARP table.	**show arp**
Display SVC parameter configurations and where the parameter values are inherited from.	**show atm class-links** [*vpi*/*vci* | *name*]
Display the list of all configured ATM static maps to remote hosts on an ATM network.	**show atm map**
Display all active ATM SVCs and traffic information.	**show atm svc** {*vpi*/*vci* | *name* | **interface** *interface_number*}
Display all active ATM virtual circuits (PVCs and SVCs) and traffic information.	**show atm vc** [*vcd* | **interface** *interface_number*]

Configure VC Classes

A VC class is a set of preconfigured VC parameters that you configure and apply to a particular VC or ATM interface. You may apply a VC class to an ATM main interface, subinterface, PVC or SVC. For example, you can create a VC class that contains VC parameter configurations that you will apply to a particular PVC or SVC. You might create another VC class that contains VC parameter configurations that you will apply to all VCs configured on a particular ATM main interface or subinterface. Refer to "VC Class Configuration Examples" section later in this document for examples of VC class configurations.

To create and use a VC class, complete the following tasks:

- Create a VC Class
- Configure VC Parameters
- Apply a VC Class

Create a VC Class

To create a VC class, perform the following task in global configuration mode:

Task	Command
Create a VC class and enter vc-class configuration mode.	**vc-class atm** *name*

Configure VC Parameters

After you create a VC class and enter vc-class configuration mode, configure VC parameters using one or more of the following commands:

- **broadcast**
- **encapsulation**
- **idle-timeout**
- **ilmi manage**
- **inarp**
- **oam-pvc**
- **oam retry**
- **oam-svc**
- **protocol**
- **ubr**
- **ubr+**
- **vbr-nrt**

Refer to the sections "Configure PVCs" and "Configure SVCs" for descriptions on how to configure these commands for PVCs and SVCs.

If an SVC command (for example, **idle-timeout** or **oam-svc**) is configured in a VC class, but the VC class is applied on a PVC, the SVC command is ignored. This is also true if a PVC command is applied to an SVC.

Apply a VC Class

Once you have created and configured a VC class, you can apply it directly on an ATM PVC or SVC, or you can apply it on an ATM interface or subinterface.

To apply a VC class directly on an ATM PVC or SVC, perform the following tasks starting in interface configuration mode:

Task		Command
Step 1	Specify one of the following VCs:	
	• ATM PVC	**pvc** [*name*] *vpi*/*vci*
	• ATM SVC	**svc** [*name*] **nsap** *address*
Step 2	Apply a VC class directly on the PVC or SVC.	**class** *vc-class-name*

To apply a VC class on an ATM main interface or subinterface, perform the following tasks starting in global configuration mode:

Task		Command
Step 1	Specify the ATM interface or subinterface for one of the following:	
	• AIP on Cisco 7500 series routers and ATM port adapter on the Cisco 7200 series routers	**interface atm** *slot*/**0**[**.***subinterface-number* **multipoint**]
	• NPM on Cisco 4500 and 4700 routers	**interface atm** *number*[**.***subinterface-number* **multipoint**]
	• ATM port adapter on Cisco 7500 series routers	**interface atm** *slot*/*port-adapter*/**0**[**.***subinterface-number* **multipoint**]
Step 2	Apply a VC class on an the ATM main interface or subinterface.	**class** *vc-class-name*

Configuration Examples

The following sections give examples for configuring ATM PVCs, SVCs, and VC classes:

- PVC Configuration Examples
- SVC Configuration Examples
- VC Class Configuration Examples

PVC Configuration Examples

This section contains the following PVC configuration examples:

- Create a PVC Example
- PVC with AAL5 and LLC/SNAP Encapsulation Examples
- PVCs in a Fully Meshed Network Example
- Dynamic Rate Queue Examples
- Configure Communication with the ILMI Example

- Enable Inverse ARP Example
- Configure Generation of End-to-End F5 OAM Loopback Cells Example

Create a PVC Example

The following example creates a PVC on an ATM main interface. AAL5/MUX encapsulation is configured and a VBR-NRT QOS is specified. For further information, refer to the related task section "Create a PVC" presented earlier in this chapter.

```
interface 2/0
 pvc cisco 1/20
 encapsulation aal5mux ip
 vbr-nrt 100000 50000 20
 exit
```

PVC with AAL5 and LLC/SNAP Encapsulation Examples

The following example creates PVC 0/10 on ATM interface 3/0. It uses the global default LLC/SNAP encapsulation over AAL5. The interface is at IP address 1.1.1.1 with 1.1.1.5 at the other end of the connection. For further information, refer to the related task sections "Create a PVC" and "Map a Protocol Address to a PVC" presented earlier in this chapter.

```
interface atm 3/0
 ip address 1.1.1.1 255.255.255.0
 pvc 0/10
 protocol ip 1.1.1.5 broadcast
 exit
!
 ip route-cache cbus
```

