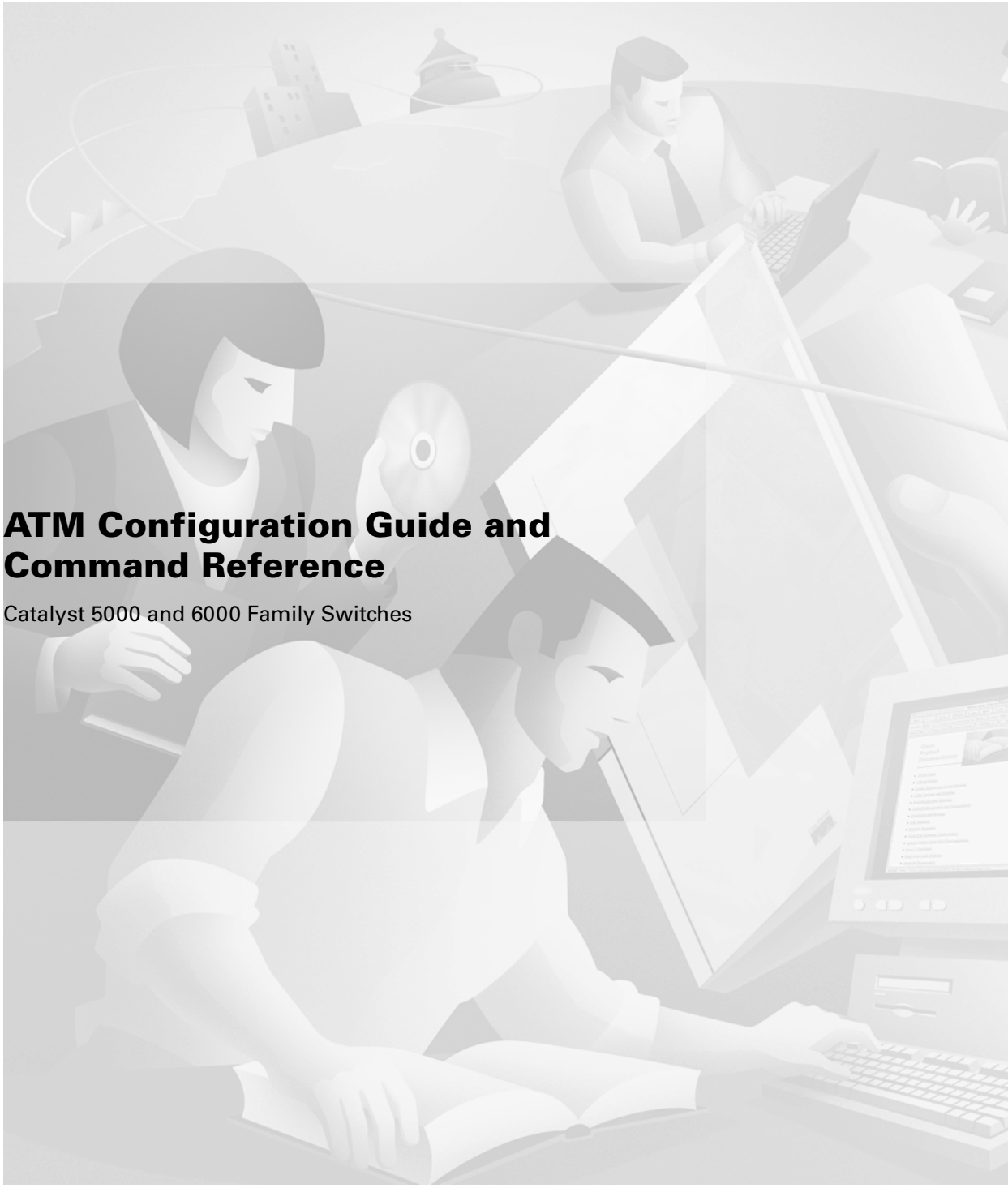

ATM Configuration Guide and Command Reference

Catalyst 5000 and 6000 Family Switches

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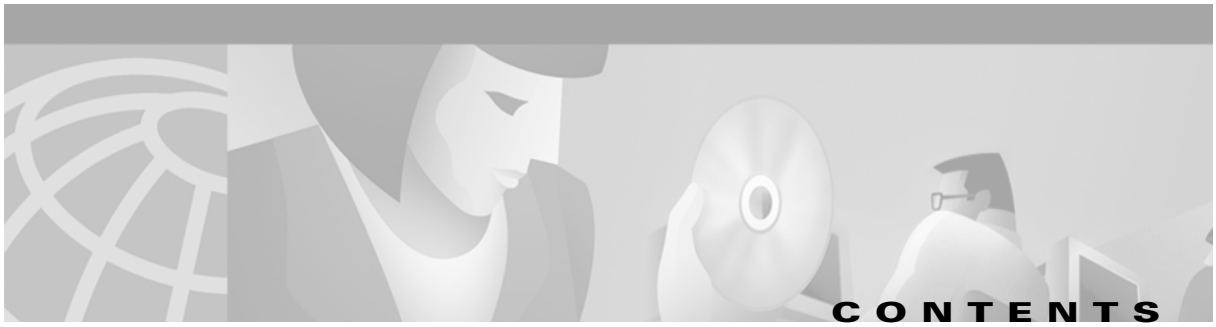
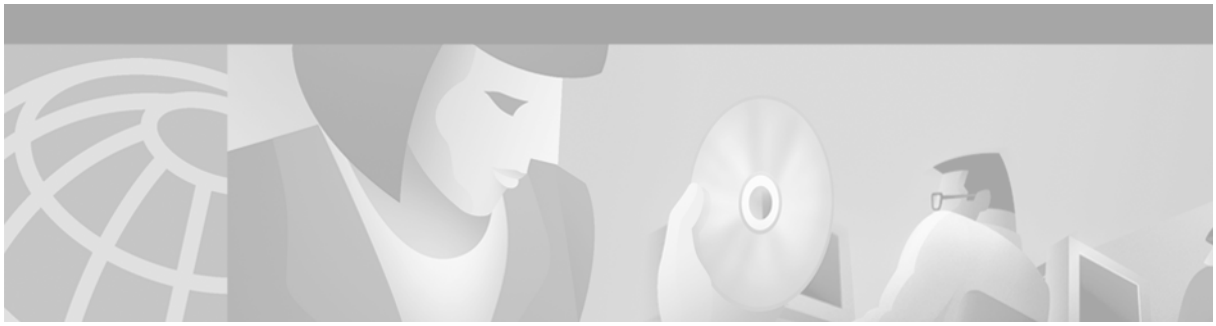
Customer Order Number: DOC-787032=.
Text Part Number: 78-7032-02

ATM Configuration Guide and Command Reference—Catalyst 5000 and 6000 Family Switches



CONTENTS



Preface

This preface describes who should read the *ATM Software Configuration Guide and Command Reference*, how it is organized, and its document conventions.

Audience

This guide is for experienced network administrators who are responsible for configuring and maintaining Catalyst 5000 family and 6000 family switches.

Organization

The major sections of this guide are as follows:

Chapter	Title	Description
Part 1—ATM Software Configuration Guide		
Chapter 1	Product Overview	Provides configuration information for ATM modules supported on the Catalyst 5000 family and 6000 family of switches.
Chapter 2	ATM Module Management	Describes the command-line interface (CLI) used to configure the ATM modules on the Catalyst 5000 family and 6000 family switches.
Chapter 3	Configuring ATM LAN Emulation	Describes how to configure ATM LANE and explains how LANE works.
Chapter 4	Configuring ATM PVCs and QoS Traffic Shaping	Describes how to configure permanent virtual connection (PVC)-supported VLANs on the ATM modules.
Chapter 5	Configuring Multiprotocol over ATM	Describes how to configure MPOA on ATM modules and routers.
Chapter 6	Configuring the ATM Fabric Integration Module	Describes how to configure the ATM fabric integration module.

Chapter	Title	Description
Part 2—Command Reference		
Chapter 7	Command Reference	Lists all ATM commands with full descriptions.
Appendix A	Acronyms	Provides definitions for acronyms used in Catalyst 5000 family and Catalyst 6000 family documents.

Related Documentation

The following publications are available for the Catalyst 5000 and 6000 family switches:

- *Catalyst 5000 Family Installation Guide*
- *Catalyst 5000 Family Supervisor Engine Installation Guide*
- *Catalyst 5000 Family Module Installation Guide*
- *Quick Software Configuration Guide—Catalyst 5000 Family, Catalyst 4000 Family, Catalyst 2926G Series, Catalyst 2948G, and Catalyst 2980G, Software Release 6.x*
- *Command Reference—Catalyst 5000 Family*
- *System Message Guide—Catalyst 6000 Family, 5000 Family, 4000 Family, 2926G Series, 2948G, and 2980G Switches*
- *Software Configuration Guide—Catalyst 5000 Family*
- *Catalyst 6000 Family Software Configuration Guide*
- *Catalyst 6000 Family Command Reference*
- *Catalyst 6000 Family Quick Software Configuration Guide*
- *Enterprise MIB User Quick Reference (online)*
- *Release Notes for Catalyst 5000 Family Supervisor Engine Software Release 5.x*
- *Release Notes for Catalyst 6000 Family Supervisor Engine Software Release 5.x*

Other useful publications are as follows:

- LightStream 1010 ATM switch documentation—Use these publications to help you install and configure LightStream 1010 ATM switch components in the Catalyst 5500 chassis.
- Catalyst 8500 series documentation—Use these publications to help you install and configure Catalyst 8500 series CSR or MSR components in the Catalyst 5500 chassis.
- Cisco IOS Configuration Guides and Command References—Use these publications to help you configure the Cisco IOS software that runs on the RSM, ATM modules, LightStream 1010 ASP, and Catalyst 8500 series CSR SRP.
- *http://www.cisco.com/warp/public/627/5000_resources/*—This URL has an up-to-date list of online resources for the Catalyst 5000 series switches.

Conventions

Note Throughout this publication, the phrase "Catalyst 5000 family switches" refers to the Catalyst 5002, Catalyst 5000, Catalyst 5505, Catalyst 5509, and Catalyst 5500 switches unless otherwise noted.

Note Throughout this publication, the phrase "Catalyst 6000 family switches" refers to the Catalyst 6000 series and Catalyst 6500 series switches.

Command descriptions use these conventions:

boldface font	Commands and keywords are in **boldface**.
italic font	Arguments for which you supply values are in *italics*.
[ ]	Elements in square brackets are optional.
{x | y | z}	Alternative keywords are grouped in braces and separated by vertical bars.
[x | y | z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.

Screen examples use these conventions:

`screen` font	Terminal sessions and information the system displays are in `screen` font.
`boldface screen` font	Information you must enter is in **`boldface screen`** font.
italic screen font	Arguments for which you supply values are in *italic screen* font.
→	This pointer highlights an important line of text in an example.
^	The symbol ^ represents the key labeled Control—for example, the key combination ^D in a screen display means hold down the Control key while you press the D key.
< >	Nonprinting characters, such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.
`<...output truncated...>`	Indicates that screen output not relevant to the example was removed to save space and preserve clarity.

Notes use these conventions:

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the publication.

Cautions use these conventions:

Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Obtaining Documentation

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

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You can access CCO in the following ways:

- WWW: www.cisco.com
- Telnet: cco.cisco.com
- Modem using standard connection rates and the following terminal settings: VT100 emulation; 8 data bits; no parity; and 1 stop bit.
  - From North America, call 408 526-8070
  - From Europe, call 33 1 64 46 40 82

You can e-mail questions about using CCO to cco-team@cisco.com.

Technical Assistance Center

The Cisco Technical Assistance Center (TAC) is available to warranty or maintenance contract customers who need technical assistance with a Cisco product that is under warranty or covered by a maintenance contract.

To display the TAC web site that includes links to technical support information and software upgrades and for requesting TAC support, use www.cisco.com/techsupport.

To contact by e-mail, use one of the following:

Language	E-mail Address
English	tac@cisco.com
Hanzi (Chinese)	chinese-tac@cisco.com
Kanji (Japanese)	japan-tac@cisco.com
Hangul (Korean)	korea-tac@cisco.com
Spanish	tac@cisco.com
Thai	thai-tac@cisco.com

In North America, TAC can be reached at 800 553-2447 or 408 526-7209. For other telephone numbers and TAC e-mail addresses worldwide, consult the following web site: http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml.

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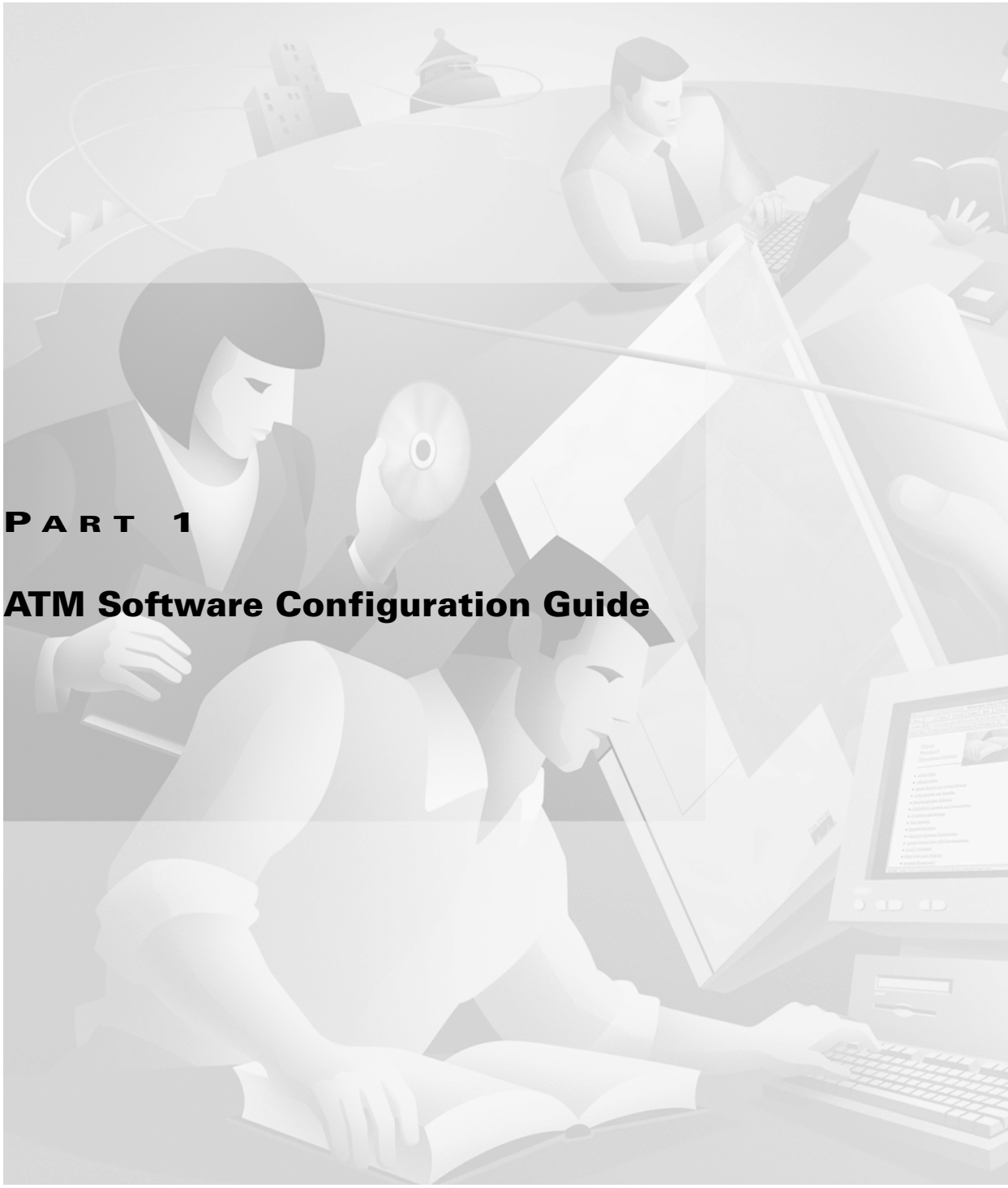
We appreciate and value your comments.



PART 1

ATM Software Configuration Guide

CHAPTER 1

Product Overview

The Catalyst 5000 family and 6000 family switches support a variety of ATM modules that permit transparent connections between legacy LANs over ATM backbones and enable permanent virtual connections (PVCs) between Catalyst 5000, 6000, and ATM core switches. The modules also support PVC traffic shaping, Multiprotocol over ATM (MPOA), Fast Simple Server Redundancy Protocol (FSSRP), and ATM fabric integration.

This chapter consists of these sections:

ATM Modules Overview

Note For installation information and a complete description of the Catalyst 5000 family ATM modules, refer to the *Catalyst 5000 Family Installation Guide*, the *Catalyst 5000 Family Supervisor Engine Installation Guide*, and the *Catalyst 5000 Family Module Installation Guide*. For installation information and a description of the Catalyst 6000 family ATM modules, refer to the *Catalyst 6000 Family Installation Guide* and the *Catalyst 6000 Family Module Installation Guide.*

Table 1-1 lists the product numbers and features on all ATM modules supported on the Catalyst 5000 family switches, and Table 1-2 lists the product numbers and features on all ATM modules supported on the Catalyst 6000 family switches.

Table 1-1 Catalyst 5000 Family ATM Modules

Product Number	Module Description
WS-X5156	ATM LANE[1] Dual PHY Module (UTP) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC[2], LES[3], BUS[4], and LECS[5]
WS-X5158	ATM LANE Dual PHY OC-3 Module (MMF) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC, LES, BUS, and LECS
WS-X5157	ATM LANE Dual PHY OC-3 Module (SMF) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC, LES, BUS, and LECS
WS-X5166	ATM Dual PHY DS3 Module • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • Support for PVC traffic shaping
WS-X5167	ATM Dual PHY OC-3 LANE/MPOA[6] Module (MMF) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC, LES, BUS, and LECS • MPOA support

Table 1-1 Catalyst 5000 Family ATM Modules (continued)

Product Number	Module Description
WS-X5168	ATM Dual OC-3 LANE/MPOA Module (SMF) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC, LES, BUS, and LECS • MPOA support
WS-X5161	ATM Dual PHY OC-12 LANE/MPOA Module (MMF) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC, LES, BUS, and LECS • MPOA support
WS-X5162	ATM Dual PHY OC-12 LANE/MPOA Module (SMF) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC, LES, BUS, and LECS • MPOA support

1. LANE=LAN Emulation
2. LEC=LAN Emulation Client
3. LES=LAN Emulation Server
4. BUS=broadcast and unknown server
5. LECS=LAN Emulation Configuration Server
6. MPOA=Multiprotocol over ATM

Table 1-2 Catalyst 6000 Family ATM Modules

Product Number	Module Description
WS-X6101	ATM Dual PHY OC-12 LANE/MPOA Module (SMF) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC[1], LES[2], BUS[3], and LECS[4] • MPOA support[5]
WS-X6101	ATM Dual PHY OC-12 LANE/MPOA Module (MMF) • Reassembly of up to 255 buffers simultaneously; each buffer represents a packet • Support for up to 4096 virtual circuits • Support for AAL 5 • ATM LANE 1.0, including LEC, LES, BUS, and LECS • MPOA support

1. LEC=LAN Emulation Client
2. LES=LAN Emulation Server
3. BUS=broadcast and unknown server
4. LECS=LAN Emulation Configuration Server
5. MPOA=Multiprotocol over ATM

ATM Switch Processor Software

ATM modules require an additional software image, which is factory installed on the module.

Catalyst 5000 family and 6000 family share a command-line interface (CLI) with which you can configure modules and ports on the switches. For descriptions of the available CLI commands, see Chapter 7, “Command Reference.”

Software Features

Catalyst 5000 family and 6000 family ATM modules support these software features:

- LAN emulation
- PVCs with traffic shaping
- MPOA
- Fabric integration
- Fast Simple Server Redundancy Protocol (FSSRP)

VLAN/ELAN Trunks

Emulated LANs (ELANs) effectively extend VLANs across an ATM cloud. When you configure an ELAN, it is by default bound to a VLAN. Using ELANs, you can connect members of the same VLANs on different devices over an ATM link.

Network Management

Catalyst 5000 and 6000 family ATM modules can be monitored and controlled with network management, with the CLI, or with alternative methods, such as CWSI, CiscoWorks 2000, and SNMP. For information on SNMP, refer to the *Software Configuration Guide* for your switch.

ATM MIBs

Table 1-3 shows the supported MIB objects for the ATM software releases.

For additional information on MIBs, RMON groups, and traps, refer to the Cisco public MIB directory (http://www.cisco.com/public/mibs/) and the "*Enterprise MIB User Quick Reference*," on Cisco Connection Online (CCO).

Table 1-3 Supported ATM MIB Objects

Software Release	MIBs
3.2 (2) and later	CISCO-ATM-DUAL-PHY-MIB
51.1 and later	CISCO-ATM-DUAL-PHY-MIB
	CISCO-ATM-PVC-MIB

CHAPTER 2

ATM Module Management

This chapter provides basic configuration and management information for the ATM modules and describes the command-line interface (CLI) used to configure the ATM modules for the Catalyst 5000 and 6000 family switches.

Note For descriptions of all ATM commands, see Chapter 7, "Command Reference."

This chapter consists of these sections:

ATM Module CLI Overview

The ATM modules use a subset of the Cisco IOS software. The Cisco IOS user interface provides access to several different command modes. Each command mode provides a group of related commands.

Cisco IOS software provides two command access modes: *user EXEC* and *privileged EXEC*. The user EXEC mode does not require a password and allows you direct access only to the ATM module with which you have established a session. The user EXEC mode commands are a subset of the privileged EXEC mode commands.

The privileged EXEC mode requires a password (the default password is **atm**). From the privileged level, you can access the six configuration modes:

- User EXEC
- Privileged EXEC
- Global configuration
- Interface configuration

- Line configuration
- LAN Emulation (LANE) database configuration

Enter a question mark (**?**) at the system prompt to display the available commands for the current command mode.

Almost every configuration command has a **no** form. The **no** form disables a feature or function. Enter the command without the keyword **no** to reenable a disabled feature or to enable a feature that is disabled by default. See Chapter 7, "Command Reference" for more information about the ATM module commands.

The user interface also provides context-sensitive help on command syntax. For information on how to use the help system, see the "Getting Context-Sensitive Help" section on page 2-13. The user interface also describes the command editing and command history features that allow you to recall previous command entries and easily edit command entries.

Accessing the ATM Module CLI

To access an ATM module installed in a Catalyst 5000 or 6000 family switch, enter the **session** *mod_num* command at the Console> prompt. The switch responds with the Enter Password prompt. Enter **atm** as the default password. The ATM module responds with the ATM> prompt. At this point, you are in user EXEC command mode, and you have direct access only to the ATM module with which you have established a session.

This example shows how to open a session on an ATM module installed in slot 4:

```
Console> session 4
Enter Password:
ATM>
```

Operating the ATM Module CLI

This section describes the command modes and functions that allow you to access and operate the ATM module CLI. Table 2-1 lists the command modes, how to access each mode, the prompt you see while you are in that mode, the main uses for each configuration mode, and the method to exit that mode. The prompts listed assume the default name ATM.

Table 2-1 ATM Module Command Mode Summary

Command Mode	Access Method	Prompt	Exit Method
User EXEC	Enter the **session** command in the switch CLI.	ATM>	Enter the **logout** command.
Privileged EXEC	From user EXEC mode, enter the **enable** EXEC command. Enter the enable password at the prompt (default is **atm**).	ATM#	Enter the **disable** command.
Global configuration	From privileged EXEC mode, enter the **configure** privileged EXEC command.	ATM(config)#	Enter the **exit** or **end** command, or press **Ctrl-Z**

Table 2-1 ATM Module Command Mode Summary (continued)

Command Mode	Access Method	Prompt	Exit Method
Interface configuration	From global configuration mode, enter the **interface** *interface_num* command.	ATM (config-if)#	To exit to global configuration mode, enter the **end** command. To exit to privileged EXEC mode, enter the **exit** command, or press **Ctrl-Z.**
Subinterface configuration	From interface configuration mode, enter the **interface** *sub_interface_num* command.	ATM (config-subif)#	To exit to global configuration mode, enter the **end** command. To exit to privileged EXEC mode, enter the **exit** command, or press **Ctrl-Z.**
Line configuration	From global configuration mode, enter the **line** *line_number* command.	ATM (config-line)#	To exit to global configuration mode, enter the **exit** command. To exit to privileged EXEC.
LANE database configuration	From global configuration mode, enter the **lane database** command.	ATM (config-if)#	To exit to global configuration mode, enter the **exit** command. To exit to privileged EXEC mode, enter the **end** command, or press **Ctrl-Z.**

Accessing User EXEC Mode

After you log in to the ATM module, you are automatically in user EXEC command mode. The user EXEC commands are a subset of the privileged EXEC commands. The user EXEC commands allow you to change terminal settings on a temporary basis, perform basic tests, and list system information.

To list the commands available in user EXEC mode, enter a question mark (**?**) at the ATM> prompt.

Accessing Privileged EXEC Mode

Because many privileged commands set operating parameters, use password protection to restrict access to privileged EXEC mode. The privileged EXEC command set includes those commands in user EXEC mode, as well as the **configure** command through which you can access the remaining command modes. Privileged EXEC mode also includes high-level testing commands, such as **debug**.

To access and list the privileged EXEC commands, perform this task:

	Task	Command
Step 1	Enter privileged EXEC mode.	**enable** *password*
Step 2	List privileged EXEC commands.	**?**

If the system administrator has set a password, you are prompted to enter it before you are allowed access to privileged EXEC mode. The password is not displayed on the screen and is case sensitive. If an **enable** password has not been set, you can only access privileged EXEC mode from the console. The default password for the ATM module is **atm**.

This example shows how to access privileged EXEC mode:

```
ATM> enable
Password:
ATM#
```

From privileged EXEC mode, you can access global configuration mode. For instructions, see the "Accessing Global Configuration Mode" section on page 2-4.

To return from privileged EXEC mode to user EXEC mode, perform this task:

Task	Command
Exit privileged EXEC mode and return to user EXEC mode.	**disable**

Accessing Global Configuration Mode

Global configuration commands apply to features that affect the ATM module as a whole. To enter global configuration mode, enter the **configure** privileged EXEC command. When you enter this command, the privileged EXEC mode prompts you for the source of the configuration commands, as follows:

```
Configuring from terminal, memory, or network [terminal]?
```

Note Only the **write memory** and **write terminal** commands are supported. The **write network** command is not supported.

You can specify either the terminal or NVRAM as the source of configuration commands (refer to the Cisco IOS configuration guide and command reference publications for complete information on Cisco IOS commands). The default is to enter commands from the console terminal. Press **Return** to enter terminal configuration mode.

To access and list the global configuration commands, perform this task:

	Task	Command
Step 1	At the console terminal, from privileged EXEC mode, enter global configuration mode.	**configure terminal**
Step 2	List the global configuration commands.	**?**

This example shows how to access global configuration mode:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#
```

To exit global configuration command mode and return to privileged EXEC mode, perform this task using one of these commands:

Task	Command
Exit global configuration mode.	**exit** **end**

Accessing Interface Configuration Mode

Interface configuration commands modify the operation of the ATM interface. Interface configuration commands always follow an **interface** global configuration command, which defines the interface type.

To access and list the interface configuration commands, perform this task:

	Task	Command
Step 1	Enter interface configuration mode.	**interface atm0**[1]
Step 2	List the interface configuration commands.	**?**
Step 3	From interface configuration mode, enter subinterface configuration mode.	**interface atm0.***sub_interface_num*
Step 4	List the subinterface configuration commands.	**?**

1. Always specify ATM interface 0 for the ATM module.

This example shows how to access interface configuration mode:

```
ATM(config)#interface atm0
ATM(config-if)#
```

This example shows how to access subinterface configuration mode:

```
ATM(config-if)#interface atm0.1
ATM(config-subif)#
```

To exit interface configuration mode and return to global configuration mode, perform this task:

Task	Command
Exit interface configuration mode.	**exit**

To exit global configuration mode and return to privileged EXEC mode, perform this task:

Task	Command
Exit global configuration mode.	**end**

Accessing Line Configuration Mode

Line configuration commands modify the operation of a terminal line. Line configuration commands always follow a **line** command, which defines a line number. These commands change terminal parameter settings either on a line-by-line basis or for a range of lines.

To access and list the virtual terminal line configuration commands, perform this task:

	Task	Command
Step 1	From global configuration mode, configure a virtual terminal line.	**line** [**vty**] *line-number* [*ending-line-number*][1]
Step 2	List the line configuration commands.	**?**

1. This command is documented in the "Terminal Lines and Modem Support Commands" chapter in the *Router Products Command Reference* publication.

This example shows how to enter line configuration mode for virtual terminal line 4:

```
ATM(config)#line 0 4
ATM(config-line)#
```

To exit line configuration mode and return to global configuration mode, perform this task:

Task	Command
Exit line configuration mode.	**exit**

To exit global configuration mode and return to privileged EXEC mode, perform this task using one of these commands:

Task	Command
Exit global configuration mode.	**end** **Ctrl-Z**

Downloading System Software Images to the ATM Modules

This section contains the following subsections:

You can download system software images to the ATM modules using the Trivial File Transfer Protocol (TFTP) or Remote Copy Protocol (rcp). Both methods allow you to download image files over the network from a server.

When you download a software image file to an ATM module, the switch checks the header of the image file to determine the type of software image.

When you download ATM module software images, you can either specify the module to which the image file should be downloaded or not specify the module, in which case the software image is downloaded to all ATM modules installed in the switch. The file is relayed packet by packet to the appropriate modules using the Inter-Process Communications protocol internal to the system, with communication taking place across the switching bus. Downloading a software image to multiple modules significantly speeds up the process of updating the software on multiple modules of the same type.

Preparing to Download an Image

Before you begin downloading a software image, make sure of the following:

- Ensure that the workstation acting as the TFTP or rcp server is configured properly.
- Ensure that the switch has a route to the server. The switch and the server must be in the same subnetwork if you do not have a router to route traffic between subnets. Check connectivity to the TFTP server using the **ping** command.
- Ensure that the software image to be downloaded is in the correct directory on the server (for example, /tftpboot on a UNIX workstation).
- Ensure that the permissions on the file are set correctly. Permissions on the file should be world-read.

Downloading ATM Module Images

Use this procedure to download a software image to an intelligent module on a Catalyst 5000 or 6000 family switch:

Step 1 Copy the software image file to the appropriate directory on the workstation.

Step 2 Log into the switch through the console port or a Telnet session. If you log in using Telnet, your Telnet session might disconnect when you reset modules to run the new software.

Step 3 Use the command appropriate for your switch and supervisor engine to download the software image from the TFTP server:

- **Catalyst 5000 family Supervisor Engine III and III F**
  - If there is only one module of the type appropriate for the image, or if there are multiple modules of the same type and you want to update the image on all of them, enter the **copy tftp | rcp flash** command. When prompted, enter the IP address or host name of the TFTP server, the name of the file to download, the Flash device to which to copy the file, and the destination filename.
  - If there are multiple modules of the type appropriate for the image but you only want to update a single module, enter the **copy tftp** *m***/bootflash: | rcp** *m***/bootflash:**command, where *m* is the number of the module to which to download the software image.
- **Catalyst 5000 family Supervisor Engine II, II G, and III G**
  - If there is only one module of the type appropriate for the image, or if there are multiple modules of the same type and you want to update the image on all of them, enter the **download** *host file* command, where *host* is the IP address or host name of the server and *file* is the name of the file to download.

– If there are multiple modules of the type appropriate for the image but you only want to update a single module, enter the **download** *host file mod_num* command, where *mod_num* is the slot in which the module is installed.

Note If you do not specify a module number, the switch examines the header of the image file to determine to which modules the software is downloaded. The image is then downloaded to all the modules of that type.

- **Catalyst 6000 family supervisor engines**
  – If there is only one module of the type appropriate for the image, or if there are multiple modules of the same type and you want to update the image on all of them, enter the **copy tftp | rcp flash** command. When prompted, enter the IP address or host name of the TFTP server, the name of the file to download, the Flash device to which to copy the file, and the destination filename.
  – If there are multiple modules of the type appropriate for the image but you only want to update a single module, enter the **copy tftp** *m***/bootflash: | rcp** *m***/bootflash:**command, where *m* is the number of the module to which to download the software image.

The switch downloads the image file, erases the Flash memory on the appropriate modules, and reprograms the Flash memory with the downloaded Flash code.

Note All modules in the switch remain operational while the image downloads.

Step 4 Reset the appropriate modules using the **reset** *mod_num* command. If you are connected through Telnet, your Telnet session disconnects if you reset the module through which your connection was made.

Step 5 When the upgraded modules come online, enter the **show version** [*mod_num*] command to check the version of the code on the switch.

Note For examples that show complete procedures for downloads to intelligent modules, see the "Example Single Intelligent Module Image Download (Catalyst 5000 Family Supervisor II, II G, or III G)" section on page 2-9, the "Example Multiple Module Image Download (Supervisor II, II G, or III G)" section on page 2-11, the "Example Single Module Image Download (Supervisor III or III F)" section on page 2-9 and the "Example Multiple Module Image Download (Supervisor III or III F)" section on page 2-10.

Example Download Procedures

These sections show example download procedures:

Example Single Module Image Download (Supervisor III or III F)

Note For a step-by-step procedure for downloading software images to ATM modules on a Catalyst 5000 family switch with a Supervisor Engine III or III F, see the "Downloading ATM Module Images" section on page 2-7.

This example shows a complete TFTP download procedure of an ATM software image to a single ATM module in a Catalyst 5000 family switch with a Supervisor Engine III or III F module:

```
Console> (enable) show version 4
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ----------------------------------------
4   1    WS-X5155   003414855 Hw : 1.2
                               Fw : 1.3
                               Fw1: 1.3
                               Sw : 3.2(6)
Console> (enable) copy tftp 4/flash
IP address or name of remote host []? 172.20.52.3
Name of file to copy from []? cat5000-atm.3-2-7.bin
Download image tftp:cat5000-atm.3-2-7.bin to Module 4 FLASH (y/n) [n]? y
This command will reset Download Module(s) you selected.

Do you wish to continue download flash (y/n) [n]? y
-
Download done for module 4, please wait for it to come online

File has been copied successfully.
Console> (enable) 07/21/1998,13:13:54:SYS-5:Module 4 is online

Console> (enable) show version 4
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ----------------------------------------
4   1    WS-X5155   003414855 Hw : 1.2
                               Fw : 1.3
                               Fw1: 1.3
                               Sw : 3.2(7)
Console> (enable)
```

Example Single Intelligent Module Image Download (Catalyst 5000 Family Supervisor II, II G, or III G)

Note For a step-by-step procedure for downloading software images to intelligent modules on a Catalyst 5000 family switch with a Supervisor Engine II, II G, or III G, see the "Downloading ATM Module Images" section on page 2-7.

This example shows a complete TFTP download procedure of an FDDI software image to a single ATM module in a Catalyst 5000 family switch with a Supervisor Engine II, II G, or III G module:

```
Console> (enable) show version 3
Mod Port Model Serial #  Versions
--- ---- ---------- --------- ----------------------------------------
3   2    WS-X5155  003414855 Hw : 1.2
                             Fw : 1.3
                             Fw1: 1.3
                             Sw : 3.2(6)
Console> (enable) download 172.20.52.3 cat5000-fddi.3-1-1.bin 3
This command will reset module 3.
Download image cat5000-fddi.3-1-1.bin from 172.20.52.3 to Module 3 FLASH (y/n) [
n]? y
|
Finished network single module download. (1060456 bytes)
.....................................................................
.....................................................................
.....................................................................
.....................................................................
.....................................................................
.....................
SCP download checksum ok
SCP download done.
Please wait until module 3 comes online before resetting.
(Approximately 5 minutes)
Console> (enable) Console> (enable) 07/21/1998,11:23:36:SYS-5:Module 3 FLASH pro
gramming complete
07/21/1998,11:24:59:SYS-5:Module 3 is online
07/21/1998,11:25:00:DTP-5:Port 3/1-2 has become dot10 trunk

Console> (enable) show version 3
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ----------------------------------------
3   2    WS-X5155 003414855 Hw : 1.2
                             Fw : 1.3
                             Fw1: 1.3
                             Sw : 3.2(7)
Console> (enable)
```

Example Multiple Module Image Download (Supervisor III or III F)

Note For a step-by-step procedure for downloading software images to intelligent modules on a Catalyst 5000 family switch with a Supervisor Engine III or III F, see the "Downloading ATM Module Images" section on page 2-7.

This example shows a complete TFTP download procedure of an ATM software image to multiple ATM modules in a Catalyst 5000 family switch with a Supervisor Engine III or III F module:

```
Console> (enable) show version 4
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ----------------------------------------
4   1    WS-X5155   003414855 Hw : 1.2
                               Fw : 1.3
                               Fw1: 1.3
                               Sw : 3.2(6)
Console> (enable) show version 5
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ----------------------------------------
5   1    WS-X5155   003414463 Hw : 1.2
                               Fw : 1.3
                               Fw1: 1.3
                               Sw : 3.2(6)
Console> (enable) copy tftp flash
IP address or name of remote host []? 172.20.52.3
Name of file to copy from []? cat5000-atm.3-2-7.bin
Download image tftp:cat5000-atm.3-2-7.bin to Module 4 FLASH (y/n) [n]? y
Download image tftp:cat5000-atm.3-2-7.bin to Module 5 FLASH (y/n) [n]? y
This command will reset Download Module(s) you selected.

Do you wish to continue download flash (y/n) [n]? y
-
Download done for module 4, please wait for it to come online

Download done for module 5, please wait for it to come online

File has been copied successfully.
Console> (enable) 07/21/1998,12:25:10:SYS-5:Module 4 is online
07/21/1998,12:25:10:SYS-5:Module 5 is online

Console> (enable) show version 4
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ----------------------------------------
4   1    WS-X5155   003414855 Hw : 1.2
                               Fw : 1.3
                               Fw1: 1.3
                               Sw : 3.2(7)
Console> (enable) show version 5
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ----------------------------------------
5   1    WS-X5155   003414463 Hw : 1.2
                               Fw : 1.3
                               Fw1: 1.3
                               Sw : 3.2(7)
Console> (enable)
```

Example Multiple Module Image Download (Supervisor II, II G, or III G)

Note For a step-by-step procedure for downloading software images to intelligent modules on a Catalyst 5000 family switch with a Supervisor Engine II, II G, or III G, see the "Downloading ATM Module Images" section on page 2-7.

This example shows a complete TFTP download procedure of an ATM software image to multiple ATM modules in a Catalyst 5000 family switch with a Supervisor Engine II, II G, or III G module:

```
Console> (enable) show version 8
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ---------------------------------------
8   1    WS-X5155   003414855 Hw : 1.2
                              Fw : 1.3
                              Fw1: 1.3
                              Sw : 3.2(4)
Console> (enable) show version 9
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ---------------------------------------
9   1    WS-X5155   003414463 Hw : 1.2
                              Fw : 1.3
                              Fw1: 1.3
                              Sw : 3.2(6)
Console> (enable) download 172.20.52.3 cat5000-atm.3-2-7.bin
Download image cat5000-atm.3-2-7.bin from 172.20.52.3 to Module 8 FLASH (y/n) [n
]? y
Download image cat5000-atm.3-2-7.bin from 172.20.52.3 to Module 9 FLASH (y/n) [n
]? y
This command will reset download module(s) you selected.

Do you wish to continue download to flash (y/n) [n]? y
-
Download done for module 8, please wait for it to come online

Download done for module 9, please wait for it to come online

Finished network multiple modules download. (2378316 bytes)
Please wait until module(s) come online before resetting.
Console> (enable) 07/21/1998,13:19:54:SYS-5:Module 8 is online
07/21/1998,13:19:54:SYS-5:Module 9 is online
Console> (enable) show version 8
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ---------------------------------------
8   1    WS-X5155   003414855 Hw : 1.2
                              Fw : 1.3
                              Fw1: 1.3
                              Sw : 3.2(7)
Console> (enable) show version 9
Mod Port Model      Serial #  Versions
--- ---- ---------- --------- ---------------------------------------
9   1    WS-X5155   003414463 Hw : 1.2
                              Fw : 1.3
                              Fw1: 1.3
                              Sw : 3.2(7)
Console> (enable)
```

Performing ATM Module Functions

This section describes how to perform the following functions:

- Getting Context-Sensitive Help, page 2-13
- Checking Command Syntax, page 2-14

Getting Context-Sensitive Help

You can get a list of the associated keywords and arguments for any command by using the context-sensitive help feature.

To get help specific to a command mode, a command, a keyword, or arguments, perform one of these tasks:

Task	Command
• Obtain a brief description of the help system in any command mode.	**help**
• Configure a line or lines to receive help for the full set of user-level commands when you enter **?**.	**full-help**
• Configure a line to receive help for the full set of user-level commands for this EXEC session.	**terminal full-help**[1]
• Obtain a list of commands that begin with a particular character string.	*abbreviated-command-entry***?**
• Complete a partial command name.	*abbreviated-command-entry*<**Tab**>
• List all commands available for a particular command mode.	**?**
• List the associated keywords for a command.	*command* **?**
• List the associated arguments for a keyword.	*command keyword* **?**

1. This command is documented in the *Cisco Access Connection Guide*.

When using context-sensitive help, the space (or lack of a space) before the question mark (**?**) is significant.

To obtain a list of commands that begin with a particular character sequence, enter the characters immediately followed by the question mark (**?**). Do not include a space. This form of help completes the word for you.

To list keywords or arguments, enter command syntax help by entering a question mark (**?**) in place of a keyword or argument. Include a space before the **?**. This form of help reminds you which keywords or arguments are applicable based on the command, keywords, and arguments you have already entered.

You can abbreviate commands and keywords by using a number of characters that allow a unique abbreviation. For example, you can abbreviate the **show** command to **sh**.

Enter the **help** command (which is available in any command mode) for a brief description of the help system:

```
ATM#help
Help may be requested at any point in a command by entering
a question mark '?'. If nothing matches, the help list will
be empty and you must back up until entering a '?' shows the
available options.
Two styles of help are provided:
1. Full help is available when you are ready to enter a
   command argument (e.g. 'show ?') and describes each possible
   argument.
2. Partial help is provided when an abbreviated argument is entered
   and you want to know what arguments match the input
   (e.g. 'show pr?'.)
```

You can enter a partial command name and a question mark (**?**) to obtain a list of commands beginning with a particular character set. See the "Completing a Partial Command Name" section on page 2-18 for more details.

This example shows how context-sensitive help enables you to create an access list from configuration mode. Enter **co** at the system prompt followed by a question mark (**?**). Do not leave a space between the last letter and the question mark (?). The system provides the commands that begin with **co**.

```
ATM#co?
configure  connect  copy
```

Enter the **configure** command followed by a space and a question mark (**?**) to list the command's keywords and a brief explanation:

```
ATM#configure ?
  memory    Configure from NV memory
  network   Configure from a TFTP network host
  terminal  Configure from the terminal
  <cr>
```

Checking Command Syntax

An error indicator (^) symbol appears at the point in the command string where you have entered an incorrect command, keyword, or argument. The error location indicator and interactive help system allow you to easily find and correct syntax errors.

This example shows how to use context-sensitive help to determine how to clear an ATM interface.

First, check the syntax for the command:

```
ATM#clear ?
  counters   Clear counters on one or all interfaces
  interface  Clear the hardware logic on an interface
  lane       lane
  line       Reset a terminal line
  logging    Clear logging buffer
  tcp        Clear a TCP connection or statistics

ATM#
```

The help output shows that **clear interface** is the syntax for clearing an interface. Next, check the syntax for specifying the type of interface:

```
ATM#clear interface ?
  ATM       ATM interface
  Ethernet  IEEE 802.3
  Null      Null interface

ATM#clear interface
```

The help output shows that **clear interface atm** is the syntax for clearing an ATM interface. Next, check the syntax for specifying the specific ATM interface:

```
ATM#clear interface atm ?
  <0-0>  ATM interface number

ATM#clear interface atm
```

The help output shows you must specify the ATM interface number. When you specify the interface correctly, the ATM interface is cleared:

```
ATM#clear interface atm 0
ATM#
```

Using the Command History Features

The command history feature keeps a record of commands you have entered and allows you to recall these commands. The functions of the command history feature are as follows:

- Setting the Command History Buffer Size, page 2-15
- Recalling Commands, page 2-16
- Disabling the Command History Feature, page 2-16

Setting the Command History Buffer Size

By default, the system records ten command lines in its history buffer. To set the number of command lines the system records during the current terminal session, perform this task in user EXEC mode:

Task	Command
Enable the command history feature for the current terminal session.	**terminal history** [**size** *number-of-lines*][1]

1. This command is documented in the *Cisco Access Connection Guide*.

The **terminal no history size** command resets the number of lines saved by history to the default of ten lines.

To configure the number of command lines the system records, perform this task in line configuration mode:

Task	Command
Enable the command history feature.	**history** [**size** *number-of-lines*][1]

1. The **no history** command turns off command history for the line.

Recalling Commands

To recall commands from the history buffer, perform one of these tasks:

Task	Key Sequence/Command
• Recall commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.	Press **Ctrl-P** or the up arrow key[1].
• Return to more recent commands in the history buffer after recalling commands with **Ctrl-P** or the up arrow key. Repeat the key sequence to recall successively more recent commands.	Press **Ctrl-N** or the down arrow key[1].
• In EXEC mode, list the last several commands you have just entered.	**show history**

1. The arrow keys function only on ANSI-compatible terminals such as VT100s.

Disabling the Command History Feature

The command history feature is enabled automatically. To disable it during the current terminal session, perform this task in user EXEC mode:

Task	Command
Disable the command history feature for the current session.	**terminal no history**[1]

1. This command is documented in the *Cisco Access Connection Guide*.

To configure a specific line so that the command history feature is disabled, perform this task in line configuration mode:

Task	Command
Configure the line so that the command history feature is disabled.	**no history**

Using the Editing Features

Catalyst 5000 family ATM software release 2.3 and above includes an enhanced editing mode that provides a set of editing key functions similar to those of the Emacs editor. You can enter commands in uppercase, lowercase, or a mix of both. Only passwords are case sensitive. You can abbreviate commands and keywords to the number of characters that allow a unique abbreviation.

For example, you can abbreviate the **show** command to **sh**. After entering the command at the system prompt, press **Return** to execute the command.

Enabling Enhanced Editing Mode

Although enhanced editing mode is enabled automatically, you can disable it and revert to the editing mode of previous software releases. For more information, see the "Ending a Session" section on page 2-21.

To reenable the enhanced editing mode for the current terminal session, perform this task in user EXEC mode:

Task	Command
Enable the enhanced editing features for the current terminal session.	**terminal editing**[1]

1. This command is documented in the *Cisco Access Connection Guide*.

To reconfigure a specific line in enhanced editing mode, perform this task in line configuration mode:

Task	Command
Enable the enhanced editing features.	**editing**

Moving Around on the Command Line

Perform one of these tasks to move the cursor around on the command line for corrections or changes:

Task	Keystrokes
• Move the cursor back one character.	Press **Ctrl-B** or press the left arrow key[1].
• Move the cursor forward one character.	Press **Ctrl-F** or press the right arrow key[1].
• Move the cursor to the beginning of the command line.	Press **Ctrl-A**.
• Move the cursor to the end of the command line.	Press **Ctrl-E**.
• Move the cursor back one word.	Press **Esc B**.
• Move the cursor forward one word.	Press **Esc F**.

1. The arrow keys function only on ANSI-compatible terminals such as VT100s.

Completing a Partial Command Name

If you cannot remember a complete command name, press the **Tab** key to allow the system to complete a partial entry. To do so, perform this task:

Task	Keystrokes
Complete a command name.	Enter the first few letters, and press the **Tab** key.

If your keyboard does not have a Tab key, press **Ctrl-I** instead.

In the following example, when you enter the letters **conf** and press the **Tab** key, the system provides the complete command:

```
ATM#conf<Tab>
ATM#configure
```

If you enter a set of characters that could indicate more than one command, the system beeps to indicate an error. Enter a question mark (**?**) to obtain a list of commands that begin with that set of characters. Do not leave a space between the last letter and the question mark (**?**). For example, three commands in privileged mode start with **co**. To see what they are, enter **co?** at the privileged EXEC prompt. The system displays all commands that begin with **co**, as follows:

```
ATM#co?
configure  connect  copy
```

Pasting in Buffer Entries

The system provides a buffer that contains the last ten items you deleted. You can recall these items and paste them in the command line by performing this task:

	Task	Command
Step 1	Recall the most recent entry in the buffer.	Press **Ctrl-Y**.
Step 2	Recall the next buffer entry.	Press **Esc Y**.

The buffer contains only the last ten items you have deleted or cut. If you press **Esc Y** more than ten times, you cycle back to the first buffer entry.

Editing Command Lines That Wrap

The editing command set provides a wraparound feature for commands that extend beyond a single line on the screen. When the cursor reaches the right margin, the command line shifts ten spaces to the left. You cannot see the first ten characters of the line, but you can scroll back and check the syntax at the beginning of the command. To scroll back, perform this task:

Task	Keystrokes
Return to the beginning of a command line to verify that you have entered a lengthy command correctly.	Press **Ctrl-B** or the left arrow key repeatedly until you scroll back to the beginning of the command entry, or press **Ctrl-A** to return directly to the beginning of the line[1].

1. The arrow keys function only on ANSI-compatible terminals such as VT100s.

In this example, the **lane config-atm-address** command entry extends beyond one line. When the cursor reaches the end of the line, the line shifts ten spaces to the left and is redisplayed. The dollar sign ($) indicates that the line scrolled to the left. Each time the cursor reaches the end of the line, the line shifts ten spaces to the left.

```
ATM(config-subif)#lane config-atm-address 39.000000000000014155551211.080020
ATM(config-subif)#$ -atm-address 39.000000000000014155551211.0800200c1001.00
```

When you complete the entry, press **Ctrl-A** to check the complete syntax, and then press **Return** to execute the command. The dollar sign ($) appears at the end of the line to indicate that the line scrolled to the right:

```
ATM(config-subif)#lane config-atm-address 39.000000000000014155551211.080020 $
```

The system assumes your terminal screen is 80 columns wide. If your screen has a different width, enter the **terminal width** command to tell the router the correct width of your screen.

Use line wrapping with the command history feature to recall and modify previous complex command entries. See the "Recalling Commands" section on page 2-16 for information about recalling previous command entries.

Deleting Entries

Perform one of these tasks to delete command entries if you make a mistake or change your mind:

Task	Keystrokes
• Erase the character to the left of the cursor.	Press the **Delete** or **Backspace** key.
• Delete the character at the cursor.	Press **Ctrl-D**.
• Delete from the cursor to the end of the command line.	Press **Ctrl-K**.
• Delete from the cursor to the beginning of the command line.	Press **Ctrl-U** or **Ctrl-X**.
• Delete the word to the left of the cursor.	Press **Ctrl-W**.
• Delete from the cursor to the end of the word.	Press **Esc D**.

Scrolling Down a Line or a Screen

When you use the help facility to list the commands in a particular mode, the list is often longer than the terminal screen can display. In such cases, a ---More--- prompt is displayed at the bottom of the screen. To view the next line or screen, perform these tasks:

Task	Keystrokes
• Scroll down one line.	Press the **Return** key.
• Scroll down one screen.	Press the **Spacebar**.

Note The ---More--- prompt is used for any output that has more lines than can be displayed on the terminal screen, including **show** command output.

Redisplaying the Current Command Line

If you enter a command and the system suddenly sends a message to your screen, you can recall your current command line entry. To do so, perform this task:

Task	Keystrokes
Redisplay the current command line.	Press **Ctrl-L** or **Ctrl-R**.

Transposing Mistyped Characters

If you mistype a command entry, you can transpose the mistyped characters by performing this task:

Task	Keystrokes
Transpose the character to the left of the cursor with the character located at the cursor.	Press **Ctrl-T**.

Controlling Capitalization

You can change words to uppercase or lowercase, or capitalize a set of letters, by performing these tasks:

Task	Keystrokes
• Capitalize at the cursor.	Press **Esc C**.
• Change the word at the cursor to lowercase.	Press **Esc L**.
• Capitalize letters from the cursor to the end of the word.	Press **Esc U**.

Designating a Keystroke as a Command Entry

To use a particular keystroke as an executable command, perform this task:

Task	Keystrokes
Insert a code to indicate to the system that the keystroke immediately following should be treated as a command entry, *not* an editing key.	Press **Ctrl-V** or **Esc Q**.

Ending a Session

After entering the **setup** command or other configuration commands, exit the ATM module and quit the session.

To end a session, perform this task:

Task	Command
Enter the quit EXEC command.	**quit**

Configuring PHY Redundancy

The Catalyst 5000 and 6000 families' dual physical-sublayer (dual PHY) ATM modules provide one active connection and one standby connection to the ATM network. You can connect both PHYs to a single ATM switch, or you can connect one PHY to one ATM switch and one PHY to a second ATM switch.

Only one PHY is active at a time. If the active PHY loses its connection, the ATM module switches automatically to the standby PHY. PHY A is the preferred PHY by default. You can change the preferred PHY using the **atm preferred phy** interface configuration command.

Release 12.0(4a)W5(10) and later supports the Fast PHY switchover feature on the ATM modules. Fast switchover reduces the time to restore traffic flow when traffic switches from the active PHY to the redundant PHY.

To change the preferred PHY on the dual PHY ATM modules, perform this task in interface configuration mode:

Task	Command
Change the preferred PHY to the one not currently in use.	**atm preferred phy** {**A** | **B**}

This example shows how to change the preferred PHY to PHY B:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#atm preferred phy B
ATM(config-if)#^Z
ATM#
```

The **show interface** command displays the preferred and active PHY:

```
ATM#show interface atm0
ATM0 is up, line protocol is up
  Hardware is Catalyst 5000 ATM
  MTU 1500 bytes, sub MTU 0, BW 156250 Kbit, DLY 80 usec, rely 255/255, load 125
  Encapsulation ATM, loopback not set, keepalive not supported
  Encapsulation(s): AAL5, PVC mode
  4096 maximum active VCs, 1024 VCs per VP, 3 current VCCs
  VC idle disconnect time: 300 seconds
  Signalling vc = 1, vpi = 0, vci = 5
  UNI Version = 3.0, Link Side = user
  Preferred Phy : PHY B
  Currently Active Phy : PHY B
  Link Status : UP
  Standby Phy Status : UP
  Last input 00:00:00, output never, output hang never
  Last clearing of "show interface" counters 1d23h
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 1000 bits/sec, 1 packets/sec
  5 minute output rate 132043000 bits/sec, 1 packets/sec
     1720746 packets input, 101473920 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     1720745 packets output, 3872214384 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
ATM#
```

Configuring Basic ATM Parameters

These sections describe how to configure basic parameters on the ATM modules:

Configuring VTP on the ATM Module

To enable VTP on the ATM module, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Enable VTP on the ATM module.	**vtp enable**
Step 3	Exit configuration mode.	**Ctrl-Z**

This example shows how to enable VTP on the ATM module:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#vtp enable
ATM(config)#^Z
ATM#
```

To disable VTP on the ATM module, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Disable VTP on the ATM module.	**no vtp enable**
Step 3	Exit configuration mode.	**Ctrl-Z**

This example shows how to disable VTP on the ATM module:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#no vtp enable
ATM(config)#^Z
ATM#
```

Setting the Clock Source

You can configured the ATM modules on the Catalyst 5000 family and 2926G series switches to generate the transmit clock from its internal source or to set the clock-generation mode to receive timing from an external source. By default, the ATM module generates the transmit clock signal from its internal source. The default is loop-timed clock mode for the ATM dual PHY OC-3 modules (WS-X5167 and WS-X5168).

Note The **atm clock internal** and the **no atm clock internal** commands are not supported by the ATM dual PHY OC-12 modules.

To change the clock source, perform this task in interface configuration mode:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**
Step 3	Set the clock source	[**no**] **atm clock internal**
Step 4	Exit configuration mode.	**Ctrl-Z**

This example shows how to set the ATM module to generate the transmit clock from its internal source:

```
ATM(config-if)#atm clock internal
ATM(config-if)#
```

This example shows how to set the ATM module to generate the transmit clock from an external source:

```
ATM(config-if)#no atm clock internal
ATM(config-if)#
```

Configuring Mode

You can configure the mode of operation and control type for cell-rate decoupling on the SONET PLIM using the **atm sonet** command. The default mode is STS-3c operation for the ATM dual PHY OC-3 modules and STS-12c operation for the ATM dual PHY OC-12 modules.

To configure the mode of operation, perform this task in interface configuration mode:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**
Step 3	Set the mode of operation.	**atm sonet** {**stm-1** | **sts-3c**} {**stm-4** | **sts-12c**}
Step 4	Exit configuration mode.	**Ctrl-Z**

This example shows how to set the mode for cell-rate decoupling on the SONET PLIM to stm-1:

```
ATM (config-if)#atm sonet stm-1
ATM (config-if)#
```

Configuring Output Throttling

You can configure output throttling on the ATM modules to control the transmission rate on the ATM interface. Output throttling applies to both LANE and PVCs. Per-VC pacing is not supported on the modules.

To throttle the output of the entire interface, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**
Step 3	Apply output throttling to the interface.	**atm traffic-shape rate** *peak_rate*
Step 4	Exit configuration mode.	**Ctrl-Z**

This example shows how to throttle the output of the ATM module interface to 100 Mbps:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#atm traffic-shape rate 100
ATM(config-if)#^Z
ATM#
```

To return the output rate to the default value for the interface, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**
Step 3	Apply output throttling to the interface.	**no atm traffic-shape rate** *peak_rate*
Step 4	Exit configuration mode.	**Ctrl-Z**

This example shows how to return the output of the ATM module interface to the default value:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#no atm traffic-shape rate 100
ATM(config-if)#^Z
ATM#
```

Configuring ILMI Keepalives

When you enable Integrated Local Management Interface (ILMI) keepalives on a dual PHY ATM module, periodic ILMI keepalive messages are sent to the ATM switch on the active PHY. The ATM switch responds to the ILMI keepalives.

If the ATM switch fails to respond to four consecutive keepalives, the dual PHY module switches from the active PHY to the backup PHY. The ILMI keepalives feature is useful only if the dual PHY module is connected to two different ATM switches. ILMI keepalives are disabled by default.

To enable ILMI keepalives and configure the interval between messages, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**
Step 3	Enable ILMI keepalives and specify the message interval.	**atm ilmi-keepalive** [*interval*]
Step 4	Exit configuration mode.	**Ctrl-Z**
Step 5	Verify the output rate for the interface.	**show atm ilmi-status**

Note If you enable ILMI keepalives but do not specify the interval, the default value of 5 seconds applies.