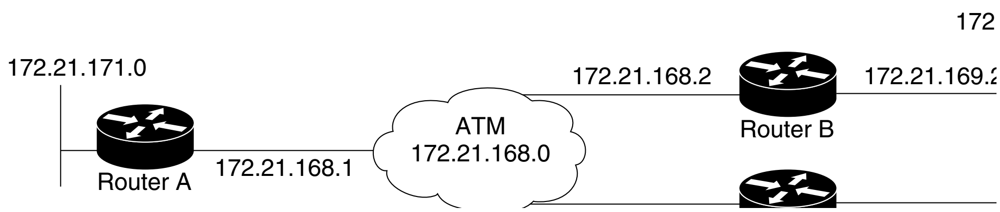
The following example is of a typical ATM configuration for a PVC:

```
interface atm 4/0
 ip address 172.21.168.112 255.255.255.0
 atm maxvc 512
 pvc 1/1
 protocol ip 171.21.168.110
 exit
!
 pvc 2/2
 protocol decnet 10.1 broadcast
 exit
!
 pvc 6/6
 protocol clns 47.004.001.0000.0c00.6e26.00 broadcast
 exit
!
 decnet cost 1
 clns router iso-igrp comet
 exit
!
router iso-igrp comet
 net 47.0004.0001.0000.0c00.6666.00
 exit
!
router igrp 109
 network 172.21.0.0
 exit
!
ip domain-name CISCO.COM
```

PVCs in a Fully Meshed Network Example

Figure 3 illustrates a fully meshed network. The configurations for Routers A, B, and C follow the figure. In this example, the routers are configured to use PVCs. *Fully meshed* indicates that any workstation can communicate with any other workstation. Note that the two **protocol** statements configured in Router A identify the ATM addresses of Routers B and C. The two **protocol** statements in Router B identify the ATM addresses of Routers A and C. The two **protocol** statements in Router C identify the ATM addresses of Routers A and B. For further information, refer to the related task sections "Create a PVC" and "Map a Protocol Address to a PVC" presented earlier in this chapter.

Figure 3 Fully Meshed ATM Configuration Example



Router A

```
ip routing
!
interface atm 4/0
 ip address 131.108.168.1 255.255.255.0
 pvc 0/10
 protocol ip 131.108.168.2 broadcast
 exit
!
 pvc 0/20
 protocol ip 131.108.168.3 broadcast
 exit
```

Router B

```
ip routing
!
interface atm 2/0
 ip address 131.108.168.2 255.255.255.0
 pvc test-b-1 0/10
 protocol ip 131.108.168.1 broadcast
 exit
!
 pvc test-b-2 0/30
 protocol ip 131.108.168.3 broadcast
 exit
```

Router C

```
ip routing
!
interface atm 4/0
 ip address 131.108.168.3 255.255.255.0
 pvc 0/20
```

```
 encapsulation aal5snap
 protocol ip 131.108.168.1 broadcast
 exit
!
 pvc 0/30
 encapsulation aal5snap
 protocol ip 131.108.168.2 broadcast
 exit
```

Dynamic Rate Queue Examples

Both of the following examples assume that no permanent rate queues have been configured. The software dynamically creates rate queues when a **pvc** command creates a new PVC that does not match any user-configured rate queue. For further information, refer to the related task section "Create a PVC" presented earlier in this chapter.

In the following example, the software sets the peak rate to the maximum that the PLIM will allow and sets the average rate to the peak rate. Then it creates a rate queue for the peak rate of this VC.

```
interface 2/0
 pvc 1/1
 exit
```

In the following example, the software creates a 100-Mbps rate queue with an average rate of 50-Mbps and a burst size of 64 cells:

```
interface 2/0
 pvc 2/2
 vbr-nrt 100000 50000 64
 exit
```

In the following example, the software creates a 15-Mbps rate queue and sets the average rate to the peak rate:

```
interface 2/0
 pvc 3/3
 ubr 15000
 exit
```

Configure Communication with the ILMI Example

The following example configures the ILMI protocol on an ATM main interface. For further information, refer to the related task section "Configure Communication with the ILMI" presented earlier in this chapter.

```
interface 2/0
 pvc cisco 0/16 ilmi
 exit
```

Enable Inverse ARP Example

The following example enables Inverse ARP on an ATM interface and specifies an Inverse ARP time period of 10 minutes. For further information, refer to the related task section "Enable Inverse ARP" presented earlier in this chapter.

```
interface 2/0
 pvc 1/20
 protocol ip inarp no broadcast
 inarp 10
 exit
```

Configure Generation of End-to-End F5 OAM Loopback Cells Example

The following example enables OAM management on an ATM PVC. The PVC is assigned the name routerA and the VPI and VCI are 0 and 32, respectively. OAM management is enabled with a frequency of 3 seconds between OAM cell transmissions. For further information, refer to the related task section "Configure Generation of End-to-End F5 OAM Loopback Cells to Verify Connectivity" presented in this document. For further information, refer to the related task section "Configure Generation of End-to-End F5 OAM Loopback Cells to Verify Connectivity" presented earlier in this chapter.

```
interface atm 2/0
 pvc routerA 0/32
 oam-pvc manage 3
 oam retry 5 5 10
```

SVC Configuration Examples

This section contains the following SVC configuration examples:

- SVCs in a Fully Meshed Network Example
- SVCs with Multipoint Signaling Example
- Traffic Parameters Example