This example shows how to enable ILMI keepalives and configure the interval between messages to 4 seconds:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#atm ilmi-keepalive 4
ATM(config-if)#^Z
ATM#
```

The following **show atm ilmi-status** command displays the ILMI keepalive configuration:

```
ATM#show atm ilmi-status

Interface : ATM0 Interface Type : Private UNI (User-side)
ILMI VCC : (0, 16) ILMI Keepalive : Enabled (5 Seconds)
ILMI State:       UpAndNormal
Peer IP Addr:     172.20.52.41    Peer IF Name:     ATM12/0/0
Peer MaxVPIbits:  8               Peer MaxVCIbits:  14
Active Prefix(s) :
47.0091.8100.0000.00e0.4fac.b401
End-System Registered Address(s) :
47.0091.8100.0000.00e0.4fac.b401.00e0.4fac.b091.01(Confirmed)
47.0091.8100.0000.00e0.4fac.b401.00e0.4fac.b092.01(Confirmed)
47.0091.8100.0000.00e0.4fac.b401.00e0.4fac.b091.02(Confirmed)
47.0091.8100.0000.00e0.4fac.b401.00e0.4fac.b092.02(Confirmed)
47.0091.8100.0000.00e0.4fac.b401.00e0.4fac.b095.00(Confirmed)
ATM#
```

To disable ILMI keepalives, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**

	Task	Command
Step 3	Disable ILMI keepalives.	**no atm ilmi-keepalive**
Step 4	Exit configuration mode.	**Ctrl-Z**

This example shows how to disable ILMI keepalives on the ATM module:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#no atm ilmi-keepalive
ATM(config-if)#^Z
ATM#
```

Configuring the UNI Signaling Version

The ATM modules are backward compatible with ATM switches that support User-Network Interface (UNI) version 3.0. When the ATM module comes online, ILMI negotiates between the UNI version automatically.

If the UNI version is successfully learned through ILMI, the ATM module accepts the UNI version returned from the ATM switch. If ILMI is unable to determine the UNI version, or if ILMI is disabled, the UNI version defaults to version 3.0.

To statically configure the UNI version, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**
Step 3	Shut down the interface.	**shutdown**
Step 4	Statically configure the UNI version for the ATM interface.	**atm uni-version** {**3.0** | **3.1**}
Step 5	Bring up the interface.	**no shutdown**
Step 6	Exit configuration mode.	**Ctrl-Z**
Step 7	Verify the UNI version.	**show interface atm0**

This example shows how to statically configure the UNI version to version 3.0 and verify the configuration:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#shutdown
ATM(config-if)#atm uni-version 3.0
ATM(config-if)#no shutdown
ATM(config-if)#^Z
ATM#show interface atm0
ATM0 is up, line protocol is up
  Hardware is Catalyst 5000 ATM
  MTU 1500 bytes, sub MTU 0, BW 156250 Kbit, DLY 80 usec, rely 255/255, load 1/2
55
  Encapsulation ATM, loopback not set, keepalive not supported
  Encapsulation(s): AAL5, PVC mode
  4096 maximum active VCs, 1024 VCs per VP, 32 current VCCs
  VC idle disconnect time: 300 seconds
  Signalling vc = 1, vpi = 0, vci = 5
  UNI Version = 3.0, Link Side = user
  PHY Type : SINGLE PHY;         Link Status: UP
  Last input 00:00:00, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 1000 bits/sec, 1 packets/sec
  5 minute output rate 1000 bits/sec, 1 packets/sec
     870851 packets input, 116131392 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     705922 packets output, 83530944 bytes, 0 underruns
     0 output errors, 0 collisions, 8 interface resets
     0 output buffer failures, 0 output buffers swapped out
ATM#
```

To return the UNI version to the default (either the version returned by ILMI or UNI version 3.0, if ILMI cannot learn the UNI version or if ILMI is disabled), perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**
Step 3	Shut down the interface.	**shutdown**
Step 4	Restore the default UNI version for the ATM interface (learned through ILMI or version 3.0 if ILMI cannot learn the UNI version).	**no atm uni-version**
Step 5	Bring up the interface.	**no shutdown**
Step 6	Exit configuration mode.	**Ctrl-Z**
Step 7	Verify the UNI version.	**show interface atm0**

This example shows how to return the UNI version on the ATM interface to the default:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#shutdown
ATM(config-if)#no atm uni-version
ATM(config-if)#no shutdown
ATM(config-if)#^Z
ATM#
```

Displaying ATM Module Statistics and Information

You can monitor activity on the ATM modules and view configuration information by entering statistics commands. See related chapters for information on how to access statistics output specific to the LANE, MPOA, or PVC protocols.

Currently, the following basic ATM statistics commands are supported:

- **show version**—Displays version information for the ATM module.
- **show atm interface**—Displays information for the interface.
- **show ilmi atm**—Displays ILMI-related information.
- **show atm traffic**—Dislays current global ATM traffic information to and from all ATM networks connected to the ATM module.
- **show atm vlan**—Displays the active VLAN to PVC bindings.
- **show atm vc**—Displays the active ATM virtual connections and traffic information.
- **show sscop**—Displays SSCOP details for all ATM interfaces.

CHAPTER 3

Configuring ATM LAN Emulation

This chapter describes how to configure ATM LAN Emulation (LANE) on the ATM modules for the Catalyst 5000 and 6000 family switches.

Note For information on installing Catalyst 5000 family ATM modules, refer to the *Catalyst 5000 Family Module Installation Guide*. For information on installing Catalyst 6000 family ATM modules, refer to the *Catalyst 6000 Family Module Installation Guide*.

Note For syntax and usage information for the commands used in this chapter, see the Chapter 7, "Command Reference."

This chapter consists of these sections:

Understanding How ATM LANE Works

These sections describe how ATM LANE works on the Catalyst 5000 family switches:

ATM LANE Overview

ATM LANE uses a client server architecture to emulate LANs over ATM. But unlike a physical LAN server/host architecture, emulated LANs are logical. You use LANE to provide connectivity among hubs, bridges, routers, and switches to an ATM high-speed backbone. In addition, LANE allows end stations to communicate with an ATM-attached device, such as a file server, through a LAN-to-ATM switch without requiring the traffic to pass through a router.

Configuring LANE on a Catalyst 5000 or 6000 family LANE module requires connectivity to an ATM switch that supports User-Network Interface (UNI) 3.0 or 3.1 and point-to-multipoint signaling (for example, the Cisco LightStream 1010 ATM switch).

Note Cisco supports only IEEE 802.3, Ethernet emulated LANs (ELANs).

LANE provides the following features:

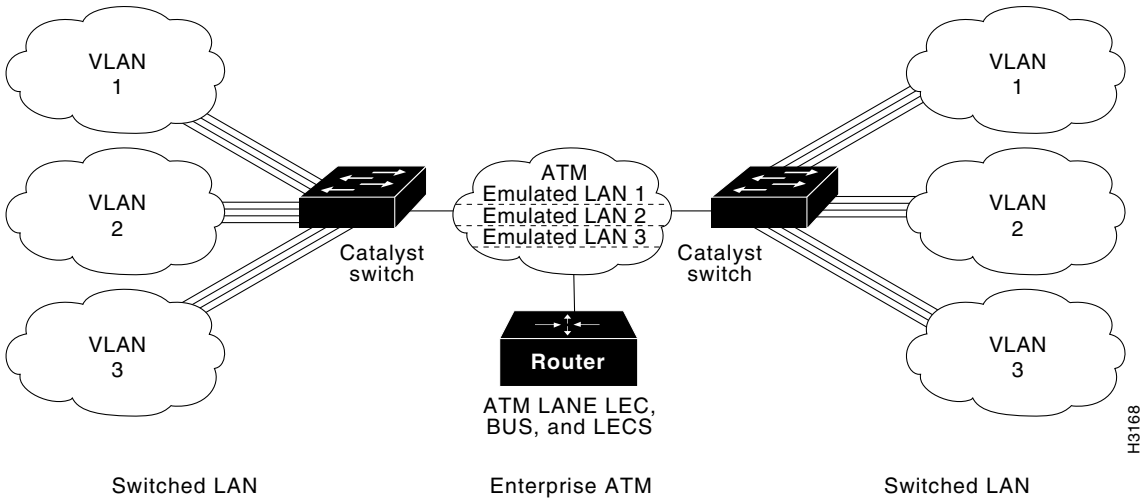
- Connectivity between ATM-attached stations and LAN-attached stations
- Connectivity between LAN-attached stations across an ATM network

Because LANE connectivity is defined at the Media Access Control (MAC) layer, upper-layer protocol functions of LAN applications can operate unchanged when the devices join ELANs. This feature protects corporate investments in legacy LAN applications.

An ATM network can support multiple independent ELANs. End-system membership in any of the ELANs is independent of the physical location of the end system, simplifying hardware adds, moves, and changes. In addition, the end systems can move easily from one ELAN to another, whether or not the hardware moves. Figure 3-1 shows a typical ATM LANE configuration. End stations in switched LANs are interconnected through an ATM network with ELANs that have been mapped to existing VLANs on the switched LANs. VLANs can be extended across the ATM backbone by mapping them to configured ELANs.

Note Figure 3-1 shows VLANs connected through ELANs configured on a router. You do not need to route traffic between hosts on the same VLANs or ELANs. To enable traffic between hosts on different VLANs or ELANs, the router needs to be configured for LANE.

Figure 3-1 Extending VLANs Using ATM LANE



ATM LANE Components

You can set up an unlimited number of ELANs in an ATM cloud. A Catalyst 5000 or 6000 family switch ATM module can host multiple ELANs. If you use the Fast Simple Server Redundancy Protocol (FSSRP), each ELAN can contain multiple LES/BUS pairs for fault tolerance.

LANE is defined on a client-server LAN model and consists of these components:

- LANE Client (LEC)—A LEC emulates a LAN interface to higher-layer protocols and applications. LECs forward data to other LANE components and perform LANE address-resolution functions. Each LEC is a member of only one ELAN. Traffic must be routed between LECs that belong to different ELANs.
- LANE Server (LES)—The LES for an ELAN is the control center. It provides joining, address resolution, and address registration services to the LECs in that ELAN. LECs can register destination unicast and multicast MAC addresses with the LES. In addition, the LES handles LANE Address Resolution Protocol (LE ARP) requests and responses.
- LANE broadcast-and-unknown server (BUS)—The LANE BUS sequences and distributes multicast and broadcast packets and handles unicast flooding. At least one combined LES and BUS is required per ELAN.
- LANE Configuration Server (LECS)—The LECS contains a database of ATM addresses of LES/BUS pairs for configured ELANs. A LEC consults the LECS to determine the LES's ATM address when it first joins an ELAN. The LECS returns the ATM address of the LES for that ELAN.

  At least one LECS is required per ATM LANE switch cloud.

  The LECS database can have the following four types of entries:

  - ELAN_name, ATM_address_of_LES/BUS pairs
  - LEC_MAC_address, ELAN_name pairs
  - LEC_ATM_template, ELAN_name pairs
  - Default_ELAN_name

ELAN names must be unique on an interface. If two interfaces participate in LANE, the second interface might be in a different switch cloud.

Note Multiple LESs, BUSs, and LECSs can exist for the same ELAN, which provides redundancy. See the "Configuring Fast SSRP for Redundant LANE Services" section on page 3-24 for information on how to configure server redundancy.

Comparing VLANs and ELANs

Catalyst 5000 and 6000 family switches support port-based VLAN configuration. An end station connected to a port belongs to the VLAN assigned to that port. The VLAN number identifies the VLAN.

On an ATM network, ELANs are designated by a name. You can configure some ELANs from a router and some from a Catalyst 5000 or 6000 family switch. You can configure some ELANs with unrestricted membership and some with restricted membership. You can also configure a default ELAN, which must have unrestricted membership.

To create a VLAN that spans multiple Catalyst LAN switches across an ATM network, you must map a given ATM ELAN to the same VLAN configured on each switch. For example, if you have VLAN 10 configured on two different switches, you must map VLAN 10 to the same ATM ELAN. To communicate between two or more ELANs, you must use a router, whether the ELANs are on the same or different Catalyst switches.

LANE Operation and Communication Connections

Establishing LANE operation and communication requires the following connections:

- Configure-Direct Connection—Bidirectional point-to-point virtual circuit connection (VCC) established by the LEC to the LECS.
- Control-Direct Connection—Bidirectional point-to-point VCC set up by the LEC to register with the LES. This connection is used later by the LEC to transmit LE-ARP requests for ATM addresses of the BUS and other LECs.
- Control-Distribute Connection—Unidirectional point-to-point VCC established by the LES to the LEC to verify registration.
- Multicast-Send Connection—Bidirectional point-to-point VCC set up by the LEC to the BUS.
- Multicast-Forward Connection—Bidirectional or unidirectional connection VCC set up by the BUS to distribute data to the LEC.
- Data-Direct Connection—Bidirectional point-to-point VCC set up between LECs for unicast traffic.

Figure 3-2 illustrates the various types of VCCs.

Figure 3-2 LANE Virtual Channel Circuit Types

Joining a LEC to an ELAN

The following process (illustrated in Figure 3-2) occurs after you enable a LEC on the ATM module in a Catalyst 5000 or 6000 family switch:

1. Initialization
   a. Using a locally configured ATM address, ILMI, or the ATM Forum's well-known address, the LEC discovers its own ATM address and that of the LECS and sets up a Configure-Direct Connection (a bidirectional point-to-point VCC) to the LECS.
   b. The LECS responds by providing the LES ATM address.
   c. The LEC tears down the Configure-Direct VCC.
2. Registration
   a. The LEC set up a Control-Direct Connection to the LES and requests to join the ELAN.
   b. The LES verifies that the LEC is allowed to join the ELAN.
   c. The LES for the ELAN sets up a connection to the LECS to verify that the LEC is allowed to join the ELAN (bidirectional, point-to-point Server Configure VCC, link 11–12 in Figure 3-2). The LES configuration request contains the LEC MAC address, its ATM address, and the name of the ELAN. The LECS checks its database to determine whether the LEC can join that ELAN and uses the same VCC to inform the LES whether or not the LEC is allowed to join.
   d. The LES allows or does not allow the LEC to join the ELAN.
   e. If allowed, the LES adds the LEC to the unidirectional, point-to-multipoint Control Distribute VCC (link 2–8 in Figure 3-2) and confirms the LEC's membership over the bidirectional, point-to-point Control Direct VCC (link 1–7 in Figure 3-2). If not allowed, the LES rejects the LEC's request to join using the bidirectional, point-to-point Control Direct VCC (link 1–7 in Figure 3-2).
   f. The LEC sends LE ARP packets for the broadcast address (all ones).

g. Sending LE ARP packets for the broadcast address returns the ATM address of the BUS. The LEC sets up the Multicast Send VCC (link 4–9 in Figure 3-2), and the BUS adds the LEC to the Multicast Forward VCC (link 5–10 in Figure 3-2) to and from the BUS.

ELAN Address Resolution

As communication occurs on the ELAN, each LEC dynamically builds a local LE ARP table. A LEC LE ARP table can also have static, preconfigured entries. The LE ARP table maps MAC addresses to ATM addresses.

LE ARP is not the same as IP ARP. IP ARP maps IP addresses (Layer 3) to Ethernet MAC addresses (Layer 2); LE ARP maps ELAN MAC addresses (Layer 2) to ATM addresses (also Layer 2).

When a LEC first joins an ELAN, its LE ARP table has no dynamic entries, and the LEC has no information about destinations on or behind its ELAN. To learn about a destination when a packet is to be sent, the LEC follows this process to find the ATM address corresponding to the known MAC address:

1. The LEC sends an LE ARP request to the LES for its ELAN (point-to-point Control Direct VCC, link 1–7 in Figure 3-2).
2. If the MAC address is registered with the LES, the LES returns the corresponding ATM address. If not, the LES forwards the LE ARP request to all LECs on the ELAN (point-to-multipoint Control Distribute VCC, link 2–8 in Figure 3-2).
3. Any LEC that recognizes the MAC address responds with its ATM address (point-to-point Control Direct VCC, link 1–7 in Figure 3-2).
4. The LES forwards the response (point-to-multipoint Control Distribute VCC, link 2–8 in Figure 3-2).
5. The LEC adds the MAC address-ATM address pair to its LE ARP cache.
6. The LEC establishes a VCC to the desired destination and transmits packets to that ATM address (bidirectional, point-to-point Data Direct VCC, link 6–6 in Figure 3-2).

For unknown destinations, the LEC sends a packet to the BUS, which forwards the packet to all LECs. The BUS floods the packet because the destination might be behind a bridge that has not yet learned this particular address.

Sending Multicast Traffic

When a LEC sends broadcast, multicast, or unicast traffic with an unknown address, the following process occurs:

- The LEC sends the packet to the BUS (unidirectional, point-to-point Multicast Send VCC, link 4–9 in Figure 3-2).
- The BUS floods the packet to all LECs (unidirectional, point-to-multipoint Multicast Forward VCC, link 5–10 in Figure 3-2). This VCC branches at each switch. The switch forwards such packets to multiple outputs. (The switch does not examine the MAC addresses; it only forwards all packets it receives.)

LANE ATM Addressing Structure

On a LAN, packets are addressed using the MAC-layer addresses of the destination and source stations. To provide similar functionality for LANE, MAC-layer addressing must be supported. Every LEC must have a MAC address. In addition, every LANE component (LECS, LES, BUS, and LEC) must have a unique ATM address.

All LECs on the same interface have the same automatically assigned MAC address. That MAC address is also used as the end-system identifier (ESI) part of the ATM address. Although LEC MAC addresses are not unique, all ATM addresses are unique.

An ATM address has the same syntax as a network service access point (NSAP), but it is not a network-level address. The ATM address consists of the following:

- A 13-byte prefix that includes the following fields defined by the ATM Forum:
  - Authority and Format Identifier (AFI) field (1 byte)
  - Data Country Code (DCC) or International Code Designator (ICD) field (2 bytes)
  - Domain Specific Part Format Identifier (DFI) field (1 byte)
  - Administrative Authority field (3 bytes)
  - Reserved field (2 bytes)
  - Routing Domain field (2 bytes)
  - Area field (2 bytes)
- A 6-byte end-system
- A 1-byte selector field

Assigning ATM Addresses Automatically

Cisco provides the following method of constructing and assigning ATM and MAC addresses in an LECS database. A pool of 16 MAC addresses is assigned to each ATM module. For constructing ATM addresses, the following assignments are made to the LANE components:

- The prefix fields are the same for all LANE components in routers and in ATM modules for the Catalyst 5000 family and 6000 family switches; the prefix indicates the identity of the ATM switch. You might need to configure the prefix value on the ATM switch.
- The ESI field value assigned to every LEC on the interface is the first pool of MAC addresses assigned to the interface.
- The ESI field value assigned to every LES on the interface is the second pool of MAC addresses.
- The ESI field value assigned to the BUS on the interface is the third pool of MAC addresses.
- The ESI field value assigned to the LECS is the fourth pool of MAC addresses.
- The selector field value is set to the subinterface number (in hexadecimal notation) of the LANE component—except for the LECS, which has a selector field value of 00.

Because LANE components are defined on different subinterfaces of an ATM interface, the value of the selector field in an ATM address is different for each component. The result is a unique ATM address for each LANE component, even within the same Catalyst 5000 family switch. For more information about assigning components to subinterfaces, see the “ATM LANE Configuration Guidelines” section on page 3-9.

For example, if the MAC addresses assigned to an interface are 0800.200C.1000 through 0800.200C.100F, the ESI portion of the ATM addresses is assigned to LANE components as follows:

- Any LECS gets the ESI 0800.200c.1000.
- Any LEC gets the ESI 0800.200c.1001.
- The LES gets the ESI 0800.200c.1002.
- The BUS gets the ESI 0800.200c.1003.

Registering ILMI Addresses

Catalyst 5000 family and 6000 family switches build their ATM addresses by obtaining the ATM address prefix from the ATM switch. The switch combines the ATM address prefix with its own MAC address and the LEC subinterface number. After the ATM module determines its ATM address, it uses Interim Local Management Interface (ILMI) registration to register this address with the ATM switch. ILMI and signaling PVCs are set up by default.

Using the **atm vc-per-vp** command, you can configure the maximum number of virtual channel identifiers (VCIs) per virtual path identifier (VPI). If this value is configured when the ATM module registers with the ATM switch, the maximum number of VCIs per VPI is passed to the ATM switch. In this way, the ATM switch assigns to the Catalyst 5000 or 6000 family switch a VCI value for a switched virtual circuit (SVC) that is within the ATM switch range. The default is 10 VCI bits and 2 VPI bits on the ATM module. Any change from the default requires an ATM module reset.

Using VTP to Create LECs Automatically

You can configure Catalyst 5000 and 6000 family switches and the ATM modules to use VTP to create LECs automatically when VLANs are created on the Catalyst 5000 and 6000 family switches.

You must enable VTP on the ATM module and configure the LES/BUS and the LECS database for each VLAN/ELAN. LECs are created automatically based on the VTP mode of the switch in which the ATM module is installed:

- If the Catalyst switch is in VTP transparent mode, when you create a VLAN on the switch, a LEC is created automatically on all ATM modules installed in that switch.
- If the switch belongs to a VTP domain, when you create a VLAN on the switch, a LEC is created automatically on all ATM modules installed in all switches belonging to the same VTP domain.

For information about creating LECs automatically using VTP, see the "Creating LECs Automatically Using VTP" section on page 3-29.

Drafting an ATM LANE Implementation Plan

Before implementing LANE, create a LANE plan for your own LANE scenario. Determine the LANE components you want to use, their locations, their associated VLANs, and the necessary redundancy features. Note the ATM address of each LANE component on each subinterface of each participating device.

Your plan should include the following information:

- How many ELANs you will create, and whether they will be unrestricted or restricted membership ELANs
- The VLAN to which each ELAN maps
- The ELAN that will function as the default ELAN in the LECS database (optional)
- The device and interface where the LECS will be located
- The device, interface, and subinterface where the LES/BUS for each ELAN will be located
- The devices and subinterfaces where the LECs for each ELAN will be located

Default ATM LANE Configuration

Table 3-1 shows the ATM LANE default configuration.

Table 3-1 ATM LANE Default Configuration

Feature	Default Value
LANE components	No LECS database is configured No LES/BUS is configured No LECs are configured
PVCs	LMI and signaling PVCs are set up
Preferred PHY (dual PHY modules only)	PHY A
Output throttling	Disabled
ILMI keepalives	Disabled
UNI version	Autonegotiate (reverts to UNI 3.0 if autonegotiation fails)
VTP	Disabled

ATM LANE Configuration Guidelines

These guidelines apply when configuring LANE:

- The LECS is always assigned to the major interface. Assigning any other component to the major interface is identical to assigning that component to the 0 subinterface.
- The LES/BUS and the LEC of the *same* ELAN can be configured on the same subinterface.
- LECs of two *different* ELANs cannot be configured on the same subinterface.
- The LES/BUS for *different* ELANs cannot be configured on the same subinterface.
- All ATM switches have identical lists of the global LECS addresses with the identical priorities.
- The operating LECSs must use exactly the same configuration database. Create and maintain a configuration file containing the LECS database and load it onto devices using the **config net** command. This method minimizes errors and allows you to maintain the database centrally.
- The LANE subsystem supports up to 16 LECS addresses.

- The number of LES/BUSs that can be defined per ELAN is unlimited.
- When a LECS switchover occurs, no previously joined clients are affected.
- In a LES/BUS switchover, there is a momentary loss of clients until all clients are transferred to the new LES/BUS.
- LECSs come up as masters automatically until a higher level LECS takes priority.
- Using Fast Simple Server Redundancy Protocol (FSSRP), you can configure redundant LES/BUSs and LECSs to reduce the possibility of a server failure resulting in loss of communication on the LANE network. With redundant LES/BUSs and LECSs, LANE components can switch to the backup LES/BUS or LECS automatically if the primary server fails. For specific information on how to configure FSSRP, see the section "Configuring Fast SSRP for Redundant LANE Services" section on page 3-24.

Note FSSRP works only with LECS and LES/BUS combinations on Cisco devices. Third-party LANE components interoperate with the LECS and LES/BUS functions of Cisco devices but cannot take advantage of the redundancy features. Additionally, FSSRP-unaware LECs on Cisco equipment will not be able to take advantage of FSSRP LES/BUS redundancy.

- With multiple LES/BUS pairs configured for a single ELAN, the priority of a given LES/BUS pair is established by the order in which it was entered in the LECS database. When a higher priority LES/BUS pair comes online, it takes over the functions of the current LES/BUS on the ELAN. For a short time after a power on, some LECs might change from one LES/BUS to another, depending upon the order in which the LES/BUSs come online.
- If no specified LES/BUS pair is up or connected to the master LECS, and more than one LES/BUS is defined for an ELAN, the LECS rejects any configuration request for that specific ELAN.
- Changes made to the list of LECS addresses on ATM switches can take up to one minute to propagate through the network. Changes made to the configuration database regarding LES/BUS addresses take effect almost immediately.
- If no designated LECS is operational or reachable, the ATM Forum-defined "well-known" LECS address is used.
- The LECS can be overridden on any subinterface by entering these commands:
  - **lane auto-config-atm-address**
  - **lane fixed-config-atm-address**
  - **lane config-atm-address** *atm-address-template*

Note To avoid affecting LES/BUS/LEC redundancy, do not override any LECS, LES, or BUS addresses.

- In the event of an ATM network failure, there can be multiple master LECs and multiple active LES/BUSs for the same ELAN, resulting in a partitioned network. Clients continue to operate normally, but transmission between different partitions of the network is not possible. The system recovers when the network break is repaired.

Configuring ATM LANE

These sections describe how to configure ATM LANE on the ATM modules:

Opening a Session from the Switch to the ATM Module

Enter the **session** *mod_num* command to open a session to the ATM module from the Catalyst 5000 or 6000 family switch in which the module is installed.

This example shows how to session to an ATM module installed in slot 5 of the Catalyst 5000 switch:

```
Console> (enable) session 5
Trying ATM-5...
Connected to ATM-5.
Escape character is '^]'.

ATM>
```

After opening the session, you see the ATM> prompt. You then have direct access only to the ATM module with which you have established a session.

The ATM module uses a subset of Cisco IOS software. Generally, Cisco IOS software works the same on the ATM module as it does on routers.

To configure the ATM module, you must use configuration mode. To enter configuration mode, enter the EXEC command **configure** at the privileged EXEC prompt (ATM#). You will see the following message, which asks you to specify the terminal, the nonvolatile RAM (NVRAM), or a file stored on a network server as the source of configuration commands:

```
Configuring from terminal, memory, or network [terminal]?
```

Note You cannot configure from the network on the ATM modules.

Terminal configuration means changing the running configuration. You can save the running configuration into the NVRAM using the **copy running-config startup-config** command. When you configure from memory, the running configuration is updated from the NVRAM.

Displaying Default ATM Addresses

To help you configure the LECS database and the LECS addresses on the ATM switch, default ATM addresses for the LECS, LES, BUS, and LECs are automatically generated on the ATM module based on the ATM address prefix learned from the switch and the MAC address of the ATM module. (For more

information about the LANE default ATM addresses, see the "Assigning ATM Addresses Automatically" section on page 3-7.) Use one of these procedures to display the default ATM addresses on the ATM module.

If the ATM module (single PHY or dual PHY) is connected to a single ATM switch, you can display the default ATM addresses by performing this task:

Task	Command
Display default ATM addresses. (Record the addresses for later use.)	**show lane default-atm-addresses**

This example shows how to display the default ATM addresses on an ATM LANE module:

```
ATM#show lane default-atm-addresses
interface ATM0:
LANE Client:        47.00918100000000E04FACB401.00E04FACB070.**
LANE Server:        47.00918100000000E04FACB401.00E04FACB071.**
LANE Bus:           47.00918100000000E04FACB401.00E04FACB072.**
LANE Config Server: 47.00918100000000E04FACB401.00E04FACB073.00
note: ** is the subinterface number byte in hex

ATM#
```

If the ATM LANE module does not learn the ATM address prefix, ensure that the module is connected to the switch properly, that the interfaces on both the ATM module and the ATM switch are up, and that the ILMI PVC is established (enter the **show atm vc** command to see configured PVCs). If the interface is administratively down, you will need to issue a **no shutdown** command to bring the interface up.

This example shows that the ATM module could not learn the ATM address prefix from the ATM switch through ILMI:

```
ATM#show lane default-atm-addresses
interface ATM0:
LANE Client:        ...00E04FACB070.**
LANE Server:        ...00E04FACB071.**
LANE Bus:           ...00E04FACB072.**
LANE Config Server: ...00E04FACB073.00
note: ** is the subinterface number byte in hex

ATM#
```

If the ATM module (dual PHY) is connected to two different ATM switches, you must determine the default ATM addresses to use for both PHYs.

To display the default ATM addresses on a dual PHY module connected to two different ATM switches, perform this task:

	Task	Command
Step 1	Display the default ATM addresses for the first PHY.	**show lane default-atm-addresses**
Step 2	Enter configuration mode.	**configure terminal**
Step 3	Enter interface configuration mode.	**interface atm0**
Step 4	Change the preferred PHY to the one not currently in use.	**atm preferred phy** {**A** | **B**}

	Task	Command
Step 5	Exit configuration mode.	**Ctrl-Z**
Step 6	Display the default ATM addresses for the second PHY.	**show lane default-atm-addresses**

This example shows how to display the default ATM address for both PHYs:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with Ctrl-Z.
ATM(config)#interface atm0
ATM(config-subif)#atm preferred phy A
ATM(config-subif)#end
ATM#show lane default-atm-addresses
interface ATM0:
LANE Client:        47.00918100000000E04FACB401.00E04FACB070.**
LANE Server:        47.00918100000000E04FACB401.00E04FACB071.**
LANE Bus:           47.00918100000000E04FACB401.00E04FACB072.**
LANE Config Server: 47.00918100000000E04FACB401.00E04FACB073.00
note: ** is the subinterface number byte in hex
ATM#configure terminal
Enter configuration commands, one per line.  End with Ctrl-Z.
ATM(config)#interface atm0
ATM(config-subif)#atm preferred phy B
ATM(config-subif)#end
ATM#show lane default-atm-addresses
interface ATM0:
LANE Client:        47.00918100000000603E7B2001.00000C407575.**
LANE Server:        47.00918100000000603E7B2001.00000C407576.**
LANE Bus:           47.00918100000000603E7B2001.00000C407577.**
LANE Config Server: 47.00918100000000603E7B2001.00000C407578.00
note: ** is the subinterface number byte in hex
ATM#
```

Configuring LECS ATM Addresses on a LightStream 1010 ATM Switch

You must program all LECS addresses into each ATM switch (such as a LightStream 1010 switch) connected to an ATM module in your LANE network. Programming the LECS addresses allows the LESs and LECs to determine the LECs addresses dynamically through ILMI.

To configure a LECS ATM address on a LightStream 1010 ATM switch, perform this task in privileged mode for each connected LightStream 1010 ATM switch:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Enter the address of the LECS.	**atm lecs-address-default** *lecs_atm_address*
Step 3	Exit configuration mode.	**Ctrl-Z**
Step 4	Verify the configured LECS addresses.	**show atm ilmi-configuration**

This example shows how to configure a LECS address on the LightStream 1010 ATM switch and verify the configuration:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#atm lecs-address-default 47.0091.8100.0000.00e0.4fac.b401.0010.0daa.cc43.00
Switch(config)#^Z
Switch#show atm ilmi-configuration

LECS Address(es):
  47.0091.8100.0000.00e0.4fac.b401.0010.0daa.cc43.00
Switch#
```

Setting Up the LES/BUS for an ELAN

You must configure at least one LES/BUS for each ELAN in the ATM LANE network. The LES/BUS for each ELAN should be configured on a separate subinterface of the major ATM interface on the ATM module. The LES/BUS and the LEC of the same ELAN can be configured on the same subinterface. The LES/BUSs for different ELANs cannot be configured on the same subinterface.

Caution If you plan to configure the ELAN in Step 3 for restricted membership, make sure the ELAN name you specify is exactly the same as the ELAN name specified in the LECS database. If the ELAN name specified in the **lane server-bus** command does not match the LECS database entry linking the LEC to an ELAN, the LEC is not allowed to join the ELAN.

To specify the LES/BUS for an ELAN, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Specify the subinterface for the first ELAN and the link type.	**interface atm 0.** *subinterface-number* *point-to-point* | *multipoint*
Step 3	Enable the LES/BUS for an ELAN on the subinterface (you cannot configure more than one LES/BUS per subinterface).	**lane server-bus ethernet** *elan-name*
Step 4	Repeat Steps 2 and 3 for all LES/BUSs you want to configure on this ATM module.	
Step 5	Exit configuration mode.	**Ctrl-Z**
Step 6	Verify the LES/BUS configuration.	**show lane server**

Note The LES/BUSs are not fully operational until one or more LECs are configured and the LECS database is configured and bound to the ATM module interface.

This example shows how to specify the LES/BUS for an ELAN and verify the configuration:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.1
ATM(config-subif)#lane server-bus ethernet default
ATM(config-subif)#interface atm0.2
ATM(config-subif)#lane server-bus ethernet Eng_ELAN
ATM(config-subif)#^Z
ATM#show lane server
LE Server ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.01
LECS used: 47.0079000000000000000000.00A03E000001.00 NOT yet connected

LE Server ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.02
LECS used: 47.0079000000000000000000.00A03E000001.00 NOT yet connected

ATM#
```

Setting Up a LEC for an ELAN

LECs serve to pass traffic between VLANs on the Catalyst switches and ELANs in the ATM network. You can configure one or more LECs for one or more ELANs on the ATM modules.

Before you set up a LEC on the ATM module, you must configure a VLAN on the switch and the LES/BUS for an ELAN on an ATM module subinterface. When you configure a LEC on the ATM module, you map a VLAN on the Catalyst 5000 or 6000 family switch to an ATM ELAN. For information on configuring VLANs on the Catalyst 5000 or 6000 family supervisor engine, refer to the *Software Configuration Guide* for your switch. For information on configuring the LES/BUS for an ELAN, refer to the "Setting Up the LES/BUS for an ELAN" section on page 3-14.

Note Using the VLAN Trunk Protocol (VTP), you can cause LECs to be created automatically when you configure VLANs on the Catalyst 5000 family supervisor engine. For more information on using VTP to create LECs automatically, see the "Creating LECs Automatically Using VTP" section on page 3-29.

Note If you later want to associate a LEC with a different ELAN, change the LECS database configuration before you change the LEC configuration on the subinterface. For information on configuring the LECS database, see the "Configuring the LECS Database" section on page 3-17.

To set up a LEC for an ELAN, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Specify a subinterface for the LEC.	**interface atm 0.***subinterface*

	Task	Command
Step 3	Create the LEC, specifying the VLAN number and the ELAN name to which to bind the LEC.	**lane client ethernet** *vlan_id elan-name*
Step 4	Repeat Steps 2 and 3 for each LEC you want to configure.	
Step 5	Exit configuration mode.	**Ctrl-Z**
Step 6	Verify the LEC configuration.	**show lane client**

Note The LECs do not come up until the LES/BUSs are configured and the LECS database is configured and bound to the ATM module interface.

This example shows how to configure LECs and verify the configuration:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.1
ATM(config-subif)#lane client ethernet 1 default
ATM(config-subif)#interface atm0.2
ATM(config-subif)#lane client ethernet 2 Eng_ELAN
ATM(config-subif)#^Z
ATM#show lane client
LE Client ATM0.1  ELAN name: default  Admin: up  State: initialState
Client ID: unassigned        Next join attempt in 0 seconds
Join Attempt: 4
Last Fail Reason: Config VC being released
HW Address: 0010.0daa.cc40   Type: ethernet             Max Frame Size: 1516
        VLANID: 1
ATM Address: 47.00918100000000E04FACB401.00100DAACC40.01

 VCD  rxFrames  txFrames  Type       ATM Address
   0         0         0  configure  47.0079000000000000000000000.00A03E000001.00
   0         0         0  direct     00.0000000000000000000000000.000000000000.00
   0         0         0  distribute 00.0000000000000000000000000.000000000000.00
   0         0         0  send       00.0000000000000000000000000.000000000000.00
   0         0         0  forward    00.0000000000000000000000000.000000000000.00

LE Client ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: initialState
Client ID: unassigned        Next join attempt in 1 seconds
Join Attempt: 2
Last Fail Reason: Config VC being released
HW Address: 0010.0daa.cc40   Type: ethernet             Max Frame Size: 1516
        VLANID: 2
ATM Address: 47.00918100000000E04FACB401.00100DAACC40.02

 VCD  rxFrames  txFrames  Type       ATM Address
   0         0         0  configure  47.0079000000000000000000000.00A03E000001.00
VCD  rxFrames  txFrames  Type       ATM Address
   0         0         0  direct     00.0000000000000000000000000.000000000000.00
   0         0         0  distribute 00.0000000000000000000000000.000000000000.00
   0         0         0  send       00.0000000000000000000000000.000000000000.00
   0         0         0  forward    00.0000000000000000000000000.000000000000.00

ATM#
```

Configuring the LECS Database

The LECS database contains LANE configuration information, including ELAN name-to-LES/BUS ATM address mappings, LEC address-to-ELAN name mappings, and the name of the default ELAN, if specified. You must configure at least one LECS database in the ATM LANE network.

You can configure redundant LECSs. Redundant LECSs should be configured on different devices in the LANE network. If you configure more than one LECS, make sure that all databases with the same name are identical.

These sections describe how to set up the LECS database on the ATM module:

- Setting Up One (Default) ELAN in the LECS Database, page 3-17
- Setting Up Unrestricted-Membership ELANs in the LECS Database, page 3-18
- Setting Up Restricted-Membership ELANs in the LECS Database, page 3-20

Setting Up One (Default) ELAN in the LECS Database

When you configure a Catalyst 5000 family ATM module as the LECS for one default ELAN, you provide a name for the database, the ATM address of the LES/BUS for the ELAN, and the name of the default ELAN.

The default ELAN cannot be a restricted-membership ELAN. You do not need to specify the ATM or MAC addresses of the LECs for the default ELAN.

On the dual PHY ATM modules, you must configure redundant LES/BUS/LECS, one for each PHY.

Note Before beginning the LECS database configuration, make sure you have configured the LES/BUS and LEC for the default ELAN (see the "Setting Up the LES/BUS for an ELAN" section on page 3-14 and the "Setting Up a LEC for an ELAN" section on page 3-15).

To set up the LECS for one default ELAN, perform this task:

	Task	Command
Step 1	Display the ATM address of the LES/BUS for the default ELAN.	**show lane server**
Step 2	Enter configuration mode.	**configure terminal**
Step 3	Enter database configuration mode, specifying a LANE database name.	**lane database** *database-name*
Step 4	Bind the name of the ELAN to the ATM address of the LES/BUS.	**name** *elan-name* **server-atm-address** *atm-address*
Step 5	In the configuration database, provide a default name of the ELAN.	**default-name** *elan-name*
Step 6	Exit from configuration mode.	**Ctrl-Z**
Step 7	Verify the LECS database configuration.	**show lane database**

Note After you configure the LECS database, you must bind the LECS database to the major ATM interface (ATM0) on the ATM module. For information on how to bind the database to the interface, see the "Binding the LECS to the ATM Interface" section on page 3-23.

This example shows how to display the ATM address of the LES/BUS of the default ELAN, how to configure the LECS database for the default ELAN, and how to verify the configuration:

```
ATM#show lane server
LE Server ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.01
LECS used: 47.0079000000000000000000000.00A03E000001.00 NOT yet connected

ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane database LANE_Backbone
ATM(lane-config-database)#name default server-atm-address 47.00918100000000E04FACB401.00100DAACC41.01
ATM(lane-config-database)#default-name default
ATM(lane-config-database)#^Z
ATM#show lane database

LANE Config Server database table 'LANE_Backbone'
default elan: default
elan 'default': un-restricted
  server 47.00918100000000E04FACB401.00100DAACC41.01 (prio 0)

ATM#
```

Setting Up Unrestricted-Membership ELANs in the LECS Database

When you configure unrestricted-membership ELANs in the LECS database, you create database entries that link the name of each ELAN to the ATM address of its LES/BUS. With unrestricted-membership ELANs, you do not need to specify the ATM or MAC addresses of the LECs for each ELAN. If desired, you can specify a default ELAN for LECs not bound to an ELAN explicitly.

Note Before beginning the LECS database configuration, make sure you have configured a LES/BUS and LEC for each ELAN (see the "Setting Up the LES/BUS for an ELAN" section on page 3-14 and the "Setting Up a LEC for an ELAN" section on page 3-15).

To configure unrestricted-membership ELANs in the LECS database, perform this task:

	Task	Command
Step 1	Display the ATM addresses of the configured LES/BUSs.	**show lane server** [**interface atm0**[.*subinterface*] | **name** *elan-name*] [**brief**]
Step 2	Enter configuration mode.	**configure terminal**
Step 3	Enter database configuration mode, specifying a LANE database name.	**lane database** *database-name*

	Task	Command
Step 4	Bind the ELAN name to the ATM address of the LES/BUS for that ELAN (use the ATM address displayed in the **show lane server** command output). Repeat this step for each ELAN in the LANE network.	**name** *elan-name* **server-atm-address** *atm-address*
Step 5	(Optional) Specify an ELAN as the default ELAN for LECs not bound to an ELAN explicitly.	**default-name** *elan-name*
Step 6	Exit from configuration mode.	**Ctrl-Z**
Step 7	Verify the LECS database configuration.	**show lane database**

Note After you configure the LECS database, you must bind the LECS database to the major ATM interface (ATM0) on the ATM module. For information on how to bind the database to the interface, see the "Binding the LECS to the ATM Interface" section on page 3-23.

This example shows how to display the ATM address of the LES/BUSs for all ELANs, how to configure the LECS database for each ELAN, how to specify a default ELAN, and how to verify the configuration:

```
ATM#show lane server
LE Server ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.01
LECS used: 47.0079000000000000000000.00A03E000001.00 NOT yet connected

LE Server ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.02
LECS used: 47.0079000000000000000000.00A03E000001.00 NOT yet connected

LE Server ATM0.3  ELAN name: Mktg_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.03
LECS used: 47.0079000000000000000000.00A03E000001.00 NOT yet connected

ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane database LANE_Backbone
ATM(lane-config-database)#name default server-atm-address 47.00918100000000E04FACB401.00100DAACC41.01
ATM(lane-config-database)#name Eng_ELAN server-atm-address 47.00918100000000E04FACB401.00100DAACC41.02
ATM(lane-config-database)#name Mktg_ELAN server-atm-address 47.00918100000000E04FACB401.00100DAACC41.03
ATM(lane-config-database)#default-name default
ATM(lane-config-database)#^Z
```

The **show lane database** command displays the database configuration:

```
ATM#show lane database

LANE Config Server database table 'LANE_Backbone'
default elan: default
elan 'default': un-restricted
  server 47.00918100000000E04FACB401.00100DAACC41.01 (prio 0)
elan 'Eng_ELAN': un-restricted
  server 47.00918100000000E04FACB401.00100DAACC41.02 (prio 0)
elan 'Mktg_ELAN': un-restricted
  server 47.00918100000000E04FACB401.00100DAACC41.03 (prio 0)

ATM#
```

Setting Up Restricted-Membership ELANs in the LECS Database

When you configure restricted-membership ELANs in the LECS database, you create database entries that link the name of each ELAN to the ATM address of its LES/BUS. In addition, you must specify the ATM or MAC addresses of the LECs belonging to each ELAN. If desired, you can specify a default ELAN for LECs not bound to an ELAN explicitly. The default ELAN must be an unrestricted-membership ELAN.

If there are LECs for a given restricted-membership ELAN configured on multiple Catalyst 5000 family ATM modules, you must bind the ATM or MAC address of each LEC explicitly with the name of that ELAN using the **client-atm-address** database configuration command. For example, if you configure three LECs for a particular restricted-membership ELAN on three different ATM modules, you must configure three LECS database entries, one entry for each LEC. Each entry binds the ATM or MAC address of each LEC to the restricted-membership ELAN.

Note Before beginning the LECS database configuration, make sure you have configured a LES/BUS and LEC for each ELAN (see the "Setting Up the LES/BUS for an ELAN" section on page 3-14 and the "Setting Up a LEC for an ELAN" section on page 3-15).

To configure restricted-membership ELANs in the LECS database, perform this task:

	Task	Command
Step 1	Display the ATM addresses of the configured LES/BUSs.	**show lane server** [**interface atm0**[.*subinterface*] | **name** *elan-name*] [**brief**]
Step 2	Display the ATM addresses of the configured LECs.	**show lane client** [**interface atm0**[.*subinterface*] | **name** *elan-name*] [**brief**]
Step 3	Enter configuration mode.	**configure terminal**
Step 4	Enter database configuration mode, specifying a LANE database name.	**lane database** *database-name*
Step 5	Bind the restricted-membership ELAN name to the ATM address of the LES/BUS for that ELAN. Repeat this step for every restricted-membership ELAN in the LANE network.	**name** *elan-name* **server-atm-address** *atm-address* **restricted**

	Task	Command
Step 6	Bind a specific LEC ATM address with a specific restricted-membership ELAN. Repeat this step for every LEC belonging to the restricted-membership ELAN in the LANE network (including LECs configured on other ATM modules).	**client-atm-address** *atm-address* **name** *elan-name*
Step 7	(Optional) Configure a default ELAN for LECs not bound to an ELAN explicitly by binding the default ELAN name to the ATM address of the LES/BUS for the default ELAN. The default ELAN must be an unrestricted-membership ELAN.	**name** *default-elan-name* **server-atm-address** *atm-address*
Step 8	(Optional) Specify the default ELAN.	**default-name** *default-elan-name*
Step 9	Exit from configuration mode.	**Ctrl-Z**
Step 10	Verify the LECS database configuration.	**show lane database**

Note After you configure the LECS database, you must bind the LECS database to the major ATM interface (ATM0) on the ATM module. For information on how to bind the database to the interface, see the "Binding the LECS to the ATM Interface" section on page 3-23.

This example shows how to display the ATM address of the LES/BUSs and LECs, how to configure the LECS database for restricted-membership ELANs, how to specify a default ELAN, and how to verify the configuration:

```
ATM#show lane server
LE Server ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.01
LECS used: 47.007900000000000000000000.00A03E000001.00 NOT yet connected

LE Server ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.02
LECS used: 47.007900000000000000000000.00A03E000001.00 NOT yet connected

LE Server ATM0.3  ELAN name: Mktg_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.03
LECS used: 47.007900000000000000000000.00A03E000001.00 NOT yet connected

ATM#show lane client brief
LE Client ATM0.1  ELAN name: default  Admin: up  State: initialState
Client ID: unassigned        Next join attempt in 38 seconds
Join Attempt: 121
Last Fail Reason: Config VC being released
HW Address: 0010.0daa.cc40   Type: ethernet             Max Frame Size: 1516
        VLANID: 1
ATM Address: 47.00918100000000E04FACB401.00100DAACC40.01


LE Client ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: initialState
Client ID: unassigned        Next join attempt in 60 seconds
Join Attempt: 90
Last Fail Reason: Config VC being released
HW Address: 0010.0daa.cc40   Type: ethernet             Max Frame Size: 1516
        VLANID: 2
ATM Address: 47.00918100000000E04FACB401.00100DAACC40.02


LE Client ATM0.3  ELAN name: Mktg_ELAN  Admin: up  State: initialState
Client ID: unassigned        Next join attempt in 39 seconds
Join Attempt: 89
Last Fail Reason: Config VC being released
HW Address: 0010.0daa.cc40   Type: ethernet             Max Frame Size: 1516
        VLANID: 3
ATM Address: 47.00918100000000E04FACB401.00100DAACC40.03


ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane database LANE_Backbone
ATM(lane-config-database)#name Eng_ELAN server-atm-address 47.00918100000000E04FACB401.00100DAACC41.02
restricted
ATM(lane-config-database)#name Mktg_ELAN server-atm-address 47.00918100000000E04FACB401.00100DAACC41.03
restricted
ATM(lane-config-database)#client-atm-address 47.00918100000000E04FACB401.00100DAACC40.02 name Eng_ELAN
ATM(lane-config-database)#client-atm-address 47.00918100000000E04FACB401.00100DAACC40.03 name Mktg_ELAN
ATM(lane-config-database)#name default server-atm-address 47.00918100000000E04FACB401.00100DAACC41.01
ATM(lane-config-database)#default-name default
ATM(lane-config-database)#^Z
```

The **show lane database** command displays the database configuration:

```
ATM#show lane database

LANE Config Server database table 'LANE_Backbone'
default elan: default
elan 'Eng_ELAN': restricted
  server 47.00918100000000E04FACB401.00100DAACC41.02 (prio 0)
    atm client 47.00918100000000E04FACB401.00100DAACC40.02
elan 'Mktg_ELAN': restricted
  server 47.00918100000000E04FACB401.00100DAACC41.03 (prio 0)
    atm client 47.00918100000000E04FACB401.00100DAACC40.03
elan 'default': un-restricted
  server 47.00918100000000E04FACB401.00100DAACC41.01 (prio 0)

ATM#
```

Binding the LECS to the ATM Interface

Before LANE communication can occur, you must bind the LECS database to the major interface on the ATM module.

To bind the LECS database to the ATM module interface, perform this task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm0**
Step 3	Specify the address of the LECS (enter the **auto-config-atm-address** keyword to use the autogenerated LECS ATM address).	**lane config** {**auto-config-atm-address** | **config-atm-address** *lecs_atm_address*}
Step 4	Bind the LECS database to the interface.	**lane config database** *database-name*
Step 5	Exit configuration mode.	**Ctrl-Z**
Step 6	Verify that the LECS is up and running.	**show lane configuration**

This example shows how to bind the autogenerated LECS ATM address and the LECS database to the major ATM interface and how to verify the configuration:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#lane config auto-config-atm-address
ATM(config-if)#lane config database LANE_Backbone
ATM(config-if)#^Z
ATM#show lane configuration
LE Config Server ATM0 config table: LANE_Backbone
Admin: up  State: operational
LECS Mastership State: active master
list of global LECS addresses (58 seconds to update):
47.00918100000000E04FACB401.00100DAACC43.00  <-------- me
ATM Address of this LECS: 47.00918100000000E04FACB401.00100DAACC43.00 (auto)
 vcd  rxCnt  txCnt  callingParty
   5      0      0  47.00918100000000E04FACB401.00100DAACC41.03 LES Mktg_ELAN 0
active
   6      0      0  47.00918100000000E04FACB401.00100DAACC41.02 LES Eng_ELAN 0
active
  11      1      1  47.00918100000000E04FACB401.00100DAACC41.01 LES default 0
active
cumulative total number of unrecognized packets received so far: 0
cumulative total number of config requests received so far: 3
cumulative total number of config failures so far: 1
    cause of last failure: no configuration
    culprit for the last failure: 47.00918100000000E04FACB401.00E04FACB070.04

ATM#
```

Configuring Fast SSRP for Redundant LANE Services

With Fast Simple Server Redundancy Protocol (FSSRP), you can configure redundant LES/BUS pairs for each ELAN. FSSRP differs from the previously implemented Simple Server Redundancy Protocol (SSRP) in that all configured LESs of an ELAN are active. This means FSSRP-aware redundant LES/BUS pairs can accept join requests from any FSSRP-aware client.

LECs that are FSSRP aware have virtual circuits established to every single LES/BUS in the ELAN. Because virtual circuit connections already exist between all LECs and LES/BUS pairs in the ELAN, the LECs can switch over to another LES/BUS pair without any noticeable delay should a failure occur.

When you configure more than one LES/BUS pair for an ELAN, one LES/BUS takes precedence over others based on the order in which they are entered into the LECS database.

Note Redundant LES/BUS pairs for a single ELAN should be configured on different ATM LANE modules in the LANE network for maximum fault tolerance.

Configuring redundant LES/BUS pairs for an ELAN is a two-part process:

- You must first configure the redundant LES/BUS pairs on subinterfaces for that ELAN.
- You must then enter the ATM addresses of the redundant LES/BUS pairs into the LECS database for the ELAN.

To configure the LES/BUS pairs, perform the following task:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Specify the major interface.	**interface atm0**
Step 3	Enable FSSRP on the major interface.	**lane fssrp**
Step 4	Specify the subinterface for the first ELAN.	**interface atm 0.** *subinterface-number*
Step 5	Enable the LES/BUS for an ELAN on the subinterface (you cannot configure more than one LES/BUS per subinterface).	**lane server-bus ethernet** *elan-name*
Step 6	Repeat Steps 2 and 3 for all LES/BUSs you want to configure on this ATM module.	
Step 7	Exit configuration mode.	**Ctrl-Z**
Step 8	Verify the LES/BUS configuration.	**show lane server**

Note The LES/BUSs are not fully operational until one or more LECs are configured and the LECS database is configured and bound to the ATM module interface.

This example shows how to specify the LES/BUS for an ELAN and verify the configuration:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.1
ATM(config-subif)#lane server-bus ethernet default
ATM(config-subif)#interface atm0.2
ATM(config-subif)#lane server-bus ethernet Eng_ELAN
ATM(config-subif)#^Z
ATM#show lane server
LE Server ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.01
LECS used: 47.0079000000000000000000000.00A03E000001.00 NOT yet connected

LE Server ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.02
LECS used: 47.0079000000000000000000000.00A03E000001.00 NOT yet connected

ATM#
```

To add the redundant LES/BUS pairs to the LECS, perform this task:

	Task	Command
Step 1	Display the ATM address of the LES/BUS for the ELAN.	**show lane server**
Step 2	Enter configuration mode	**configure terminal**
Step 3	Enter database configuration mode, specifying a LANE database name.	**lane database** *database-name*
Step 4	Bind the name of the ELAN to the ATM addresses of the LES/BUS pairs in the order you want the services to fail over.	**name** *elan-name* **server-atm-address** *atm-address*
Step 5	In the configuration database, provide a default name of the ELAN.	**default-name** *elan-name*
Step 6	Exit from configuration mode.	Ctrl-Z
Step 7	Verify the LECS database configuration.	**show lane database**

This example shows how to display the ATM address of the LES/BUS of the default ELAN, how to configure the LECS database for the default ELAN, and how to verify the configuration:

```
ATM#show lane server
LE Server ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.01
LECS used: 47.00790000000000000000000.00A03E000001.00 NOT yet connected

ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane database LANE_Backbone
ATM(lane-config-database)#name default server-atm-address 47.00918100000000E04FACB401.00100DAACC41.01
ATM(lane-config-database)#default-name default
ATM(lane-config-database)#^Z
ATM#show lane database

LANE Config Server database table 'LANE_Backbone'
default elan: default
elan 'default': un-restricted
  server 47.00918100000000E04FACB401.00100DAACC41.01 (prio 0)
```

Monitoring and Maintaining LANE

After configuring LANE components on the LANE module, you can display a variety of information on their status. To show LANE information, perform any of these tasks in user EXEC or privileged EXEC mode:

Task	Command
• Display complete LANE configuration and status information for LES/BUSs, LECs, and LECSs.	**show lane**
• Display the global and per-VCC LANE information for all the LANE components and ELANs configured on an interface or any of its subinterfaces.	**show lane [interface atm0** [*.subinterface-number*] | **name** *elan-name*] [**brief**]
• Display the global and per-VC LANE information for the LES configured on a specified subinterface or ELAN.	**show lane server** [**interface atm0** [*.subinterface-number*] | **name** *elan-name*] [**brief**]
• Display the global and per-VC LANE information for the BUS configured on any subinterface or ELAN.	**show lane bus** [**interface atm0**.[*subinterface-number*] | **name** *elan-name*] [**brief**]
• Display the global and per-VC LANE information for all LECs configured on any subinterface or ELAN.	**show lane client** [**interface atm0** [*.subinterface-number*] | **name** *elan-name*] [**brief**]
• Display the global and per-VC LANE information for the LECS configured on any interface.	**show lane config**
• Display the LECS database.	**show lane database** [*database-name*]
• Display the LE ARP table of the LECs configured on the specified subinterface or ELAN.	**show lane le-arp** [**interface atm0** [*.subinterface-number*] | **name** *elan-name*]
• Display ATM VC information.	**show atm vc** [*vcd_number*]

This example shows how to display brief information on all configured LANE components:

```
ATM#show lane brief
LE Server ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.01
LECS used: 47.00918100000000E04FACB401.00100DAACC43.00 connected, vcd 12
control distribute: vcd 19, 3 members, 27723 packets

LE BUS ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC42.01
data forward: vcd 23, 3 members, 174529 packets, 0 unicasts

LE Client ATM0.1  ELAN name: default  Admin: up  State: operational
Client ID: 1                LEC up for 15 hours 9 minutes 47 seconds
Join Attempt: 140
HW Address: 0010.0daa.cc40   Type: ethernet             Max Frame Size: 1516
        VLANID: 1
ATM Address: 47.00918100000000E04FACB401.00100DAACC40.01

LE Config Server ATM0 config table: LANE_Backbone
Admin: up  State: operational
LECS Mastership State: active master
list of global LECS addresses:
47.00918100000000E04FACB401.00100DAACC43.00
ATM Address of this LECS: 47.00918100000000E04FACB401.00100DAACC43.00 (auto)

LE Server ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.02
LECS used: 47.00918100000000E04FACB401.00100DAACC43.00 connected, vcd 8
control distribute: vcd 31, 1 members, 27287 packets

LE BUS ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC42.02
data forward: vcd 35, 1 members, 28190 packets, 0 unicasts
```

```
LE Client ATM0.2  ELAN name: Eng_ELAN  Admin: up  State: operational
Client ID: 1                LEC up for 15 hours 9 minutes 34 seconds
Join Attempt: 109
HW Address: 0010.0daa.cc40   Type: ethernet            Max Frame Size: 1516
        VLANID: 2
ATM Address: 47.00918100000000E04FACB401.00100DAACC40.02

LE Server ATM0.3  ELAN name: Mktg_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC41.03
LECS used: 47.00918100000000E04FACB401.00100DAACC43.00 connected, vcd 7
control distribute: vcd 54, 1 members, 27250 packets

LE BUS ATM0.3  ELAN name: Mktg_ELAN  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.00918100000000E04FACB401.00100DAACC42.03
data forward: vcd 58, 1 members, 28152 packets, 0 unicasts

LE Client ATM0.3  ELAN name: Mktg_ELAN  Admin: up  State: operational
Client ID: 1                LEC up for 15 hours 8 minutes 20 seconds
Join Attempt: 109
HW Address: 0010.0daa.cc40   Type: ethernet            Max Frame Size: 1516
        VLANID: 3
ATM Address: 47.00918100000000E04FACB401.00100DAACC40.03
```

Creating LECs Automatically Using VTP

When you create and modify VLANs on a Catalyst 5000 or 6000 family switch that belongs to a VTP domain, VTP automatically distributes VLAN configuration information over trunk links to all devices in the VTP domain. VTP is transmitted on all trunk connections, including ATM LANE.

By default, VTP is disabled on the ATM modules. When you enable VTP on an ATM module, you can have ATM modules automatically create LECs for VLANs created on the Catalyst 5000 or 6000 family switch.

You can use VTP to set up LECs in both VTP transparent and nontransparent (server or client) mode. If the Catalyst 5000 or 6000 family switch is in VTP transparent mode, configuring a VLAN creates LECs on ATM modules installed only in the switch on which you configured the VLAN.