SVCs in a Fully Meshed Network Example

The following example is also a configuration for the fully meshed network shown in Figure 3, but this example uses SVCs. PVC 0/5 is the signaling PVC. For further information, refer to the following related task sections presented earlier in this chapter:

- Configure the PVC that Performs SVC Call Setup
- Configure the NSAP Address
- Create an SVC

Router A

```
interface atm 4/0
 ip address 131.108.168.1 255.255.255.0
 atm nsap-address AB.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
 atm maxvc 1024
 pvc 0/5 qsaal
 exit
!
 svc svc-1 nsap BC.CDEF.01.234567.890A.BCDE.F012.3456.7890.1334.13
 protocol ip 131.108.168.2
 exit
!
 svc svc-2 nsap BC.CDEF.01.234567.890A.BCDE.F012.3456.7890.1334.12
 protocol ip 131.108.168.3
 exit
```

Router B

```
interface atm 2/0
 ip address 131.108.168.2 255.255.255.0
 atm nsap-address BC.CDEF.01.234567.890A.BCDE.F012.3456.7890.1334.13
 atm maxvc 1024
 pvc 0/5 qsaal
```

```
 exit
!
 svc svc-1 nsap AB.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
 protocol ip 131.108.168.1
 exit
!
 svc svc-2 nsap BC.CDEF.01.234567.890A.BCDE.F012.3456.7890.1334.12
 protocol ip 131.108.168.3
 exit
```

Router C

```
interface atm 4/0
 ip address 131.108.168.3 255.255.255.0
 atm nsap-address BC.CDEF.01.234567.890A.BCDE.F012.3456.7890.1334.12
 atm maxvc 1024
 pvc 0/5 qsaal
 exit
!
 svc nsap AB.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
 protocol ip 131.108.168.1
 exit
!
 svc nsap BC.CDEF.01.234567.890A.BCDE.F012.3456.7890.1334.13
 protocol ip 131.108.168.2
 exit
```

SVCs with Multipoint Signaling Example

The following example configures an ATM interface for SVCs using multipoint signaling. For further information, refer to the related task section “Configure Point-to-Multipoint Signaling” presented earlier in this chapter.

```
interface atm 2/0
 ip address 4.4.4.6 255.255.255.0
 atm nsap-address de.cdef.01.234567.890a.bcde.f012.3456.7890.1234.12
 atm multipoint-signalling
 atm maxvc 1024
 pvc 0/5 qsaal
 exit
!
 svc mcast-1 nsap cd.cdef.01.234566.890a.bcde.f012.3456.7890.1234.12 broadcast
 protocol ip 4.4.4.4 broadcast
 exit
!
 svc mcast-2 nsap 31.3233.34.352637.3839.3031.3233.3435.3637.3839.30 broadcast
 protocol ip 4.4.4.7 broadcast
 exit
```

Traffic Parameters Example

The following example maps specified SVCs to protocol addresses of remote hosts. Then it sets traffic parameters for certain protocol traffic. For further information, refer to the related task section “Create an SVC” presented earlier in this chapter.

```
interface atm 4/0
 svc svc-1 nsap 47.0091.81.000000.0041.0B0A.1581.0040.0B0A.1585.00
 vbr-nrt 8000 4000 64 10000 5000 64
 exit
!
interface atm 2/0
```

```
 svc svc-1 nsap 47.0091.81.000000.0041.0B0A.1581.0040.0B0B.1585.00
 ubr 10000 5000
 exit
!
interface atm 3/0
 svc svc-1 nsap 47.0091.81.000000.0041.0B0A.1581.0040.0B0C.1585.00
 ubr+ 8000 4000 10000 3000
 exit
```

VC Class Configuration Examples

This section contains the following VC class configuration examples:

- Create a VC Class Examples
- Apply a VC Class Examples

Create a VC Class Examples

The following example creates a VC class named main and configures UBR and encapsulation parameters. For further information, refer to the related task sections “Create a VC Class” and “Configure VC Parameters” presented earlier in this chapter.

```
vc-class atm main
 ubr 10000
 encapsulation aal5mux ip
```

The following example creates a VC class named sub and configures UBR and PVC management parameters. For further information, refer to the related task sections “Create a VC Class” and “Configure VC Parameters” presented earlier in this chapter.

```
vc-class atm sub
 ubr 15000
 oam-pvc manage 3
```

The following example creates a VC class named pvc and configures VBR-NRT and encapsulation parameters. For further information, refer to the related task sections “Create a VC Class” and “Configure VC Parameters” presented earlier in this chapter.

```
vc-class atm pvc
 vbr-nrt 10000 5000 64
 encapsulation aal5snap
```

Apply a VC Class Examples

The following example applies the VC class named main to the ATM main interface 4/0:

```
interface atm 4/0
 class main
 exit
```

The following example applies the VC class named sub to the ATM subinterface 4/0.5:

```
interface atm 4/0.5 multipoint
 class sub
 exit
```

The following example applies the VC class named pvc directly on the PVC 0/56:

```
interface atm 4/0.5 multipoint
 pvc 0/56
 class pvc
 exit
```