If the Catalyst 5000 or 6000 family switch is in VTP server mode, configuring a VLAN creates LECs on all ATM modules on all Catalyst 5000 or 6000 family switches in the same VTP domain (both clients and servers).

Note You might need to reload the ATM module after you configure VTP for the VTP creation of LECs to take effect.

Automatic creation of LECs using VTP is supported in Catalyst 5000 family software release 2.1 or later with ATM module software release 3.1 or later.

This procedure describes how to configure the Catalyst 5000 family and 6000 family switches and the ATM module so that when you create a VLAN on the switch, LECs are created on all ATM modules in all switches in the VTP domain (in VTP transparent mode, only ATM modules on the local switch are affected):

Step 1 Configure a VTP domain on the Catalyst 5000 or 6000 family switches.

Every switch with an ATM module on which you want LECs created automatically must belong to the same VTP domain. For information on configuring VTP, refer to the *Software Configuration Guide* for your switch.

Step 2 Enable VTP on the ATM module.

You must enable VTP on every ATM module on which you want LECs created automatically. For information on enabling VTP on the ATM module, see the "Using VTP to Create LECs Automatically" section on page 3-8.

Step 3 Configure at least one LES/BUS for each VLAN/ELAN you will configure.

VTP cannot create the LECs automatically unless one or more LES/BUSs are configured for each VLAN/ELAN. The ELAN name for VLAN 1 *must* be "default." For information on configuring the LES/BUS, see the "Setting Up the LES/BUS for an ELAN" section on page 3-14.

Note VTP does *not* create or configure the LES/BUS for VLANs/ELANs.

Step 4 Configure the LECS database with ELAN name-to-LES/BUS mappings for all VLANs/ELANs you will configure.

VTP does *not* create or configure the LECS database. Use the name of the VTP domain configured on the Catalyst 5000 or 6000 family switch as the LECS database name. VTP cannot create the LECs automatically unless the LECS database is configured properly. LECs can be created automatically by VTP *only* in unrestricted-membership ELANs. In addition, the ELAN name for VLAN 1 *must* be "default." For information on configuring the LECS database, see the "Configuring the LECS Database" section on page 3-17.

Step 5 Bind the LECS database to the ATM interface on the ATM module.

For information on binding the LECS database to the ATM interface, see the "Binding the LECS to the ATM Interface" section on page 3-23.

Step 6 At the Catalyst 5000 or 6000 family switch CLI, create the desired VLANs.

Ensure that the VLAN name matches the ELAN name configured in the LECS database on the ATM module. The name for VLAN 1 is "default" and cannot be changed. The corresponding ELAN name on the ATM module must be "default" also.

For VTP to successfully set up LECs on all ATM modules in the ATM LANE network, the default VLAN/ELAN must be operational on the ATM modules and Catalyst 5000 or 6000 family switches and must be named "default." If you currently have a different ELAN name mapped to VLAN 1, you must change the ELAN name to "default" in the LECS database.

When you enter the **set vlan** command without specifying the VLAN name, the VLAN names listed in Table 3-2 are used by default.

Table 3-2 **Default ELAN Names**

VLAN Number	ELAN Name
1	default
2	VLAN0002
3	VLAN0003
4	VLAN0004
5	VLAN0005
...1005	...VLAN1005

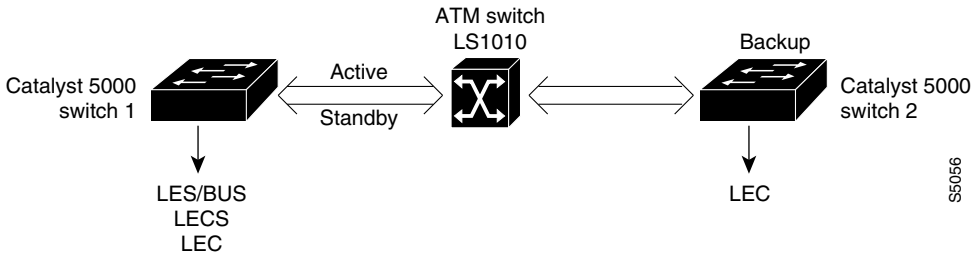
ATM LANE Configuration Examples

These sections show examples of how to configure ATM LANE on a Catalyst 5000 or 6000 family ATM module:

Example Configuration 1

Figure 3-3 shows two Catalyst 5000 family switches and a LightStream 1010 ATM switch.

Figure 3-3 LES/BUS/LECS Configuration



Example Configuration 1 Assumptions

In example Configuration 1, these assumptions apply:

- The LightStream 1010 ATM switch is used.
- Catalyst 5000 family switches with the ATM modules installed are running ATM software release 3.1 or later.
- Catalyst 5000 family Switch 1 runs the LES/BUS and LECS on interface atm0 and the LEC on interface atm0.1.

- Catalyst 5000 family Switch 2 runs LEC on interface atm0.1.
- The ATM module is installed in slot 4 of both Catalyst 5000 family switches.
- You can change the ELAN name by entering the **set vlan** *vlan_num* [**name** *elan_name*] command.
- The ELAN names shown in Table 3-3 are used.

Table 3-3 **ELAN Names**

VLAN Number	ELAN Name
1	default
2	VLAN0002
3	VLAN0003
4	VLAN0004

Example Configuration 1 Procedure

To set up LANE on the configuration in Table 3-3, perform these steps:

Step 1 Set up the prefix of the ATM Network Service Access Point (NSAP) address for the switch.

The LightStream 1010 ATM switch provides a default prefix.

Step 2 Start a session to the ATM module by entering the **session 4** command.

```
Console> session 4
Trying ATM-4...
Connected to ATM-4.
Escape character is '^]'.
ATM>
```

Step 3 Obtain the LES and LES/BUS addresses for later use by entering the **enable** command (to enable configuration mode) and the **show lane default** command at the ATM prompt.

```
ATM>enable
ATM#
ATM#show lane default
interface ATM0:
LANE Client:        47.009181000000061705b7701.00400BFF0010.**
LANE Server:        47.009181000000061705b7701.00400BFF0011.**
LANE Bus:           47.009181000000061705b7701.00400BFF0012.**
LANE Config Server: 47.009181000000061705b7701.00400BFF0013.00
ATM#
```

Note The two asterisks (**) represent the subinterface number byte in hexadecimal.

Step 4 Using the LECS address obtained in Step 3, set the address of the default LECS in the LightStream 1010 switch by entering the **configure terminal** and **atm lecs-address** *atm_address* commands on the console of the LightStream 1010 switch.

```
Switch> enable
Switch#
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#atm lecs-address 47.009181000000061705b7701.00400BFF0013.00 1
Switch(config)#end
Switch#
```

The commands shown in this step configure the LECS address in the switch. The LECS ATM NSAP address is 47.009181000000061705b7701.00400BFF0013.00. The sequence number of this LECS address, which is 1, indicates that it is the first LECS in this switch.

Step 5 Save the configuration as follows:

```
ATM#write memory
```

Step 6 Start up a LES/BUS pair on Catalyst 5000 family Switch 1 by entering the **interface atm0** and the **lane server-bus ethernet default** commands in configuration mode.

On the console of Switch 1, enter these commands:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-subif)#lane server-bus ethernet default
ATM(config-subif)#end
ATM#
```

The commands shown in this step start a LES/BUS pair. The ELAN name is “default,” and the interface on which this LES/BUS pair is configured is atm0.

Step 7 Save the configuration as follows:

```
ATM#write memory
```

Step 8 Set up the LECS database on Switch 1.

Enter the LANE server address obtained in Step 3 and replace the ** with the subinterface number of the interface in which the LES/BUS is to be configured. In this example, that number is 00. Enter the **lane database** *database_name* command, the **name** *elan_name* **server-atm-address** *atm_address* command, and the **default-name** *elan_name* commands at the ATM prompt.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane database test
ATM(lane-config-database)#name default server-atm-address 47.009181000000061705b7701.00400BFF0011.00
ATM(lane-config-database)#default-name default
ATM(lane-config-database)#end
ATM#
```

The commands shown in this step create the LECS database. The database name is “test.” The ELAN name is “default.” The LES ATM NSAP address is 47.009181000000061705b7701.00400BFF0011.00.

Step 9 Save the configuration as follows:

```
ATM#write memory
```

Step 10 Start and bind the LECS on Switch 1 by entering the **interface atm0** command, the **lane config database** *database_name* command, and the **lane config auto-config-atm-address** command at the ATM prompt.

```
ATM#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#lane config database test
ATM(config-if)#lane config auto-config-atm-address
ATM(config-if)#end
ATM#
```

The commands shown in this step start the LECS. The database name to use is "test." The interface on which the LECS is configured is atm0.

Step 11 Save the configuration as follows:

```
ATM#write memory
```

Step 12 Start the LEC on Switches 1 and 2 by entering the **interface atm0.1** command and the **lane client ethernet 1 default** command in configuration mode on the consoles of the switches. The interface on which the LEC is configured is atm0.1. The ELAN name is "default," and it is configured to emulate Ethernet.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.1
ATM(config-subif)#lane client ethernet 1 default
ATM(config-subif)#end
ATM#
```

Step 13 Save the configuration as follows:

```
ATM#write memory
```

Step 14 Create a LES/BUS pair on Switch 1 for VLAN 2 by entering the **interface atm0.2** command and the **lane server-bus ethernet VLAN0002** command in configuration mode.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config-subif)#interface atm0.2
ATM(config-subif)#lane server-bus ethernet VLAN0002
ATM(config-subif)#end
ATM#
```

Step 15 Save the configuration as follows:

```
ATM#write memory
```

Step 16 Configure the address of the new LES/BUS pair in the LECS database on Switch 1 by entering the **lane database test** command and the **name VLAN0002 server-atm-address** *atm_address* command in configuration mode.

```
ATM#configure terminal
ATM(config)#lane database test
ATM(lane-config-database)#name VLAN0002 server-atm-address 47.009181000000061705b7701.00400BFF0011.02
ATM(lane-config-database)#end
ATM#
```

Step 17 Save the configuration as follows:

```
ATM#write memory
```

Step 18 Start the new LEC on Switch 2 by entering the **interface atm0.2** command and the **lane client ethernet 2 VLAN0002** command in configuration mode.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.2
ATM(config-subif)#lane client ethernet 2 VLAN0002
ATM(config-subif)#end
ATM#
```

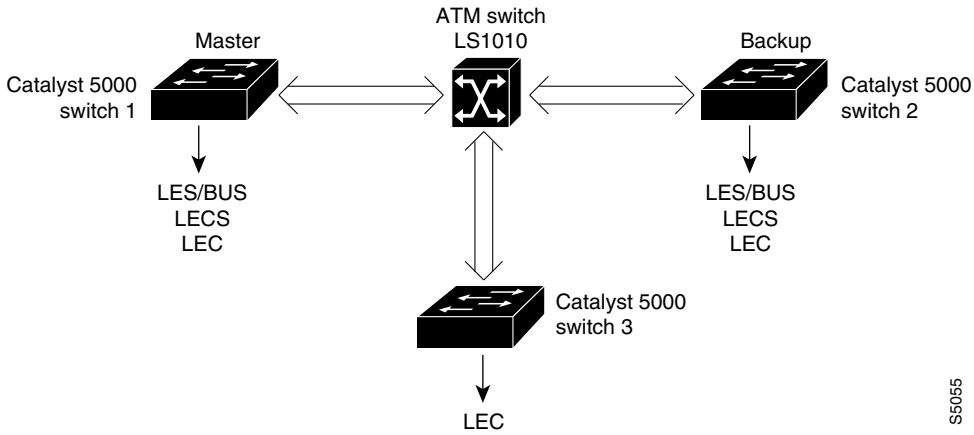
Step 19 Save the configuration as follows:

```
ATM#write memory
```

Example Configuration 2

Figure 3-4 shows three Catalyst 5000 family switches (Catalyst 5000 family Switch 1, Switch 2, and Switch 3) and a LightStream 1010 ATM switch. LES/BUS/LECS redundancy is configured. Switches 1 and 2 both have one LES/BUS/LECS for every ELAN. Switch 1 is the master server, and Switch 2 is the backup server. If Switch 1 fails, Switch 2 provides the LES/BUS/LECS components of the ELAN. When switch 1 recovers, it becomes the master server again.

Figure 3-4 LES/BUS/LECS Redundancy



Example Configuration 2 Assumptions

In Figure 3-4, these assumptions apply:

- Catalyst 5000 family Switch 1 is the master. It runs the LES/BUS and LECS on interface atm0 and runs the LEC on interface atm0.1.
- Catalyst 5000 family Switch 2 is the backup server. It runs LES/BUS and LECS on interface atm0 and runs the LEC on interface atm0.1.

- Catalyst 5000 family Switch 3 runs the LEC on interface atm0.1.
- The ATM module is installed in slot 4 of each Catalyst 5000 family switch.

Example Configuration 2 Procedure

To set up the configuration in Figure 3-4, perform these steps:

Step 1 Set up the prefix of the ATM NSAP address for the switch.

The LightStream 1010 ATM switch provides a default prefix.

Step 2 Establish a connection with the ATM module from Switch 1 by entering the **session** command.

```
Console> session 4
Trying ATM-4...
Connected to ATM-4.
Escape character is '^]'.
```

Step 3 Obtain the LES and LES/BUS addresses for later use by entering the **show lane default** command.

```
ATM>show lane default
interface ATM0:
LANE Client:        47.009181000000061705b7701.00400BFF0010.**
LANE Server:        47.009181000000061705b7701.00400BFF0011.**
LANE Bus:           47.009181000000061705b7701.00400BFF0012.**
LANE Config Server: 47.009181000000061705b7701.00400BFF0013.00
ATM>
```

Note The two asterisks (**) represent the subinterface number byte displayed in hexadecimal.

Step 4 Establish a connection to the ATM module from Switch 2 by entering the **session** command.

```
Console> session 4
Trying ATM-4...
Connected to ATM-4.
Escape character is '^]'.
```

Step 5 Obtain the LES and LES/BUS addresses for later use by entering the **show lane default** command from privileged mode.

```
ATM>
ATM>enable
ATM#
ATM#show lane default
interface ATM0:
LANE Client:        47.009181000000061705b7701.00400B583040.**
LANE Server:        47.009181000000061705b7701.00400B583041.**
LANE Bus:           47.009181000000061705b7701.00400B583042.**
LANE Config Server: 47.009181000000061705b7701.00400B583043.00
ATM#
```

Note The two asterisks (**) represent the subinterface number byte displayed in hexadecimal.

Step 6 Set up the LECS database on Switches 1 and 2. Enter the LES addresses obtained in Steps 3 and 5 and replace the two asterisks (**) with the subinterface numbers of the interfaces in which the LES/BUS is to be configured. In this example, that number is 00. Enter the **lane database** *database-name* command, the **name** *elan_name* **server-atm-address** *atm_address* command, and the **default-name** *elan_name* commands in configuration mode on both Switch 1 and Switch 2.

Note The order of the entries is critical and should be the same on both the primary and secondary Catalyst 5000 family switches for this configuration to work effectively.

Enter the following commands:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane database test
ATM(lane-config-database)#name default server-atm-address
47.009181000000061705b7701.00400BFF0011.00
ATM(lane-config-database)#name default server-atm-address
47.009181000000061705b7701.00400B583041.00
ATM(lane-config-database)#default-name default
ATM(lane-config-database)#end
ATM#
```

In this example, the name of the database is "test." The name of the ELAN is "default." The first entry is the primary LES. The second entry is the backup LES. The primary LES ATM NSAP address is 47.009181000000061705b7701.00400BFF0011.00. The backup LES ATM NSAP address is 47.009181000000061705b7701.00400B583041.00.

Step 7 Save the configuration as follows:

```
ATM#write memory
```

Step 8 Start and bind the LECS on both Switches 1 and 2 by entering the **interface atm0** command, the **lane config database** *database_name* command, and the **lane config auto-config-atm-address** command in configuration mode on both Switch 1 and Switch 2.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#lane config test
ATM(config-if)#lane config auto-config-atm-address
ATM(config-if)#end
ATM#
```

In this example, the database name is "test" and the interface on which the LECS is configured is atm0.

Step 9 Save the configuration as follows:

```
ATM#write memory
```

Step 10 Start up a LES/BUS pair on Switch 1 and Switch 2 by entering the **interface atm0** command and the **lane server-bus ethernet default** command on the console of both switches.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-subif)#lane server-bus ethernet default
ATM(config-subif)#end
ATM#
```

In this example, the ELAN name is "default" and the interface on which this LES/BUS pair is configured is atm0.

Step 11 Save the configuration as follows:

```
ATM#write memory
```

Step 12 Set the LECS addresses on Switches 1 and 2 in the ATM switch by entering the **atm lecs-address** *atm_address* command in configuration mode on the console of the LightStream 1010 switch for each Catalyst 5000 family switch.

These commands configure the address of the primary and the backup LECSs in the ATM switch, in the order presented on the screen. Enter the LANE configuration server address obtained in Steps 3 and 5.

```
ATM>enable
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#atm lecs-address 47.009181000000061705b7701.00400BFF0013.00 1
ATM(config)#atm lecs-address 47.009181000000061705b7701.00400B583043.00 2
ATM(config)#end
ATM#
```

Step 13 Save the configuration as follows:

```
ATM#write memory
```

Step 14 Start the LEC on Switches 1, 2, and 3 by entering the **interface atm0.1** command and the **lane client ethernet 1 default** command in configuration mode on the consoles of Switches 1, 2, and 3.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.1
ATM(config-subif)#lane client ethernet 1 default
ATM(config-subif)#end
ATM#
```

The interface on which the LEC is configured is atm0.1. The ELAN name is default, and it is configured to emulate Ethernet.

Step 15 Save the configuration as follows:

```
ATM#write memory
```

Note To use VTP to create the LEC, see the "Creating LECs Automatically Using VTP" section on page 3-29.

Step 16 Create a LES/BUS pair on switches 1 and 2 for VLAN 2. Enter the **interface atm0.2** command and the **lane server-bus ethernet VLAN 0002** command in configuration mode on the consoles of Switches 1 and 2.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config-subif)#interface atm0.2
ATM(config-subif)#lane server-bus ethernet VLAN0002
ATM(config-subif)#end
ATM#
```

Step 17 Save the configuration as follows:

```
ATM#write memory
```

Step 18 Configure the address of the new LES/BUS pair in the LECS database on Switch 1:

```
ATM#configure terminal
ATM(config)#lane database test
ATM(lane-config-database)#name VLAN0002 server-atm-address
47.009181000000061705b7701.00400BFF0011.02
ATM(lane-config-database)#name VLAN0002 server-atm-address
47.009181000000061705b7701.00400B583041.02
ATM(lane-config-database)#end
ATM#
```

Step 19 Save the configuration as follows:

```
ATM#write memory
```

Step 20 Start the new LEC on Switch 3 by entering the **interface atm0.2** command and the **lane client ethernet 2 VLAN0002** command on the console of Switch 3.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.2
ATM(config-subif)#lane client ethernet 2 VLAN0002
ATM(config-subif)#end
ATM#
```

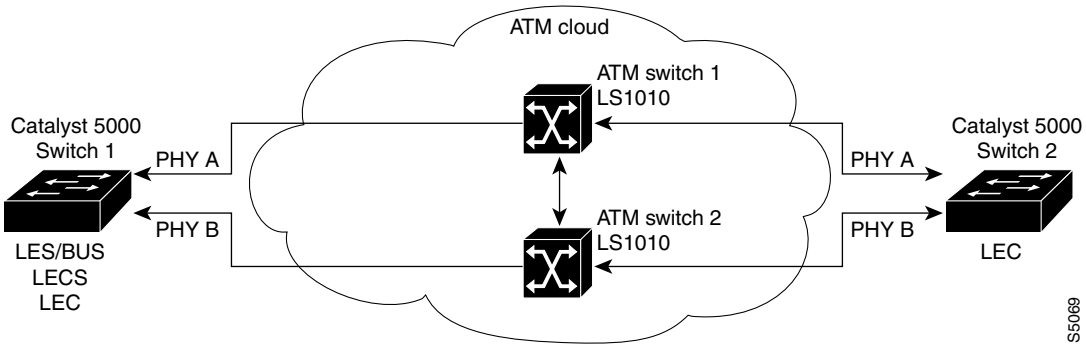
Step 21 Save the configuration as follows:

```
ATM#write memory
```

Example Configuration 3

Figure 3-5 shows two ATM switches in an ATM cloud. ATM Switch 1 is connected to two Catalyst 5000 family switches (Catalyst 5000 family Switch 1 and Catalyst 5000 family Switch 2), which have ATM dual PHY modules. ATM Switch 2 is also connected to Catalyst 5000 family Switch 1 and Catalyst 5000 family Switch 2. If PHY A on Catalyst 5000 family Switch 1 is lost, data continues to flow to Catalyst 5000 family Switch 2 on PHY B, showing dual PHY redundancy.

Figure 3-5 LES/BUS/LECS Redundancy with Dual PHYs



Example Configuration 3 Assumptions

In Figure 3-5, these assumptions apply:

- The LightStream 1010 switch is used.
- Catalyst 5000 family switches with the ATM modules installed are running ATM software release 3.1 or later.
- Catalyst 5000 family Switch 1 runs the LECS on interface atm0.
- Catalyst 5000 family Switch 1 runs the LES/BUS and LEC for VLAN/ELAN1 on interface atm0.1.
- Catalyst 5000 family Switch 1 runs the LES/BUS and LEC for VLAN/ELAN 2 on subinterface atm0.2.
- Catalyst 5000 family Switch 2 runs the LEC for ELAN/VLAN 1 on interface atm0.1.
- Catalyst 5000 family Switch 2 runs the LEC for ELAN/VLAN 2 on interface atm0.2.
- The ATM module is installed in slot 4 of the Catalyst 5000 family switches.
- You can change the ELAN name by entering the **set vlan** *vlan_num* [*name*] command.

Example Configuration 3 Procedure

To set up LANE on the configuration in Figure 3-5, perform these steps:

Step 1 Set up the prefix of the ATM NSAP address for the switch.

The LightStream 1010 ATM switch provides a default prefix.

Step 2 Establish a connection to the ATM module by entering the **session** command at the Catalyst 5000 family switch console prompt.

```
Console> session 4
Trying ATM-4...
Connected to ATM-4.
Escape character is '^]'.
```

Step 3 Obtain the LECS and LES/BUS addresses for later use by entering the **show lane default** command in privileged mode at the ATM prompt.

```
ATM>enable
ATM#
ATM#show lane default
interface ATM0:
LANE Client:        47.009181000000061705b7701.00400BFF0010.**
LANE Server:        47.009181000000061705b7701.00400BFF0011.**
LANE Bus:           47.009181000000061705b7701.00400BFF0012.**
LANE Config Server: 47.009181000000061705b7701.00400BFF0013.00
ATM#
```

Note The two asterisks (**) represent the subinterface number byte displayed in hexadecimal.

Step 4 Access path B by entering the **interface atm0** and the **atm preferred phy B** commands in configuration mode.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-subif)#atm preferred phy B
ATM(config-subif)#end
ATM#
```

Wait for approximately one minute while the PHY B comes up.

Step 5 Enter the **show lane default** command. The two asterisks (**) represent the subinterface number byte displayed in hexadecimal.

```
ATM#show lane default
interface ATM0:
LANE Client:        47.009181000000061705b8301.00400BFF0010.**
LANE Server:        47.009181000000061705b8301.00400BFF0011.**
LANE Bus:           47.009181000000061705b8301.00400BFF0012.**
LANE Config Server: 47.009181000000061705b8301.00400BFF0013.00
ATM#
```

Step 6 Return to PHY A by entering the **interface atm0** and the **atm preferred phy A** commands in configuration mode.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-subif)#atm preferred phy A
ATM(config-subif)#end
ATM#
```

Step 7 Set the address of the default LECS in the ATM switches by entering the addresses from Steps 3 and 5.

Enter the **atm lecs-address** *atm_address* command on the console of the LightStream 1010 Switch 1. These commands configure the address of the primary and the backup LECSs in the ATM switches in the specific order entered. Only one LECS runs on the Catalyst 5000 family Switch 1, but the address (the first 13 bytes) changes if PHY B is used instead of PHY A.

```
ATM>enable
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#atm lecs-address 47.009181000000061705b7701.00400BFF0013.00 1
ATM(config)#atm lecs-address 47.009181000000061705b8301.00400BFF0013.00 2
ATM(config)#end
ATM#
```

Step 8 Save the configuration as follows:

```
ATM#write memory
```

Step 9 Enter the **interface atm0** and **lane server-bus ethernet default** commands in configuration mode on the console of Catalyst 5000 family Switch 1. These commands start a LES/BUS pair. The ELAN name is "default." The interface on which this LES/BUS pair is configured is atm0.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-subif)#lane server-bus ethernet default
ATM(config-subif)#end
ATM#
```

Step 10 Save the configuration as follows:

```
ATM#write memory
```

Step 11 Configure the LECS database of the Catalyst 5000 family Switch 1 by entering the **lane database** *database_name* command, the **name** *elan_name* **server-atm-address** *atm address* command, and the **default-name** *elan_name* command.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane database test
ATM(lane-config-database)#name default server-atm-address
47.009181000000061705b7701.00400BFF0011.00
ATM(lane-config-database)#name default server-atm-address
47.009181000000061705b8301.00400BFF0011.00
ATM(lane-config-database)#default-name default
ATM(lane-config-database)#end
ATM#
```

Enter the LANE server addresses from Steps 3 and 5. Replace the two asterisks (**) with the subinterface number of the interface in which the LES/BUS is to be configured. In this example, the number is 00. These commands create the LECS database. The name of the database is test. The name of the ELAN is “default.”

The ATM NSAP address of the LES is 47.009181000000061705b7701.00400BFF0011.00. The display in Step 3 shows this LANE BUS address.

The ATM NSAP address of the LES is 47.009181000000061705b8301.00400BFF0011.00. The display in Step 5 shows this LANE BUS address.

Step 12 Save the configuration as follows:

```
ATM#write memory
```

Step 13 Start and bind the LECS on the Catalyst 5000 family Switch 1 by entering the **interface atm0** command, the **lane config database** *database_name* command, and the **lane config auto-config-atm-address** command in configuration mode at the ATM prompt. The database name is “test.” The interface on which the LECS is configured is atm0.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0
ATM(config-if)#lane config test
ATM(config-if)#lane config auto-config-atm-address
ATM(config-if)#end
ATM#
```

Step 14 Save the configuration as follows:

```
ATM#write memory
```

Step 15 Start a LEC on Catalyst 5000 family Switches 1 and 2 by entering the **interface atm0.1** and **lane client ethernet 1 default** commands in configuration mode on the consoles of each Catalyst 5000 family switch. The interface on which the LEC is configured is atm0.1. The ELAN name is default, and it is configured to emulate Ethernet.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.1
ATM(config-subif)#lane client ethernet 1 default
ATM(config-subif)#end
ATM#
```

Step 16 Save the configuration as follows:

```
ATM#write memory
```

Step 17 Create a LES/BUS pair on the Catalyst family Switch 1 for VLAN 2 by entering the **interface atm0.2** and **lane server-bus ethernet VLAN0002** commands in configuration mode.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.2
ATM(config-subif)#lane server-bus ethernet VLAN0002
ATM(config-subif)#end
ATM#
```

Step 18 Save the configuration as follows:

```
ATM#write memory
```

Step 19 Configure the address of the new LES/BUS pair in the LECS database on the Catalyst 5000 family Switch 1 by entering the **lane database** *database_name* and **name** *elan_name* **server-atm-address** *atm_address* commands in configuration mode.

```
ATM#configure terminal
ATM(config)#lane database test
ATM(lane-config-database)#name VLAN0002 server-atm-address 47.009181000000061705b7701.00400BFF0011.02
ATM(lane-config-database)#name VLAN0002 server-atm-address 47.009181000000061705b8301.00400BFF0011.02
ATM(lane-config-database)#end
ATM#
```

Step 20 Save the configuration as follows:

```
ATM#write memory
```

Step 21 Start the new LEC on the Catalyst 5000 family Switch 2 by entering the **interface atm0.2** and **lane client ethernet 2 VLAN0002** commands in configuration mode on the console of Catalyst 5000 family Switch 2.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#interface atm0.2
ATM(config-subif)#lane client ethernet 2 VLAN0002
ATM(config-subif)#end
ATM#
```

Step 22 Save the configuration as follows:

```
ATM#write memory
```

Understanding LANE QoS

LANE quality of service (QoS) is supported on the following platforms:

- Catalyst 6000 family ATM OC-12 modules (WS-X6101-OC12-SMF, WS-X6101-OC12-MMF)
- Catalyst 5000 family dual-PHY OC-12 ATM LANE/Multiprotocol over ATM (MPOA) modules (WS-X5161, WS-X-5162)

Note The Catalyst 5000 family ATM modules currently do not support LANE QoS. Support for the LANE QoS feature will be added in a future release.

LANE QoS provides the capability to differentiate multiple classes of traffic. This is achieved by creating (multiple) VCCs with the desired QoS parameters. When the prioritized traffic is received, the LEC forwards it on a VCC with matching QoS parameters.

Currently, LANE QoS supports the creation of unspecified bit rate+ (UBR+) VCCs. A UBR+ VCC is a UBR VCC for which minimum cell rate (MCR) is guaranteed by the switch. If the switch cannot guarantee the rate you have specified for the UBR+ VCC, the LANE client will revert to UBR with no MCR guarantee.

You can enable or disable the LANE QoS feature on a per LEC basis by entering the **qos** option in the **lane client** command. The same ELAN can contain both QoS-capable and non-QoS capable LECs.

Note If a QoS VCC setup is rejected due to insufficient resources at the switch, the VCC setup falls back to UBR VCC.

Packet Classification

On the Catalyst 6000 ATM platform, the routed packet is classified by the class of service (CoS) value before it is handed over to the LANE. The LEC determines the VCC based on the packets CoS. CoS to VCC mapping is determined by the user configuration. Non-IP traffic and bridged traffic streams are always sent over the UBR+ VCC.

In the Catalyst 5000 family ATM modules, the LEC creates either a UBR+ VCC or UBR VCC, but not both. A UBR+ VCC is created by specifying the QoS parameters for the ATM address of the remote LEC.

Restrictions

These restrictions apply to the LANE QoS feature on the Catalyst 5000 and 6000 ATM modules:

- LANE QoS is supported on devices with matching UBR+ VCC parameters. If the remote NSAP is not configured for QoS, the VCC setup falls back to UBR VCC.
- If a QoS VCC setup is rejected because of insufficient resources at the switch, the VCC setup reverts to UBR VCC.
- On Catalyst 5000 ATM modules, creation of multiple VCCs is not supported.
- LANE QoS is supported only with version 2-compliant LANE client software.

Configuring LANE QoS

Before you can configuring LANE QoS, you must define a LANE QoS database using the **lane qos database** *name* command.

To configure LANE QoS, perform the following task:

	Task	Command
Step 1	Enter the UBR+ VCC parameters for the destination NSAP address.	[**no**] **atm-address** *nsap-addr* **ubr+ pcr** *value* **mcr** *value*
Step 2	Map the CoS value or range of values to a UBR+ VCC.	[**no**] **ubr+ cos** {value | range}
Step 3	Apply the LANE QoS database to an interface.	[**no**] **lane client qos** *database_name*
Step 4	Verify the configuration.	**show lane qos database** [*name*]

Configuring LANE QoS on a Catalyst 5000 Family ATM Module

In this example, a UBR+ VCC is established with the network services access point (NSAP) address of 47.009181000000000061705B0C01.00E0B0951A40.0A. All traffic destined for this address is sent on the created UBR+ VCC.

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# lane qos database fred
ATM(lane-qos)# atm-address 47.009181000000000061705B0C01.00E0B0951A40.0A cos 7 pcr 500000
mcr 100000
ATM(lane-qos)# exit
ATM(config)# interface atm0.2
ATM(config-subif)# lane client qos fred
ATM(config-subif)# end
ATM# show lane qos database fred
QOS: fred
    configured cos values: 4-7, usage: 1
    dst nsap: 47.009181000000000061705B0C01.00E0B0951A40.0A
    cos: 7, pcr: 500000, mcr: 100000
ATM#
```

Configuring LANE QoS Modes on a Catalyst 5000 Family ATM Module

On Catalyst 5000 family switches, incoming packets can be classified based on such Layer 2 QoS information as the MAC address, VLAN port, or the input port, but this classification information cannot be transmitted to the UBR or UBR+ VCC on the Catalyst 5000 ATM module.

However, the LANE QoS-capable Catalyst 5000 ATM modules can forward traffic based on the IP Precedence setting. To enable the ATM modules to forward traffic based on IP Precedence, you must configure LANE QoS for trusted mode.

Note The trusted mode only works for traffic that enters the Catalyst 5000 family switch with the IP Precedence bits already set by an external device. The Catalyst 5000 family switch itself is not able to assign IP Precedence.

The Catalyst 5000 ATM LANE QoS feaure supports the following two modes:

- Untrusted Mode—In this mode, packets are sent to a UBR+ VC based on the configured NSAP address. This mode is used for all incoming traffic, expect for traffic that has the IP Precedence field set.

- Trusted Mode—In this mode, packets are forwarded to the UBR or UBR+ VC based on the IP Precedence field in the packet's IP header.

The default mode is untrusted mode. To change the command mode to trusted mode, enter the **lane qos iptos trust** command in global configuration mode.

To revert to untrusted mode, enter the **no lane qos iptos trust** command in global configuration mode.

This example shows that the command mode is changed to trusted:

```
ATM(config)# lane qos iptos trust
```

This example shows that the command mode is changed to untrusted:

```
ATM(config)# no lane qos iptos trust
```

Enter the **show running configuration** command to view the command mode setting.

Configuring LANE QoS on a Catalyst 6000 ATM Module

This example shows how to configure LANE QoS on a Catalyst 6000 ATM module. A UBR+ VCC is established with the NSAP address 47.009181000000061705B0C01.00E0B0962B50.0A in addition to the already created UBR VCC with the same NSAP. All traffic destined to the configured NSAP and matching CoS range 5 to 7 is sent over the UBR+ VCC. The remainder of the traffic is sent over the default UBR VCC.

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# lane qos database bob
ATM(lane-qos)# atm-address 47.009181000000061705B0C01.00E0B0962B50.0A ubr+ pcr 500000
mcr 100000
ATM(lane-qos)# ubr+ cos 5-7
ATM(lane-qos)# exit
ATM(config)# interface atm0.2
ATM(config-subif)# lane client qos bob
ATM(config-subif)# end
```

Monitoring and Maintaining LANE QoS

To monitor the LANE QoS configurations and settings, perform one of these tasks:

Task	Command
• Display the contents of a specific LANE QoS database.	**show lane qos database** [*name*]
• Display the contents of the le-arp table, including the type of VCC.	**show lane le-arp**
• Display the contents of the le-arp table, including the VCD value of each CoS.	**show lane le-arp qos**

CHAPTER 4

Configuring ATM PVCs and QoS Traffic Shaping

This chapter describes how to configure permanent virtual connection (PVC)-supported VLANs and PVC-supported VLANs with quality of service (QoS) traffic shaping on the ATM modules for the Catalyst 5000 and 6000 family switches.

Note For information on installing Catalyst 5000 family ATM modules, refer to the *Catalyst 5000 Family Module Installation Guide*. For information on installing Catalyst 6000 family ATM modules, refer to the *Catalyst 6000 Family Module Installation Guide*.

Note For syntax and usage information for the commands used in this chapter, see Chapter 7, "Command Reference."

This chapter consists of the following sections:

Understanding How PVCs Work

PVC-based ATM links allow Catalyst 5000 and 6000 family switches to connect to each other through ATM interfaces over PVCs. You can configure one or more PVCs for each VLAN on every Catalyst 5000 or 6000 family ATM module. Connectivity can be back-to-back or through an ATM switch cloud, using RFC 1483-compliant, bridged Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) packet encapsulation.

Note Traffic cannot be bridged between ports in the same VLAN if these ports are configured for PVCs.

When you create a PVC, you create a virtual channel descriptor (VCD) and attach it to the virtual path identifier (VPI) and virtual channel identifier (VCI). A VCD identifies the VPI-VCI pair for a particular packet. The ATM module requires this feature to manage packet transmission. The number chosen for the VCD is independent of the VPI-VCI pair used.

To use PVCs, you must configure PVCs in both the Catalyst 5000 or 6000 family ATM modules and the ATM switch cloud. PVCs remain active until the circuit is removed from either configuration.You can configure up to 4096 PVCs on the ATM module. In addition, you can divide the PVCs attached to the rate queues among different VLANs.

PVCs are compatible with switched virtual connection (SVC)-based LAN Emulation (LANE), with the following restrictions:

- You can configure a VLAN using either LANE or PVCs. You cannot configure the same VLAN to use both PVCs and LANE simultaneously.
- Only RFC-1483, bridged-Ethernet LLC/SNAP encapsulation is supported.
- If two PVCs are configured on the same VLAN and ATM module, packets received from one PVC are not forwarded to the other PVC.

Understanding How QoS Traffic Shaping Works

You can configure QoS traffic shaping with ATM PVC traffic-shaping software releases 50.1 or 51.1 and with ATM software releases 11.3WA4 and 12.0W5.

QoS consists of the following contracts:

- Class of service (CoS)
- Traffic shaping
- Traffic policing

In the Catalyst 5000 and 6000 family ATM module software, CoS is determined when you specify the traffic-shaping parameters. The following sections describe how CoS and traffic shaping functions in the Catalyst 5000 and 6000 ATM family modules. Traffic policing is not supported on the ATM modules.

Note Software releases 50.1 and 51.1 are separate images from the Catalyst 5000 family LANE/MPOA software; software releases 50.1 and 51.1 do not support traffic shaping with LANE and support only RFC 1483-bridged Ethernet SNAP-encapsulated PVCs with peak cell-rate shaping.

Caution The ATM single PHY OC-3, dual PHY OC-3, and dual PHY DS3 modules require compatible releases of the Catalyst 5000 family supervisor engine and ATM PVC traffic-shaping software. Refer to the current release notes applicable to your module for information about software release requirements.

Class of Service

Software releases 50.1 and 51.1 support unspecified bit rate (UBR) and constant bit rate (CBR) CoS. CoS for a PVC is determined by the specified traffic shaping. If you specify the peak cell rate (PCR), the PVC will have a CBR CoS. If no PCR is set, the PVC will have a UBR CoS.

Software releases 11.3 and 12.0 support UBR, CBR, and variable bit rate (VBR). As in software releases 50.1 and 51.1, the CoS is determined by the traffic shaping parameters you specify.

- UBR—CoS assigned to the PVC when you specify no traffic shaping.
- CBR—CoS assigned to the PVC when you specify the PCR.
- VBR—CoS assigned to the PVC when you specify the PCR, sustainable cell rate (SCR), and maximum burst size (MBS).

Note The MBS should be a value between 2 and 255. If you specify an MBS of 1, the channel is opened with CBR CoS.

Traffic Shaping

Traffic shaping uses queues to constrain data bursts, limit peak data rate, and smooth jitters so that traffic will fit within the promised CoS contract.

Software releases 50.1 and 51.1 support up to ten dynamically created rate queues, and the rate queue assigned to a PVC depends on the PCR you assign to that PVC. When you specify the PCR, the software assigns the PVC to a rate queue that most closely matches that cell rate. If you do not specify the PCR, the software automatically assigns the PVC a service class of UBR and the default rate queue, which is the highest bandwidth rate queue available. See Table 4-1 for rate queue ranges in the different software releases.

Note Releases 50.1 and 51.1 allow only PCR.

As in releases 50.1 and 51.1, in software releases 11.3WA4 and 12.0W5 rate queues are determined by the traffic shaping you specify. In software releases 11.3 and 12.0, the number of available rate queues is determined by the maximum amount of bandwidth divided by the specified PCR allocated for each PVC. As a result, software release 12.0 provides more rate-queue granularity and makes better use of the available bandwidth. See Table 4-1 for a listing of maximum available bandwidth for specific modules and software versions.

In software versions 11.3WA4 and12.0W5, you can specify PCR, SCR, and MBS traffic-shaping parameters.

The minimum PCR or SCR is 64 Kbps. If you specify a value less than 64 Kbps, the rate specified to the segmentation and reassembly sublayer (SAR) is 64 Kbps.

Table 4-1 Supported Rate Queues

Module	Product Number	Software Release	Number of Rate Queues	PCR Range
ATM LANE PHY OC-3	WS-X5153 WS-X5154 WS-X5155 WS-X5156 WS-X5157 WS-X5158	50.1	8	2081–155,000 Kbps
		51.1	8	2081–155,000 Kbps
			2	1-2080 Kbps
ATM Dual PHY DS-3	WS-X5166	51.1	8	2354–155,000 Kbps
			2	1-2353 Kbps
ATM Dual PHY OC-12	WS-X5161 WS-X5162	11.WA43	n	0-622050 Kbps/n
		12.0W5	n	0-622050 Kbps/n
ATM Dual PHY OC-3	WS-X5167 WS-X5168	11.3WA4	n	0-155,000 Kbps
		12.0W5	n	0-155,000 Kbps
ATM Fabric Integration	WS-X5165	11.3WA4	n	0-622,050 Kbps
		12.0W5	n	0-622,050 Kbps

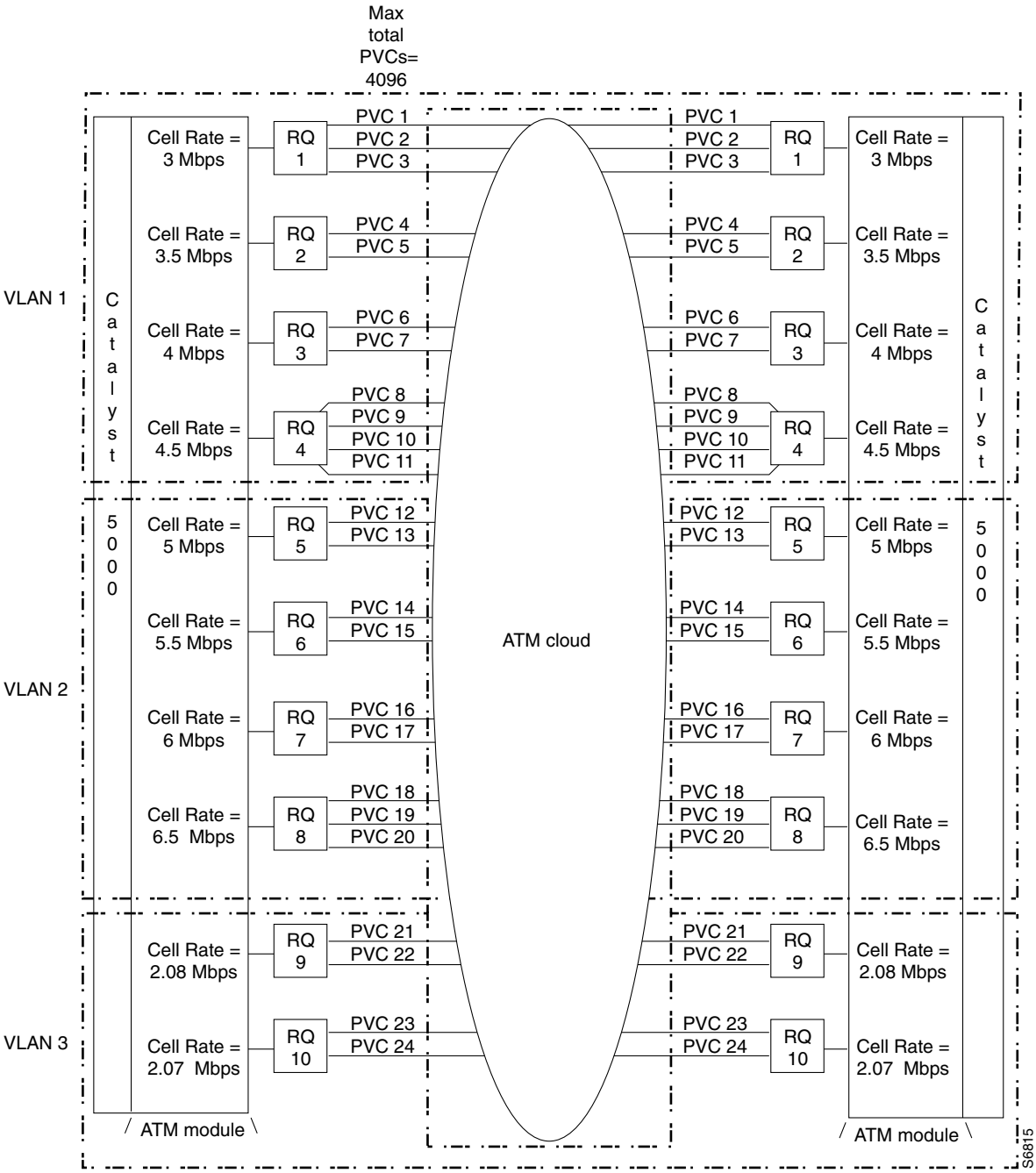
VTP is disabled by default on the ATM modules, even if you have enabled it to run on the supervisor engine module. If you enable VLAN Trunk Protocol (VTP) in the ATM module, the ATM module creates LAN Emulation Clients (LECs) for each VLAN configured on the supervisor engine. However, because a VLAN cannot simultaneously have LANE and PVCs configured, enabling VTP will cause any previously configured PVCs to be deleted.

Note If you want to use PVCs to connect VLANs to the ATM cloud, do not enable VTP on the ATM module. VTP will override PVC configurations.

PVC Traffic-Shaping Example

Figure 4-1 shows two Catalyst 5000 family switches with ATM dual PHY DS3 modules in a redundant configuration running ATM PVC traffic-shaping software. The ATM dual PHY DS3 modules contain ten rate queues. Twenty-four PVCs are divided among the ten rate queues; each specifies a particular cell rate for the PVC set attached to it. In this example, PVC 1 through PVC 7 are in VLAN 1, PVC 8 through PVC 20 are in VLAN 2, and PVC 21 through PVC 24 are in VLAN 3.

Figure 4-1 ATM PVC Traffic Shaping with the ATM Dual PHY DS3 Module



Default PVC Configuration

Table 4-2 shows the default PVC configuration.

Table 4-2 Default ATM PVC Configuration

Feature	Default Configuration
Clock internal	Transmit clock is generated internally
ATM framing	C-Bit with ADM
Line buildout	Short
DS3-scramble	Disabled

Configuring PVC-Supported VLANs

These sections describe how to configure PVC-supported VLANs on the Catalyst 5000 or 6000 family ATM modules:

Setting Up PVCs in the ATM Cloud

To configure a PVC within the ATM cloud, refer to the documentation from your ATM switch vendor.

Configuring a PVC-Supported VLAN

To set up a PVC-supported VLAN on the ATM module, perform this task in privileged mode:

	Task	Command
Step 1	On the Catalyst 5000 or 6000 family switch, assign an Ethernet port to the desired VLAN.	**set vlan** *vlan_num mod_num/port_num*
Step 2	Establish a connection to the ATM module.	**session** *mod_num*
Step 3	Activate privileged mode on the ATM module.	**enable**
Step 4	Enter configuration mode.	**configure terminal**
Step 5	Select the ATM interface.	**interface atm0**
Step 6	Set up the PVCs.	**atm pvc** *vcd vpi vci* **aal5snap**
Step 7	Bind the PVCs to the VLAN.	**atm bind pvc vlan** *vcd vlan_num*

	Task	Command
Step 8	(Optional) Set up other PVCs for the same VLAN if needed by repeating Steps 6 and 7.	
Step 9	Exit configuration mode.	**Ctrl-Z**
Step 10	Verify the PVC configuration.	**show atm vlan** **show atm vc**
Step 11	Save the configuration.	**write memory**

Note Traffic cannot be bridged between ports in the same VLAN if these ports are configured for PVCs.

Configuring a PVC-Supported VLAN with Traffic Shaping

Note Traffic shaping requires software release 50.1 or release 51.1.

To configure a PVC-supported VLAN with ATM PVC traffic shaping, perform this task in privileged mode:

	Task	Command
Step 1	Assign an Ethernet port to the desired VLAN.	**set vlan** *vlan_num mod_num/port_num*
Step 2	Establish a connection to the ATM module.	**session** *mod_num*
Step 3	Activate privileged mode on the ATM module.	**enable**
Step 4	Enter configuration mode.	**configure terminal**
Step 5	Select the ATM interface.	**interface atm0**
Step 6	(Optional) Customize the interface configuration if needed.	**atm clock internal** **atm framing** [**m23adm** | **cbitplcp** | **m23plcp**] **atm lbo** {**short** | **long**} **atm ds3-scramble**
Step 7	Set up the PVCs, indicating the desired peak cell rate.	**atm pvc** *vcd vpi vci* [**aal-encap**] **aal5snap**[1] *pcr*[2]scr mbs [**oam** *seconds*]
Step 8	Bind the PVCs to the VLAN.	**atm bind pvc vlan** *vcd vlan_num*[3]
Step 9	Set up other PVCs for the same VLAN if needed by repeating Steps 6 through 8.	
Step 10	Exit configuration mode.	**Ctrl-Z**

	Task	Command
Step 11	Verify the setup.	**show atm vlan** **show atm vc**
Step 12	Write the configuration to NVRAM.	**write memory**

1. To configure traffic shaping, you must use the **aal5snap** options.
2. The *peak* argument must not exceed 45000 for DS3 modules, 155000 for OC-3 modules or 622050 for OC-12 modules.
3. The **atm bind pvc vlan** *vcd vlan_num* command is valid only for the current software release; this command may change in future releases.

Note The **atm bind pvc vlan** *vcd vlanid* command is valid only for the current software release. The **atm traffic-shape rate** command is not available in software releases 50.1 or 51.1.

Unbinding or Removing PVCs from a VLAN

You can unbind and remove a previously assigned PVC from a VLAN. You can also unbind a previously assigned PVC from a VLAN without removing the PVC. If you do not remove the PVC, you can bind the PVC to a different VLAN.

Note The procedures in this section apply to ATM software release 4.1 and ATM PVC traffic-shaping software release 50.1.

To remove a previously assigned PVC from a VLAN, perform this task in privileged mode:

	Task	Command
Step 1	Enter privileged mode on the ATM module.	**enable**
Step 2	Enter configuration mode.	**configure terminal**
Step 3	Select the ATM interface.	**interface atm0**
Step 4	Remove the PVC from the VLAN.	**no atm pvc** *vcd*
Step 5	End the session.	**Ctrl-Z**

To unbind a previously assigned PVC from a VLAN without removing the PVC itself, perform this task in privileged mode:

	Task	Command
Step 1	Activate privileged mode on the ATM module.	**enable**
Step 2	Enter configuration mode	**configure terminal**
Step 3	Select the ATM interface.	**interface atm0**

	Task	Command
Step 4	Unbind the PVC from the VLAN.	**no atm bind pvc vlan** *vcd vlan_num*
Step 5	End the session.	**Ctrl-Z**

ATM PVC Traffic-Shaping Configuration Examples

These sections show ATM PVC traffic-shaping configuration examples:

Nonredundant Configuration Traffic-Shaping Example

This example configuration describes how to configure a nonredundant PVC-supported VLAN configuration with traffic-shaping. Figure 4-2 shows the network used in this example. Assume that the ATM module in each Catalyst 5000 family switch is in slot 2. This example applies to both the single and dual PHY OC-3 ATM modules and the dual PHY DS3 ATM module.

Figure 4-2 Nonredundant Configuration Traffic-Shaping Example Network

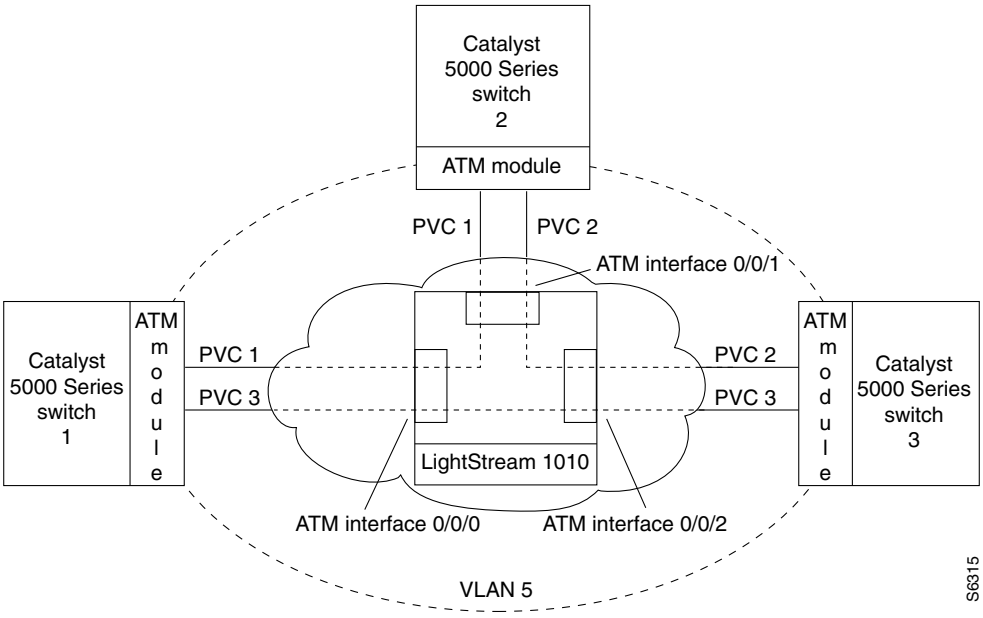


Table 4-3 shows the VLAN and switch connections, VPIs, VCIs, and traffic rates for the network shown in Figure 4-2.

Table 4-3 PVC Connections for Example Network

PVC	VLAN/Switch Connections	VPI	VCI	Rate in kbps
1	Connects Switch 1 to Switch 2 on VLAN 5	0	32	45000
2	Connects Switch 2 to Switch 3 on VLAN 5	0	33	2080
3	Connects Switch 1 to Switch 3 on VLAN 5	0	34	45000

These assumptions apply for this example:

- PVC 3 is required for Switch 1 to communicate with Switch 3, because the ATM module on Switch 2 does not forward packets received from Switch 1 on PVC 1 to Switch 3 on PVC 2.
- Any number of PVCs can be bound to the same VLAN. However, to prevent loops, each PVC must uniquely connect a VLAN group between two Catalyst 5000 family switches. You can also enable the Spanning Tree Protocol to prevent loops.

Before configuring the VLAN over PVCs, you must perform these tasks:

- Verify that you have software release 50.1 or later.
- Obtain the VLAN number to be configured.
- Obtain the VPI and VCI for each PVC to be configured.
- Note the interface number on the LightStream 1010 ATM switch to which the ATM module is connected. You need this interface number to connect the PVCs across the ATM cloud on the LightStream 1010 switch.

Set up the PVCs within the ATM Cloud.

Note These procedures apply only if your ATM switch is a Cisco LightStream 1010 ATM switch. If you have a different ATM switch, consult the documentation provided by the switch vendor.

Step 1 Create PVC 1 within the ATM cloud. Enter these commands on the LightStream 1010 ATM switch:

```
Switch> enable
Switch#
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface atm0/0/0
Switch(config-if)# atm pvc 0 32 interface atm0/0/1 0 32
Switch(config-if)# end
Switch#
```

Step 2 Verify the setup of PVC 1. Enter this command on the LightStream 1010 ATM switch:

```
Switch# show atm vc interface atm0/0/0
Interface     VPI     VCI     Type   X-Interface  X-VPI   X-VCI   Status
ATM0/0/0      0       5        PVC     ATM2/0/0     0       32      UP
ATM0/0/0      0       16       PVC     ATM2/0/0     0       33      UP
ATM0/0/0      0       18       PVC     ATM2/0/0     0       34      UP
ATM0/0/0      0       32       PVC     ATM0/0/1     0       32      UP
Switch#
```

Step 3 Create PVC 2 within the ATM cloud. Enter these commands on the LightStream 1010 ATM switch:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#
Switch(config)# interface atm0/0/1
Switch(config-if)# atm pvc 0 33 interface atm0/0/2 0 33
Switch(config-if)# end
Switch#
```

Step 4 Verify the setup of PVC 2. Enter this command on the LightStream 1010 ATM switch:

```
Switch# show atm vc interface atm0/0/1
Interface     VPI     VCI     Type   X-Interface  X-VPI   X-VCI   Status
ATM0/0/1      0       5        PVC     ATM2/0/0     0       35      UP
ATM0/0/1      0       16       PVC     ATM2/0/0     0       36      UP
ATM0/0/1      0       18       PVC     ATM2/0/0     0       37      UP
ATM0/0/1      0       32       PVC     ATM0/0/0     0       32      UP
ATM0/0/1      0       33       PVC     ATM0/0/2     0       33      UP
Switch#
```

Step 5 Create PVC 3 within the ATM cloud. Enter these commands on the LightStream 1010 ATM switch:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config-if)# interface atm0/0/2
Switch(config-if)# atm pvc 0 34 interface atm0/0/0 0 34
Switch(config-if)# end
Switch#
```

Step 6 Verify the setup of PVC 3. Enter this command on the LightStream 1010 ATM switch:

```
Switch# show atm vc interface atm0/0/2
Interface     VPI     VCI     Type   X-Interface  X-VPI   X-VCI   Status
ATM0/0/2      0       5        PVC     ATM2/0/0     0       38      UP
ATM0/0/2      0       16       PVC     ATM2/0/0     0       39      UP
ATM0/0/2      0       18       PVC     ATM2/0/0     0       40      UP
ATM0/0/2      0       33       PVC     ATM0/0/1     0       33      UP
ATM0/0/2      0       34       PVC     ATM0/0/0     0       34      UP
Switch#
```

Set up PVC 1 and PVC 3 on the Catalyst 5000 family Switch 1.

Step 7 At the console of the Catalyst 5000 family Switch 1, establish a connection to the ATM module in slot 2 by entering these commands:

```
Console> enable
Enter password:
Console> (enable) set vlan 5
Console> (enable) session 2
Trying ATM-2...
Connected to ATM-2.
Escape character is '^]'.
ATM>
```

Step 8 Configure PVC 1 and PVC 3 on Switch 1 by entering these commands:

```
ATM> enable
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm pvc 10 0 32 aal5snap 45000
ATM(config-if)# atm ds3-scramble
ATM(config-if)# atm lbo long
ATM(config-if)# atm framing m23adm
ATM(config-if)# atm clock internal
ATM(config-if)# atm pvc 11 0 34 aal5snap 45000
ATM(config-if)# end
ATM#
```

You can perform all PVC-related configurations for all VLANs on atm0, the major interface, because the subinterface number has no significance for PVC-supported VLANs. VCDs 10 and 11 (used above) can be any unused VCDs. Enter the **show atm vc** command to find unused VCDs.

Step 9 Bind PVC 1 and PVC 3 to VLAN 5 on Switch 1 by entering these commands:

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm bind pvc vlan 10 5
ATM(config-if)# atm bind pvc vlan 11 5
ATM(config-if)# end
ATM#
```

Enter the VCD numbers used in Step 8. The last option in the **atm bind pvc** command specifies VLAN 5.

Step 10 Verify the setup on Switch 1 by entering these commands:

```
ATM# show atm vlan
VCD    VLAN-ID
10     5
11     5
ATM#
ATM# show atm vc
                                        AAL/            Peak   Avg.  Burst
Interface   VCD   VPI   VCI Type  Encapsulation  Kbps   Kbps  Cells  Status
ATM0         10    0    32   PVC  AAL5-SNAP      45000    0     0    ACTIVE
ATM0         11    0    34   PVC  AAL5-SNAP      45000    0     0    ACTIVE
ATM#
```

Step 11 Save the configuration as follows:

```
ATM# write memory
Building configuration...
[OK]
ATM#
```

Set up PVC 1 and PVC 2 on the Catalyst 5000 family Switch 2.

Step 12 At the console of the Catalyst 5000 family Switch 2, establish a connection to the ATM module in slot 2 by entering these commands:

```
Console> enable
Enter password:
Console> (enable) set vlan 5
Console> (enable) session 2
Trying ATM-2...
Connected to ATM-2.
Escape character is '^]'.
ATM#
```

Step 13 Configure PVC 1 and PVC 2 on Switch 2 by entering these commands:

```
ATM> enable
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm pvc 10 0 32 aal5snap 45000
ATM(config-if)# atm ds3-scramble
ATM(config-if)# atm lbo long
ATM(config-if)# atm framing m23adm
ATM(config-if)# atm clock internal
ATM(config-if)# atm pvc 11 0 33 aal5snap 2080
ATM(config-if)# end
ATM#
```

You can perform all PVC-related configurations for all VLANs on atm0, the major interface, because the subinterface number has no significance for PVC-supported VLANs. VCDs 10 and 11 (used above) can be any unused VCDs. Enter the **show atm vc** command to find unused VCDs.

Step 14 Bind PVC 1 and PVC 2 to VLAN 5 on Switch 2 by entering these commands:

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm bind pvc vlan 10 5
ATM(config-if)# atm bind pvc vlan 11 5
ATM(config-if)# end
ATM#
```

Enter the VCDs used in Step 13. The last option in the **atm bind pvc** command specifies VLAN 5.

Step 15 Verify the setup on Switch 2 by entering these commands:

```
ATM# show atm vlan
VCD     VLAN-ID
 10     5
 11     5
ATM#
ATM# show atm vc
                                      AAL /          Peak   Avg.  Burst
Interface     VCD   VPI   VCI Type  Encapsulation  Kbps   Kbps  Cells Status
ATM0           10     0    32  PVC  AAL5-SNAP      45000  0     0     ACTIVE
ATM0           11     0    33  PVC  AAL5-SNAP      2080   0     0     ACTIVE
ATM#
```

Step 16 Save the configuration as follows:

```
ATM# write memory
Building configuration...
[OK]
ATM#
```

Set up PVC 2 and PVC 3 on the Catalyst 5000 family Switch 3.

Step 17 At the console of the Catalyst 5000 family Switch 3, establish a connection to the ATM module in slot 2 by entering these commands:

```
Console> enable
Enter password:
Console> (enable) set vlan 5
Console> (enable) session 2
Trying ATM-2...
Connected to ATM-2.
Escape character is '^]'.
ATM>
```

Step 18 Configure PVC 2 and PVC 3 on Switch 3 by entering these commands:

```
ATM> enable
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm pvc 10 0 33 aal5snap 2080
ATM(config-if)# atm pvc 11 0 34 aal5snap 45000
ATM(config-if)# end
ATM#
```

You can perform all PVC-related configurations for all VLANs on atm0, the major interface, because the subinterface number has no significance for PVC-supported VLANs. VCDs 10 and 11 (used above) can be any unused VCDs. Enter the **show atm vc** command to find unused VCDs.

Step 19 Bind PVC 2 and PVC 3 to VLAN 5 on Switch 3 by entering these commands:

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm bind pvc vlan 10 5
ATM(config-if)# atm bind pvc vlan 11 5
ATM(config-if)# end
ATM#
```

Enter the VCDs used in Step 18. The last option in the **atm bind pvc** command specifies VLAN 5.

Step 20 Verify the setup on Switch 3 by entering these commands:

```
ATM# show atm vlan
VCD     VLAN-ID
 10     5
 11     5
ATM#
ATM# show atm vc
                                        AAL /          Peak   Avg.  Burst
Interface     VCD   VPI   VCI Type  Encapsulation  Kbps   Kbps  Cells Status
ATM0           10     0    33  PVC  AAL5-SNAP      2080     0     0   ACTIVE
ATM0           11     0    34  PVC  AAL5-SNAP      45000    0     0   ACTIVE
ATM#
```

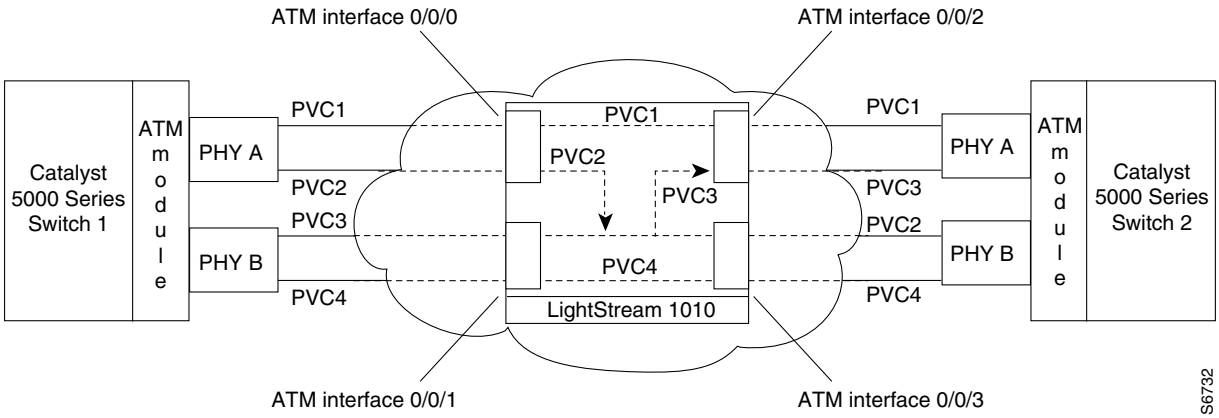
Step 21 Save the configuration as follows:

```
ATM# write memory
Building configuration...
[OK]
ATM#
```

Redundant Configuration Traffic-Shaping Example

Figure 4-3 shows the PVCs needed for complete redundancy if PHY A or PHY B on either Switch 1 or Switch 2 fails. This example (referred to as example 2) applies to the dual PHY DS3 module, but you can use the same configuration for dual PHY OC-3 modules (with appropriate PCRs).

Figure 4-3 Redundant PVC Traffic-Shaping



In Figure 4-3, you see Catalyst 5000 family Switch 1 and Catalyst 5000 family Switch 2, each with an ATM dual PHY DS3 module, connected to a LightStream 1010 ATM switch in the ATM cloud.

Assume PHY A on Switch 1 goes down and transmits no data to PHY A on Switch 2 over PVC 1, even though PHY A on Switch 2 remains active. When PHY A on Switch 1 goes down, PHY B on Switch 1 becomes active and transmits data to PHY B on Switch 2 over PVC 2.

Similarly, if PHY A on Switch 2 goes down and transmits no data to Switch 1 over PVC 1, PHY B on Switch 2 becomes active and transmits data to PHY B on Switch 1 over PVC 3.

Table 4-4 shows the PVCs used to transmit data when the specified PHYs for the Catalyst 5000 family switches in Figure 4-3 are active. For example, if PHY A on Switch 1 and PHY A on Switch 2 are both active, data is transmitted on PVC 1.

Table 4-4 Redundancy Coverage for Figure 4-3

Switch 1	Switch 2	PVC Used
PHY A— active	PHY A—active	1
PHY A—active	PHY B—active	2
PHY B—active	PHY A—active	3
PHY B—active	PHY B—active	4

Note To ensure redundancy for data transmission using dual PHYs, you must set up PVCs 1, 2, 3, and 4 on the same VLAN and configure the same data rate for each PVC.

The following assumptions apply for this example configuration:

- Table 4-5 lists the PVC and switch connections, VPI, VCI, and traffic rates shown in Figure 4-3.

Table 4-5 PVC Connections in Figure 4-3

PVC	Switch Connections	VPI	VCI	kbps Rate
1	Connects PHY A on Switch 1 to PHY A on Switch 2	0	32	45000
2	Connects PHY A on Switch 1 to PHY B on Switch 2	0	33	45000
3	Connects PHY B on Switch 1 to PHY A on Switch 2	0	34	45000
4	Connects PHY B on Switch 1 to PHY B on Switch 2	0	35	45000

- The ATM module is installed in slot 2 of the Catalyst 5000 family switches.
- Any number of PVCs can be bound to the same VLAN. However, to prevent loops, each PVC must uniquely connect a VLAN group between two Catalyst 5000 family switches. You can also enable Spanning Tree Protocol to prevent loops.

Before configuring the VLAN over PVCs, you must perform these tasks:

- Verify that you have ATM module software release 51.1(2) or above.
- Obtain the VLAN number to be configured.
- Obtain the VPI and VCI for each PVC to be configured.
- Note the interface number of the LightStream 1010 ATM switch to which the Catalyst 5000 family ATM module is connected. You need this interface number to connect the PVCs across the ATM cloud on the LightStream 1010 ATM switch.

To configure the devices in this example, follow these steps:

Note These procedures apply only if your ATM switch is a Cisco LightStream 1010 ATM switch. If you have a different ATM switch, consult the publication that accompanied the switch.

Set up the PVCs within the ATM cloud.

Step 1 Create PVC 1 within the ATM cloud. Enter these commands on the LightStream 1010 ATM switch:

```
Switch> enable
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface atm0/0/0
Switch(config-if)# atm pvc 0 32 int atm0/0/2 0 32
Switch(config-if)# end
Switch#
```

Step 2 Verify the setup of PVC 1. Enter this command on the LightStream 1010 ATM switch:

```
Switch# show atm vc interface atm0/0/0

Interface     VPI     VCI     Type   X-Interface  X-VPI   X-VCI   Status
ATM0/0/0      0       5        PVC     ATM2/0/0     0       32      UP
ATM0/0/0      0       16       PVC     ATM2/0/0     0       33      UP
ATM0/0/0      0       18       PVC     ATM2/0/0     0       34      UP
ATM0/0/0      0       32       PVC     ATM0/0/2     0       32      UP
Switch#
```

Step 3 Create PVC 2 within the ATM cloud. Enter these commands on the LightStream 1010 ATM switch:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface atm0/0/2
Switch(config-if)# atm pvc 0 33 int atm0/0/1 0 33
Switch(config-if)# end
Switch#
```

Step 4 Verify the setup of PVC 2. Enter this command on the LightStream 1010 ATM switch:

```
Switch# show atm vc interface atm0/0/2

Interface     VPI     VCI     Type   X-Interface  X-VPI   X-VCI   Status
ATM0/0/2      0       5        PVC     ATM2/0/0     0       38      UP
ATM0/0/2      0       16       PVC     ATM2/0/0     0       39      UP
ATM0/0/2      0       18       PVC     ATM2/0/0     0       40      UP
ATM0/0/2      0       32       PVC     ATM0/0/0     0       32      UP
ATM0/0/2      0       33       PVC     ATM0/0/1     0       33      UP
Switch#
```

Step 5 Create PVC 3 within the ATM cloud. Enter these commands on the LightStream 1010 ATM switch:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface atm0/0/3
Switch(config-if)# atm pvc 0 34 int atm0/0/0 0 34
Switch(config-if)# end
Switch#
```

Step 6 Verify the setup of PVC 3. Enter this command on the LightStream 1010 ATM switch:

```
Switch# show atm vc interface atm0/0/3

Interface    VPI     VCI     Type   X-Interface  X-VPI   X-VCI   Status
ATM0/0/3     0       5        PVC     ATM2/0/0     0       41      UP
ATM0/0/3     0       16       PVC     ATM2/0/0     0       42      UP
ATM0/0/3     0       18       PVC     ATM2/0/0     0       43      UP
ATM0/0/3     0       34       PVC     ATM0/0/0     0       34      UP
Switch#
```

Step 7 Create PVC 4 within the ATM cloud. Enter these commands on the LightStream 1010 ATM switch:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface atm0/0/1
Switch(config-if)# atm pvc 0 35 interface atm0/0/3 0 35
Switch(config-if)# end
Switch#
```

Step 8 Verify the setup of PVC 4. Enter this command on the LightStream 1010 ATM switch:

```
Switch# show atm vc interface atm0/0/1

Interface    VPI     VCI     Type   X-Interface  X-VPI   X-VCI   Status
ATM0/0/1     0       5        PVC     ATM2/0/0     0       35      UP
ATM0/0/1     0       16       PVC     ATM2/0/0     0       36      UP
ATM0/0/1     0       18       PVC     ATM2/0/0     0       37      UP
ATM0/0/1     0       33       PVC     ATM0/0/2     0       33      UP
ATM0/0/1     0       35       PVC     ATM0/0/3     0       35      UP
Switch#
```

Set up the PVCs on the Catalyst 5000 family Switch 1.

Step 9 At the console of the Catalyst 5000 family Switch 1, session to the ATM module in slot 2 by entering these commands:

```
Console> enable
Enter password:
Console> (enable) session 2
Trying ATM-2...
Connected to ATM-2.
Escape character is '^]'.
ATM>
```

Step 10 Configure PVCs 1, 2, 3, and 4 on Switch 1 by entering these commands:

```
ATM> enable
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm pvc 1 0 32 aal5snap 45000
ATM(config-if)# atm ds3-scramble
ATM(config-if)# atm lbo long
ATM(config-if)# atm framing m23adm
ATM(config-if)# atm clock internal
ATM(config-if)# atm pvc 2 0 33 aal5snap 45000
ATM(config-if)# atm pvc 3 0 34 aal5snap 45000
ATM(config-if)# atm pvc 4 0 35 aal5snap 45000
ATM(config-if)# end
ATM#
```

You can perform all PVC-related configurations for all VLANs on atm0, the major interface, because the subinterface number has no significance for PVC-supported VLANs. VCDs 10 and 11 (used above) can be any unused VCDs. Enter the **show atm vc** command to find unused VCDs.

Step 11 Bind the PVCs to VLAN 5 on the Switch 1 by entering these commands:

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm bind pvc vlan 1 5
ATM(config-if)# atm bind pvc vlan 2 5
ATM(config-if)# atm bind pvc vlan 3 5
ATM(config-if)# atm bind pvc vlan 4 5
ATM(config-if)# end
ATM#
```

Enter the VCD numbers used in Step 8. The last option in the **atm bind pvc** command specifies VLAN 5.

Step 12 Verify the setup on the Switch 1 by entering these commands:

```
ATM# show atm vlan
VCD   VLAN-ID
  1   5
  2   5
  3   5
  4   5
ATM#
ATM# show atm vc
                                        AAL /         Peak   Avg.  Burst
Interface     VCD   VPI   VCI Type  Encapsulation  Kbps   Kbps  Cells Status
ATM0            1     0     32   PVC   AAL5-SNAP      45000    0      0   ACTIVE
ATM0            2     0     33   PVC   AAL5-SNAP      45000    0      0   ACTIVE
ATM0            3     0     34   PVC   AAL5-SNAP      45000    0      0   ACTIVE
ATM0            4     0     35   PVC   AAL5-SNAP      45000    0      0   ACTIVE
ATM#
```

Step 13 Save the configuration as follows:

```
ATM# write memory
Building configuration...
[OK]
ATM#
```

Set up the PVCs on the Catalyst 5000 family Switch 2.

Step 14 At the console of the Catalyst 5000 family Switch 2, session to the ATM module in slot 2 by entering these commands:

```
Console> enable
Enter password:
Console> (enable) set vlan 5
Console> (enable) session 2
Trying ATM-2...
Connected to ATM-2.
Escape character is '^]'.
ATM>
```

Step 15 Configure PVCs 1, 2, 3, and 4 on Switch 2 by entering these commands:

```
ATM> enable
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm pvc 1 0 32 aal5snap 45000
ATM(config-if)# atm ds3-scramble
ATM(config-if)# atm lbo long
ATM(config-if)# atm framing m23adm
ATM(config-if)# atm clock internal
ATM(config-if)# atm pvc 2 0 33 aal5snap 45000
ATM(config-if)# atm pvc 3 0 34 aal5snap 45000
ATM(config-if)# atm pvc 4 0 35 aal5snap 45000
ATM(config-if)# end
ATM#
```

You can perform all PVC-related configurations for all VLANs on atm0, the major interface, because the subinterface number has no significance for PVC-supported VLANs. VCDs 10 and 11 (used above) can be any unused VCDs. Enter the **show atm vc** command to find unused VCDs.

Step 16 Bind the PVCs to VLAN 5 on the Catalyst 5000 family Switch 2 by entering these commands:

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)# interface atm0
ATM(config-if)# atm bind pvc vlan 1 5
ATM(config-if)# atm bind pvc vlan 2 5
ATM(config-if)# atm bind pvc vlan 3 5
ATM(config-if)# atm bind pvc vlan 4 5
ATM(config-if)# end
ATM#
```

Step 17 Verify the setup on the Catalyst 5000 family Switch 2 by entering these commands:

```
ATM# show atm vlan
VCD     VLAN-ID
  1     5
  2     5
  3     5
  4     5
ATM#
ATM# show atm vc
                                        AAL /          Peak   Avg.  Burst
Interface     VCD   VPI   VCI Type  Encapsulation  Kbps   Kbps  Cells Status
ATM0            1     0    32  PVC  AAL5-SNAP      45000    0     0  ACTIVE
ATM0            2     0    33  PVC  AAL5-SNAP      45000    0     0  ACTIVE
ATM0            3     0    34  PVC  AAL5-SNAP      45000    0     0  ACTIVE
ATM0            4     0    35  PVC  AAL5-SNAP      45000    0     0  ACTIVE
ATM#
```

Step 18 Save the configuration as follows:

```
ATM# write memory
Building configuration...
[OK]
ATM#
```

CHAPTER 5

Configuring Multiprotocol over ATM

This chapter describes how to configure Multiprotocol over ATM (MPOA) on the ATM modules for the Catalyst 5000 and 6000 family switches.

Note For information on installing the Catalyst 5000 family ATM modules, refer to the *Catalyst 5000 Family Module Installation Guide*. For information on installing Catalyst 6000 family ATM modules, refer to the *Catalyst 6000 Family Module Installation Guide*.

Note For syntax and usage information for the commands used in this chapter, see Chapter 7, "Command Reference."

This chapter consists of these sections:

Understanding How MPOA Works

These sections describe how MPOA works:

MPOA Overview

MPOA enables the fast routing of internetwork-layer packets across a nonbroadcast, multiaccess (NBMA) network. MPOA replaces multihop routing with point-to-point routing using a direct virtual channel connection (VCC) between ingress and egress edge devices or hosts. An ingress edge device or host is the point at which an inbound flow enters the MPOA system; an egress edge device or host is the point at which an outbound flow exits the MPOA system.

These components are required for using MPOA across an NBMA network:

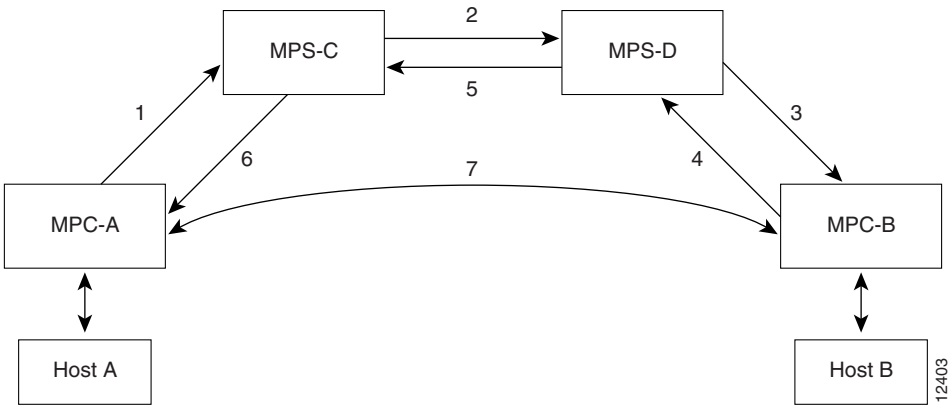
- MPOA Client (MPC)
- MPOA Server (MPS)
- Catalyst 5000 or 6000 family ATM module
- LAN Emulation (LANE)
- Next Hop Resolution Protocol (NHRP)

MPOA combines the benefits of LANE and NHRP to provide an efficient transfer of intersubnet unicast data in a LANE environment. The LANE protocol allows subnets to be bridged across the ATM/LAN boundary and provides interoperability between Ethernet and Token Ring architecture using ELANs. In this situation, LANE provides an effective means of bridging intrasubnet data across an ATM network. Intersubnet traffic between ELAN hosts, however, still needs to be routed. To minimize the hop count for intersubnet traffic over an ATM network, NHRP divides the ATM network into logical IP subnets. Although routers are still required to connect these subnets, NHRP allows intermediate routers to be bypassed by providing an extended address resolution protocol that permits Next Hop Clients (NHCs) to send queries directly between subnets. By integrating LANE and NHRP, MPOA extends the benefits of LANE by allowing intrasubnet communication over ATM VCCs without requiring routers in the data path.

Using NHRP's extended address resolution protocol, MPOA increases performance and reduces latencies by identifying the edge devices, establishing a direct VCC between the ingress and egress edge devices, and forwarding Layer-3 packets directly over this shortcut VCC, which bypasses the intermediate routers. An MPC provides the direct VCCs between the edge devices or hosts whenever possible and forwards Layer-3 packets over these shortcut VCCs. To establish shortcuts, MPCs communicate with MPSs resident on routers. The MPSs interact with their local Next Hop Servers (NHSs), which form part of the MPSs, to initiate and answer resolution requests. When an MPS receives updates from its NHS, it updates or purges relevant MPC caches as appropriate.

Figure 5-1 shows the MPOA message flow sequence between MPCs and MPSs (see Table 5-1 for definitions of the MPOA terms used in Figure 5-1).

Figure 5-1 MPOA Message Flow between MPCs and MPSs



The MPOA message flow sequence occurs as follows:

1. MPOA resolution request sent from MPC-A to MPS-C
2. NHRP resolution request sent from MPS-C to MPS-D
3. MPOA cache-imposition request sent from MPS-D to MPC-B
4. MPOA cache-imposition reply sent from MPC-B to MPS-D
5. NHRP resolution reply sent from MPS-D to MPS-C
6. MPOA resolution reply sent from MPS-C to MPC-A
7. Shortcut VCC established

Table 5-1 MPOA Terminology

MPOA Term	Definition
MPOA resolution request	A request from an MPC to resolve a destination protocol address to an ATM address to establish a shortcut VCC to the egress device.
NHRP resolution request	An MPOA resolution request that has been converted to an NHRP resolution request.
MPOA cache-imposition request	A request from an egress MPS to an egress MPC providing the MAC rewrite information for a destination protocol address.
MPOA cache-imposition reply	A reply from an egress MPC acknowledging an MPOA cache-imposition request.
NHRP resolution reply	An NHRP resolution reply that will eventually be converted to an MPOA resolution reply.
MPOA resolution reply	A reply from the ingress MPS resolving a protocol address to an ATM address.
Shortcut VCC	The path between MPCs over which Layer-3 packets are sent.

Understanding How the MPC Works

The MPC functionality involves ingress/egress cache management, data-plane and control-plane virtual circuit connection (VCC) management, MPOA frame processing, and MPOA protocol and MPOA flow detection.

The MPC connects the Lan Emulation Clients (LECs) to higher internetworking layers. Each MPC can serve more than one LEC, but each LEC must be associated with only one MPC. Each MPC has its own MPC control ATM address, which may coincide with the ATM address of one of its member LECs. The MPC control ATM address is contained in MPOA Device Type TLV, and the MPC supplies each member LEC with this information. Each time a LEC sends out an LE_ARP response, it includes this MPC Device Type TLV, indicating the control ATM address of the MPC with which it is associated.

An MPC identifies packets sent to an MPOA-capable router over the NBMA network and, if possible, establishes a shortcut VCC to the egress MPC. The MPC routes these packets directly over this shortcut VCC, bypassing the intermediate routers and enabling the fast routing of internetwork-layer packets across an NBMA network. A Catalyst 5000 or 6000 family switch configured with an MPOA-capable ATM module can be designated as an MPC. The MPC is then configured directly on the ATM module.

Understanding How the MPS Works

The MPS supplies the forwarding information used by the MPCs. The MPS responds with the information after receiving a query from a client. To support the query and response functions, MPOA uses NHRP. The MPS on the router can also terminate shortcuts.

A Catalyst 5000 family switch configured with a Route Switch Module (RSM) and a Versatile Interface Processor 2 (VIP2) containing an ATM port adapter can function as an MPS. The MPS is configured on the RSM module, not the ATM module.

Typically, a router is designated as an MPS, but can also be designated as an MPC. Configuring an MPC on a router provides router-initiated and router-terminated shortcuts for non-NBMA networks. For this reason, in this publication *MPC* refers to a Catalyst 5000 or 6000 family switch, and *MPS* refers to a router or an RSM/VIP2 with an ATM port adapter in a Catalyst 5000 family switch.

The MPS software module implements the functionality of the MPS in compliance with the ATM Forum MPOA specification. These sections describe the functions of MPS:

- MPS-NHRP Routing Interaction, page 5-4
- Shortcut Domains, page 5-5

MPS-NHRP Routing Interaction

MPS has to interact with the NHRP module in the router to smoothly propagate MPOA/NHRP packets end to end. MPOA frames are identical to NHRP frames except for some minor modifications and extensions for MPOA.

This process explains the interaction between an MPS and NHRP:

1. The MPS converts MPOA resolution requests to NHRP requests and sends it either to the next hop MPS or to the NHS depending on the configuration. The MPS searches for the next hop routing information to determine the interface and sends the packet with correct encapsulation to an MPS or an NHS.
2. The NHS sends resolution requests to the MPS when the next hop is on a LANE cloud or when the NHS is unsure of the packet destination. The MPS may do further processing, such as prompt the NHS to terminate the request or throw away the packet.

3. The NHS sends resolution replies to the MPS when the next hop interface is LANE or when the replies terminate in the router.
4. The MPS sends an MPOA resolution reply to the MPC.

Shortcut Domains

Within a router, you can permit shortcuts between some groups of LECs and deny shortcuts between other groups. A network ID is associated with an MPS. By default, all the MPSs in a router get a network ID of 1.

If you want to segregate traffic, you can give MPSs different network IDs, preventing shortcuts between LECs served by different MPSs. You can configure MPS network IDs when you define an MPS database.

If a router has both MPS and NHRP configured, then the same network ID is required to facilitate requests, replies, and shortcuts across the MPS and NHRP. The interface-specific NHRP command (**ip nhrp network-id**) must be the same for an MPS; otherwise, you will have a disjointed network.

MPOA Traffic Flow

Figure 5-1 shows how MPOA messages flow from Host A to Host B. In this figure, an MPC (MPC-A) residing on a host or edge device detects a packet flow to a destination IP address (Host B) and sends an MPOA resolution request. An MPS (MPS-C) residing on a router converts the MPOA resolution request to an NHRP resolution request and passes it to the neighboring MPS/NHS (MPS-D) on the routed path. When the NHRP resolution request reaches the egress point, the MPS (MPS-D) on that router sends an MPOA cache-imposition request to MPC-B. MPC-B acknowledges the request with a cache-imposition reply and adds a tag that allows the originator of the MPOA resolution request to receive the ATM address of MPC-B. As a result, the shortcut VCC between the edge MPCs (MPC-A and MPC-B) is set up.

When traffic flows from Host A to Host B, MPC-A is the ingress MPC and MPC-B is the egress MPC. The ingress MPC contains a cache entry for Host B with the ATM address of the egress MPC. The ingress MPC switches packets destined to Host B on the shortcut VCC with the appropriate tag received in the MPOA resolution reply. Packets traversing through the shortcut VCC do not have any DLL headers. The egress MPC contains a cache entry that associates the IP address of Host B and the ATM address of the ingress MPC to a DLL header. When the egress MPC switches an IP packet through a shortcut path to Host B, it appears to have come from the egress router.

MPOA Interaction with LANE

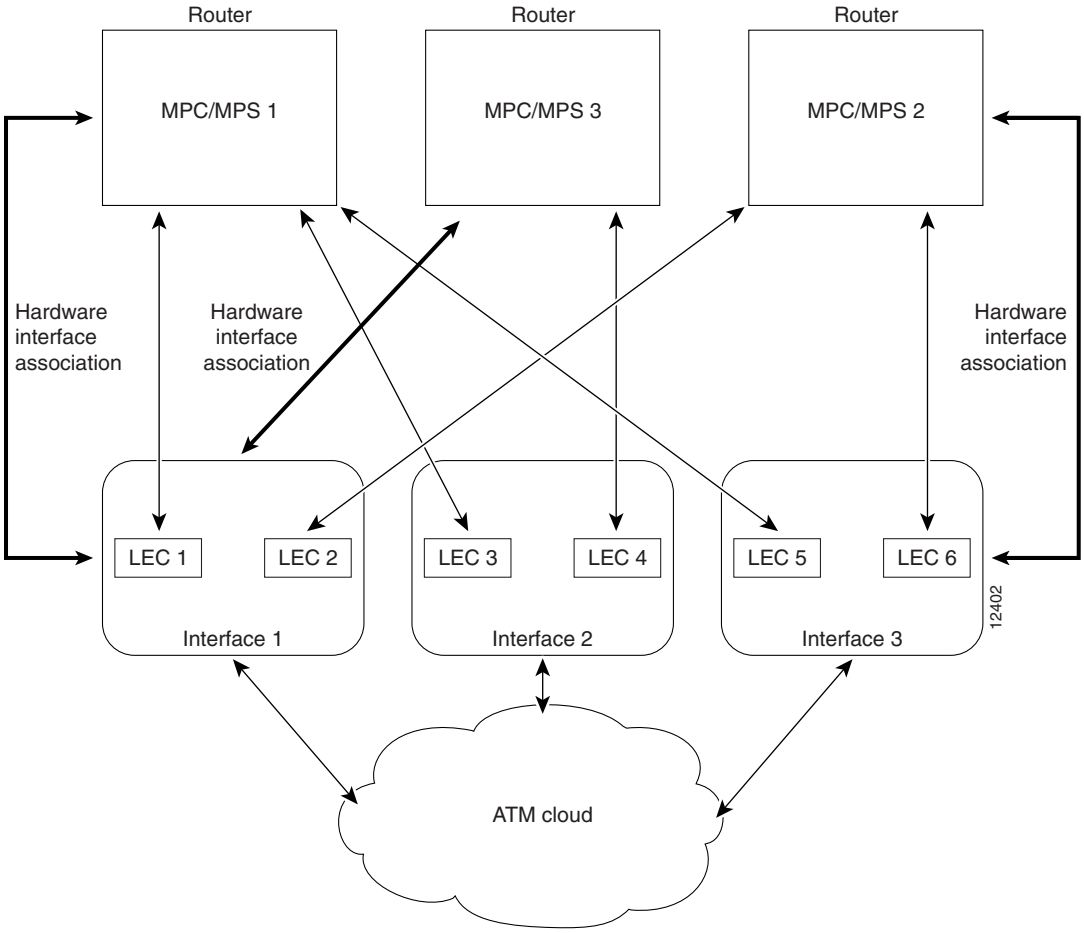
An MPOA network must have at least one MPS, one or more MPCs, and optional intermediate routers implementing NHRP servers. The MPSs and MPCs use LANE control frames to discover one another in the LANE network.

Caution For MPOA to work properly, you must first create an emulated LAN (ELAN) identifier for each ELAN. Use the **lane config database** or the **lane server-bus** ATM LANE commands to create ELAN identifiers. These commands are described in Chapter 7, "Command Reference."

An MPC and MPS can serve one or more LECs. The LEC can be associated with any MPC and MPS in the router or with an MPC in a Catalyst 5000 or 6000 family ATM module. A LEC can be attached to only one MPC or one MPS at a time.

Figure 5-2 shows the relationships between MPC/MPS and LECs.

Figure 5-2 MPC LEC and MPS LEC Relationships



MPOA Configuration Guidelines

These guidelines apply when configuring MPOA on the Catalyst 5000 and 6000 family switches:

- Multiple MPCs or MPSs can run on the same physical interface, each corresponding to a different control ATM address. After an MPC is attached to a single interface for its control traffic, it cannot be attached to another interface unless you break the first attachment. The MPC or MPS is attached to subinterface 0 of the interface.

Note An MPC or MPS can be attached to a single hardware interface only.

- More than one MPC or MPS can be attached to the same interface. Any LEC running on any subinterface of a hardware interface can be bound to any MPC or MPS. However, after a LEC is bound to a particular MPC, it cannot be bound to another MPC.

Note After a LEC is bound to an MPC or MPS, you must unbind the LEC from the first MPC or MPS before binding it to another MPC or MPS. Typically, you do not need to configure more than one MPS in a router.

- You must ensure that the physical interface to which an MPC or MPS is attached is on the same subnet as all the LECs you want to bind to it.

Note If any LEC resides on a different (unreachable) ATM network from the one to which the hardware interface is connected, MPOA does not operate properly.

Configuring the MPC

This section contains the following information about how you can configure, monitor, and maintain the MPC:

To obtain the MPC operational parameters, use one of the following methods:

- The MPC default parameters from the ATM Forum MPOA specification load automatically as soon as the MPC is named.
- The MPC queries the LECS for configuration parameters. These parameters override the default values.
- CLI commands can be used to change default parameters or parameter settings retrieved from the LECS. After you configure any or all operational parameters using the CLI commands, they override the parameters obtained using either of the above two methods.

For additional configuration information, refer to the *Release Notes for RSM, Cisco 4500, 4700, 7200, and 7500 Routers for Cisco IOS Release 11.3(3a)WA4(5)* publication.

Configuring the ELAN ID

For MPOA to work properly, LECs and MPCs must have the same ELAN IDs. When a LEC wants to communicate across the ATM cloud using MPOA, it must belong to an ELAN that has a defined ELAN ID. The MPC representing this LEC must also have the same ELAN ID. Typically, the ELAN ID is obtained by the LEC from the LECS database during registration. However, because it is possible to manually provide a LEC with the LES ATM address, the LEC may not receive the ELAN ID. In that case, you must provide the LEC with the ELAN ID manually.

Note If the LEC and the MPC representing the LEC do not share the same ELAN ID, the LEC is not reachable through the MPOA system.

To manually define an ELAN ID, perform this task:

	Task	Command
Step 1	Define an ELAN ID for the LEC (in LANE database configuration mode).	**name** *elan-name* **elan-id** *id*
Step 2	Configure the LEC with the ELAN ID (in interface configuration mode).	**lane server-bus ethernet** *elan-name* [**elan-id** *id*]

Caution If an ELAN ID is supplied, make sure both commands use the same **elan-id** value.

Configuring the MPC

To configure an MPC on a Catalyst 5000 or 6000 family ATM module, you must establish connection with the ATM module, enter privileged mode, and then enter configuration mode. For information on performing these tasks, see the "ATM Module CLI Overview" section on page 2-1.

To configure an MPC on your network, perform this task in the appropriate configuration modes:

	Task	Command
Step 1	In global configuration mode, define an MPC with a specified name.	**mpoa client config name** *mpc-name*
Step 2	In interface configuration mode, specify the physical ATM interface which the MPC is to be associated with.	**interface atm0** {*mod_num/port_num*}
Step 3	In interface configuration mode, attach an MPC to the ATM interface.	**mpoa client name** *mpc-name*
Step 4	In interface configuration mode, specify the ATM interface that contains the LEC to which you will bind the MPC.	**interface** *atm_num.sub_interface_num* **mul**
Step 5	In interface configuration mode, bind a LANE client to the specified MPC.	**lane client mpoa client name** *mpc-name*
Step 6	Repeat Steps 4 and 5 for every LEC to be served by the MPC/MPS.	

Note In Step 2, you must specify the physical interface, **atm0**, for the MPC.

Note In Step 4, you must specify the **mul** keyword when entering a subinterface number. Otherwise, the CLI does not accept the command.

This example configures an MPC named MPC1 and attaches it to a LEC configured on interface atm0.2. The **show mpoa client** command verifies the configuration.

```
ATM#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#mpoa client config name MPC1
ATM(config)#interface atm0
ATM(config-if)#mpoa client name MPC1
ATM(config-if)#interface atm0.2 mul
ATM(config-subif)#lane client mpoa client name MPC1
ATM(config-subif)#^Z
ATM#show mpoa client

MPC Name: MPC1, Interface: ATM0, State: Up
MPC actual operating address: 47.00918100000000E04FACB401.00E04FACB095.00
Shortcut-Setup Count: 10, Shortcut-Setup Time: 1
Lane clients bound to MPC MPC1: ATM0.2
ATM#
```

Monitoring and Maintaining the MPC

To monitor and maintain the configuration of an MPC, perform any of these tasks in EXEC mode:

Task	Command
• Display information about a specified MPC or all MPCs.	**show mpoa client** [**name** *mpc-name*]
• Display ingress and egress cache entries associated with an MPC.	**show mpoa client** [**name** *mpc-name*] **cache** [**ingress** | **egress**] [**ip-addr** *ip-addr*]
• Display all the statistics collected by an MPC.	**show mpoa client** [**name** *mpc-name*] **statistics**
• Clear cache entries.	**clear mpoa client** [**name** *mpc-name*] **cache** [**ingress** | **egress**] [**ip-addr** *ip-addr*]
• Display all the MPOA devices that this MPC has learned.	**show mpoa client** [**name** *mpc-name*] [*remote_device*]

Configuring the MPS

Note Currently, the Catalyst 6000 family switches do not support the MPS function.

If you are using a Catalyst 5000 family switch with a Route Switch Module (RSM) and a VIP2 containing an ATM port adapter, you can configure the MPS to run on the switch. To configure the MPS, you will need to session into the RSM and perform all configurations from that module.

To configure an MPS on your network, perform the tasks in the following sections. Only the first task is required; the remaining two tasks are optional.

- Configuring the MPS, page 5-10
- Configuring MPS Variables, page 5-11
- Monitoring and Maintaining the MPS, page 5-12

Caution For LECs to reach each other through an MPC and an MPS, all components must have the same ELAN ID. If you configure the ELAN IDs manually, make sure they are identical. See the "Configuring the ELAN ID" section on page 5-7 for information on how to configure the ELAN ID.

Configuring the MPS

To configure an MPS, session in to the RSM and perform these tasks:

	Task	Command
Step 1	In global configuration mode, define an MPS with the specified name.	**mpoa server config name** *mps-name*
Step 2	Specify the ATM interface to attach the MPS.	**interface atm** {*slot/port* | *number*}
Step 3	In interface configuration mode, attach the MPS to the ATM interface.	**mpoa server name** *mps-name*
Step 4	Specify the ATM interface to bind the MPS to a LEC.	**interface atm** {*slot/port.subinterface-number* | *number.subinterface-number*}
Step 5	In subinterface configuration mode, bind a LANE client to the specified MPS.	**lane client mpoa server name** *mps-name*

This example configures an MPS named MPS-1 and binds it to a LEC configured on interface atm3/0:

```
RSM-ER-F1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
RSM-ER-F1#(config)#mpoa server config name MPS-1
RSM-ER-F1#(mpoa-server-config)#interface atm3/0
RSM-ER-F1#(config-if)#mpoa server name MPS-1
RSM-ER-F1#(config-if)#interface atm3/0
RSM-ER-F1#(config-if)#lane client mpoa server name MPS-1
```

Configuring MPS Variables

You must define an MPS with a specified name before you can change the MPS variables that are specific to that MPS.

To change MPS variables specific only to a particular MPS, perform this task starting in MPS configuration mode:

	Task	Command
Step 1	Define an MPS with the specified name.	**mpoa server config name** *mps-name*
Step 2	(Optional) Specify the control ATM address that the MPS should use (when it is associated with a hardware interface).	**atm-address** *atm-address*
Step 3	(Optional) Specify the network ID of the MPS.	**network-id** *id*
Step 4	(Optional) Specify the keepalive time value variable of the MPS.	**keepalive-time** *time*
Step 5	(Optional) Specify the holding time value variable of the MPS.	**holding-time** *time*

This example configures MPS variables and verifies the configuration:

```
RSM-ER-F1#(config)#mpoa server config name MPS-1
RSM-ER-F1#(mpoa-server-config)#atm-address 47.00318100000000100826E901.0020D1AA1P58.01
RSM-ER-F1#(mpoa-server-config)#network-id 3
RSM-ER-F1#(mpoa-server-config)#keepalive-time  10
RSM-ER-F1#(mpoa-server-config)#holding-time 600
RSM-ER-F1#(config)#^Z
RSM-ER-F1#show mpoa server name MPS-1

MPS Name: MPS-1, MPS id: 1, Interface: ATM3/0, State: up
network-id: 3, Keepalive: 10 secs, Holding time: 600 secs
Keepalive lifetime: 35 secs, Giveup time: 40 secs
MPS actual operating address: 47.00318100000000100826E901.0020D1AA1P58.01
Lane clients bound to MPS MPS-1: ATM3/0 ATM3/0.101 ATM3/0.102
Discovered neighbours:
MPS 47.009171000000000200126PC01.00E0FEA3B451.00 vcds: 81(L,A)
MPC 47.009171000000000200726E901.00800726E592.00 vcds: 12(L,A)
MPC 47.009171000000000200726BC01.00700726B855.00 vcds: 91(L,A)
RSM-ER-F1#
```

Monitoring and Maintaining the MPS

To monitor and maintain the configuration of an MPS, perform one of these tasks in EXEC mode:

Task	Command
• Display default ATM addresses for an MPS.	**show mpoa default-atm-addresses**
• Display information about a specified server or all servers depending on the specified name of the required server.	**show mpoa server** [**name** *mps-name*]
• Display ingress and egress cache entries associated with a server.	**show mpoa server** [**name** *mps-name*] **cache** [**ingress** | **egress**] [**ip-address** *ip-address*]
• Display all the statistics collected by a server including the ingress and egress cache entry creations, deletions, and failures.	**show mpoa server** [**name** *mps-name*] **statistics**
• Clear cache entries.	**clear mpoa server** [**name** *mps-name*] **cache** [**ingress** | **egress**] [**ip-addr** *ip-addr*]
• Originate an MPOA trigger for the specified IP address to the specified client. If a client is not specified, the MPOA is triggered to all the clients.	**mpoa server name** *mps-name* **trigger ip-address** *ip-address* [**mpc-address** *mpc-address*]

CHAPTER 6

Configuring the ATM Fabric Integration Module

This chapter describes how to configure the ATM fabric integration module. The ATM fabric integration module is supported on the Catalyst 5500 series switches only.

Note For information on installing the Catalyst 5000 family ATM fabric integration module, refer to the *Catalyst 5000 Family Module Installation Guide*.

Note For syntax and usage information for the commands used in this chapter, refer to the *Command Reference* publication for your switch.

This chapter consists of these sections:

Understanding How ATM Fabric Integration Works

The ATM fabric integration module seamlessly integrates the switching fabrics of a Catalyst 5500 series switch and a LightStream 1010 ATM switch installed in the bottom slots of the Catalyst 5500 chassis.

The module consists of one external LightStream 1010 OC-12 ATM interface and one internal interface to the LightStream 1010 switching backplane. The external OC-12 ATM interface operates exactly as any OC-12 interface on a LightStream 1010 port adapter and is configured from the LightStream 1010 command-line interface.

Communication between the Catalyst 5500 series switch backplane and the LightStream 1010 ATM switch backplane occurs across the internal interface. You must configure the interface from both the ATM module CLI and the LightStream 1010 CLI.

ATM Fabric Integration Hardware and Software Restrictions

These guidelines apply when using the ATM fabric integration module:

- You must use Catalyst 5000 family supervisor engine software release 4.3(1) or later on the Catalyst 5500 series switch.
- You must use Catalyst 5000 family ATM software release 11.3(5)WA4(8a) or later on the ATM fabric integration module.
- A LightStream 1010 ATM Switch Processor running LightStream 1010 software release 12.0(1)WA5(5) or later must be installed in slot 13 of the Catalyst 5500 switch. If no ATM Switch Processor is installed, the fabric integration module will not function.
- You must install the ATM fabric integration module in slots 9–12 of the Catalyst 5500 series switch.

Default ATM Fabric Integration Configuration

The external ATM interface of the fabric integration module has the same default configuration as any LightStream 1010 OC-12 ATM interface. For information on the OC-12 ATM interface default configuration, refer to the *LightStream 1010 ATM Switch Configuration Guide* publication.

Table 6-1 shows the ATM fabric integration module internal interface default configuration on the Catalyst 5500 side.

Table 6-1 ATM Fabric Integration Module Internal Interface Default Configuration (Catalyst 5500 Side)

Feature	Default Value
LANE enable state	LANE is disabled
PVCs	ILMI and signaling PVCs are set up

Table 6-2 shows the ATM fabric integration module internal interface default configuration on the LightStream 1010 side.

Table 6-2 ATM Fabric Integration Module Internal Interface Default Configuration (LightStream 1010 Side)

Feature	Default Setting
ATM interface type	UNI
UNI version	3.0
Maximum VPI bits	8
Maximum VCI bits	14
ATM interface side	Network
ATM UNI type	Private
Framing	STS-3C
Clock source	Network-derived

Table 6-2 ATM Fabric Integration Module Internal Interface Default Configuration (LightStream 1010 Side) (continued)

Feature	Default Setting
Synchronous Transfer Signal (STS) stream scrambling	On
Cell payload scrambling	On

Configuring the ATM Fabric Integration Module

These sections describe how to configure the ATM fabric integration module:

Configuring the External OC-12 ATM Interface

You configure the external OC-12 interface on the ATM fabric integration module from the LightStream 1010 CLI. The following example shows how to configure the external interface as a network node interface (NNI), but the external interface on the ATM fabric integration module supports all the network connections configurable on a LightStream 1010.

Note For information on configuring ATM interfaces, refer to the *LightStream 1010 ATM Switch Configuration Guide*.

To configure the external OC-12 interface on the ATM fabric integration module, perform these tasks from the LightStream 1010 CLI:

	Task	Command
Step 1	Enter configuration mode.	**configure terminal**
Step 2	Select the ATM interface.	**interface atm** *card/subcard/port*
Step 3	Disable atm auto-configuration.	**no atm auto-configuration**
Step 4	Configure the interface.	**atm nni | uni | pvc**
Step 5	Exit configuration mode.	**Ctrl-Z**

This example configures the external interface as a network node interface and displays the configuration:

```
ls1010-3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ls1010-3(config)#interface atm9/1/0
ls1010-3(config-if)#no atm auto-config
ls1010-3(config-if)#atm nni
ls1010-3(config-if)#^Z
ls1010-3#show atm interface atm9/1/0
Interface:      ATM9/1/0        Port-type:      oc12suni
IF Status:      DOWN            Admin Status:   down
Auto-config:    disabled        AutoCfgState:   not applicable
IF-Side:        Network         IF-type:        NNI
Uni-type:       not applicable  Uni-version:    not applicable
Max-VPI-bits:   8               Max-VCI-bits:   14
Max-VP:         255             Max-VC:         16383
ConfMaxSvpcVpi: 255             CurrMaxSvpcVpi: 255
ConfMaxSvccVpi: 255             CurrMaxSvccVpi: 255
ConfMinSvccVci: 35              CurrMinSvccVci: 35
Svc Upc Intent: pass            Signalling:     Enabled
ATM Address for Soft VC: 47.0091.8100.0000.0050.0b87.b401.4000.0c84.9000.00


Configured virtual links:
PVCLs SoftVCLs   SVCLs   TVCLs   PVPLs SoftVPLs   SVPLs Total-Cfgd Inst-Conns
      4        0       0       0       0        0       0          4          0
Logical ports(VP-tunnels):     0
Input cells:    0               Output cells:   0
5 minute input rate:             0 bits/sec,       0 cells/sec
5 minute output rate:            0 bits/sec,       0 cells/sec
Input AAL5 pkts: 0, Output AAL5 pkts: 0, AAL5 crc errors: 0
```

Configuring the Internal ATM Port from the ATM Module CLI

On the Catalyst 5500 switch side, the internal interface functions similarly to the ATM ports on the Catalyst 5000 family ATM OC-3 LANE/MPOA modules. However, there is no PHY on the internal bridge port.

You can configure the internal ATM interface (interface ATM0) exactly as you configure any ATM interface on the Catalyst 5000 family LANE/MPOA modules. For information on configuring the ATM interface, see the following sections:

- For information on configuring ATM LANE, see Chapter 3, “Configuring ATM LAN Emulation.”
- For information on configuring MPOA, see the “Configuring the MPC” section on page 5-7 and the “Configuring the MPS” section on page 5-9.

The following commands are not available on the ATM fabric integration module:

- **set clock**
- **set sonet mode**

In addition, the **show controller** command output does not show PHY error counters for the internal ATM port.

Configuring the Internal ATM Interface from the LightStream 1010 CLI

On the LightStream 1010 side, the internal interface functions similarly to an OC-3 ATM interface on a LightStream 1010 ATM port adapter. However, there is no PHY on the internal bridge interface.

You can configure the internal ATM interface exactly as you configure any OC-3 ATM interface on a LightStream 1010 PAM. For information on configuring the LightStream 1010 ATM interface, refer to the *LightStream 1010 ATM Switch Configuration Guide* publication.

PART 2

Command Reference

CHAPTER 7

Command Reference

This chapter contains an alphabetical reference for all ATM commands available on the Catalyst 5000 and 6000 family switches.

atm-address

Use the **atm-address** command to override the control ATM address. To revert to the default value, use the **no** form of this command.

[**no**] **atm-address** *atm-address* [**ubr+ pcr** *value* **mcr** *value*]

Syntax Description

atm-address	Control ATM address.
ubr+	Keyword to specify an unavailable bit rate+ VCC.
pcr	Peak cell rate; value is specified in kpbs.
mcr	Minimum cell rate; value is specified in kpbs.

Defaults

The default is an autogenerated ATM address.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

This command specifies the control ATM address used when it is associated with a hardware interface. The **ubr+ pcr** *value* **mcr** *value* optional command arguments are used to set a CoS to QoS mapping on a specific interface.

Examples

The following example specifies the ATM address:

```
ATM(config-if)#atm-address 47.009181000000061705C2B01.00E034553024.00
ATM(config-if)#
```

The following example shows how to enter CoS to QoS mappings using PCR and MCR values on a specific ATM address. This command is entered from the lane qos database configuration mode.

```
ATM(lane-qos)# atm-address 47.009181000000061705B0C01.00E0B0951A40.0A cos 7 pcr 500000 mcr 100000
ATM(config-qos)#
```

Related Commands

show atm interface atm0
lane client qos
lane qos database

atm bind pvc vlan

Use the **atm bind pvc vlan** command to bind a PVC to a specified VLAN.

[**no**] **atm bind pvc vlan** *vcd vlan_num*

Syntax Description

vcd	Virtual circuit descriptor; a unique number for each switch that identifies which VPI/VCI to use for a particular packet.
vlan_num	Number of the VLAN.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

You can bind any number of PVCs to the same VLAN. To prevent loops, each PVC must uniquely connect a VLAN group between two Catalyst 5000 family and 2926G series switches.

Examples

This example shows how to bind PVC 10 to VLAN 5 and PVC 11 to VLAN 5:

```
ATM(config-if)#atm bind pvc vlan 10 5
ATM(config-if)#atm bind pvc vlan 11 5
```

Related Commands

show atm vc

atm clock internal

Use the **atm clock internal** command to cause the ATM module on the Catalyst 5000 family and 2926G series switches to generate the transmit clock from its internal source. Enter the **no** form of this command to set the clock generation mode to receive timing from an external source.

[**no**] **atm clock internal**

Syntax Description

This command has no arguments or keywords.

Defaults

The ATM module generates the transmit clock signal from its internal source. The default is loop-timed clock mode for the ATM dual PHY OC-3 modules (WS-X5167 and WS-X5168).

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

The **atm clock internal** and the **no atm clock internal** commands are not supported by the ATM dual PHY OC-12 module.

Examples

This example shows how to set the ATM module to generate the transmit clock from its internal source:

```
ATM(config-if)#atm clock internal
ATM(config-if)#
```

This example shows how to set the ATM module to generate the transmit clock from an external source:

```
ATM(config-if)#no atm clock internal
ATM(config-if)#
```

atm ds3-scramble

Use the **atm ds3-scramble** command to enable scrambling on the current port. Enter the **no** form of this command to disable scrambling.

Note All devices speaking to each other must have the same scramble setting (on or off) to be able to communicate.

[**no**] **atm ds3-scramble**

Syntax Description

This command has no arguments or keywords.

Defaults

The default is scrambling not enabled.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

Because ATM network equipment can exhibit sensitivity to certain bit patterns, scrambling is used to randomize such patterns to guarantee cell synchronization. This command applies to DS3 interfaces only.

Examples

This example shows how to enable scrambling:

```
ATM(config)#interface atm0
ATM(config-if)#atm ds3-scramble
ATM(config-if)#
```

atm framing

Use the **atm framing** command to change the default DS3 line framing from C-bit with ATM direct mapping (ADM) to one of the following:

- M23 ADM
- M23 PLCP
- C-bit PLCP

Enter the **no** form of this command to use the default value.

[**no**] **atm framing** [**m23adm** | **cbitplcp** | **m23plcp**]

Syntax Description

m23adm	(Optional) Keyword to specify M23 ADM.
cbitplcp	(Optional) Keyword to specify C-bit with PLCP framing.
m23plcp	(Optional) Keyword to specify M23 with PLCP framing.

Defaults

The default value is C-bit with ADM.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

This command is not available to the OC-3 ATM module.

The **atm framing** command applies to DS3 interfaces only.

This command allows you to set the DS3 framing mode to either M23 ADM, M23 PLCP, C-bit PLCP, or C-bit ADM (default value).

Examples

This example shows how to select m23adm frame as the frame type:

```
ATM(config-if)#atm framing m23adm
ATM(config-if)#
```

atm ilmi-enable

Use the **atm ilmi-enable** command to enable the ILMI on a port. To disable the ILMI, use the **no** form of this command.

[**no**] **atm ilmi-enable**

Syntax Description

This command has no arguments or keywords.

Defaults

The default is ILMI is enabled.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

The ILMI is enabled by default; however, if the peer does not support ILMI, you should turn off the ILMI using this command. When you use the **no** form of this command, the switch is disabled only after restart.

Examples

This example shows how to enable the ILMI:

```
ATM(config-if)#atm ilmi-enable
ATM(config-if)#
```

This example shows how to disable the ILMI:

```
ATM(config-if)#no atm ilmi-enable
ATM(config-if)#
```

Related Commands

show atm vc

atm ilmi-keepalive

Use the **atm ilmi-keepalive** command to enable ILMI keepalives. To disable ILMI keepalives, use the **no** form of this command.

[**no**] **atm ilmi-keepalive** *seconds*

Syntax Description

seconds	Number of seconds between keepalives.

Defaults

The default is 3 seconds. Values less than 3 seconds are rounded to 3 seconds. There is no upper boundary to the range of values.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to set the number of seconds between ILMI keepalives:

```
ATM(config-if)#atm ilmi-keepalive 5
ATM(config-if)#
```

Related Commands

show atm vc

atm lbo

Use the **atm lbo** command to set the line buildout corresponding to the cable length. This command is specific to DS3 and is not available in the OC-3 ATM module.

atm lbo {**short** | **long**}

Syntax Description

short	Keyword to set the line buildout (cable length) up to 255 feet (77.4 meters).
long	Keyword to set the line buildout (cable length) over 255 feet (77.4 meters).

Defaults

The default is **short**.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

The **atm lbo** command applies to DS3 interfaces only.

Examples

This example sets the line buildout (cable length) to over 255 feet (77.4 meters):

```
ATM(config-if)#atm lbo long
ATM(config-if)#
```

Related Commands

show atm vc

atm preferred phy

Use the **atm preferred phy** command to change the preferred PHY to the one not currently in use.

atm preferred phy {**A** | **B**}

Syntax Description

A	Keyword to indicate PHY A.
B	Keyword to indicate PHY B.

Defaults

The default is PHY A.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

Use this command only with the OC-12 dual PHY ATM module connected to the same or different switches.

Examples

This example shows how to specify PHY A as the preferred PHY:

```
ATM#configure terminal
Enter configuration commands, one per line.  End with Ctrl-Z.
ATM(config)#interface atm0
ATM(config-if)#atm preferred phy A
ATM(config-if)#
```

Related Commands

show lane default-atm-addresses

atm pvc

Use the **atm pvc** command to create a PVC on the Catalyst 5000 family and 2926G series switch interface. The **no** form of this command deletes the specified PVC.

[**no**] **atm pvc** *vcd vpi vci* [**aal5snap | ilmi | qsaal**]

Note The following version of the **atm pvc** command is available only in ATM software release 50.1(1) and later and 51.1(1) and later.

[**no**] **atm pvc** *vcd vpi vci* [**aal5snap | ilmi | qsaal**] [*peak_rate average_rate* [*burst_size*]] [**oam** *seconds*]

Note The following version of the **atm pvc** command is available only in ATM software release 11.3(6)WA4(9b) and later.

[**no**] **atm pvc aal5snap** *vcd vpi vci pcr scr mbs*

Syntax Description

vcd	Number of the VCD that identifies which VPI/VCI to use for a particular packet.
vpi	VPI for the PVC. The range of *vpi* is from 0 to 255.
vci	VCI for the PVC. The range is from 0 to 4096.
aal5snap	(Optional) Keyword to specify the use of AAL5 with LLC/SNAP encapsulation.
ilmi	(Optional) Keyword to specify the use of ILMI.
qsaal	(Optional) Keyword to specify signaling AAL.
peak_rate	(Optional) Maximum rate (in kbps) at which this virtual circuit can transmit. The range is from 0 to 155000. Available in ATM PVC traffic-shaping software release 50.1(1) and later. The maximum rate for *peak_rate* in ATM PVC traffic-shaping software release 51.1(1) and later is 45000 kbps. The maximum rate for *peak_rate* in ATM PVC traffic-shaping Release 11.3(6)WA4(9b) and later is 155000 kbps.
average_rate	(Optional) Average rate (in kbps) at which this virtual circuit can transmit. The range is from 0 to 1000. Available in ATM PVC traffic-shaping software release 50.1(1) and later and 51.1(1) and later.
burst_size	(Optional) Burst cell size in number of cells. Acceptable values are 0 to 1. Available in ATM PVC traffic-shaping software release 50.1(1) and later and 51.1(1) and later.
oam *seconds*	(Optional) Keyword that specifies how often to generate an OAM 5 loopback cell from this virtual circuit. Available in ATM PVC traffic-shaping software release 50.1(1) and later and 51.1(1) and later.
pcr[1]	(Peak cell rate) Maximum rate (in kbps) at which this virtual circuit can transmit. Valid values are 0 to 622000 for the ATM dual PHY OC-12 modules (WS-X5161 and WS-X5162) and the ATM fabric integration module (WS-X5165); 0 to 155,000 for the ATM dual PHY OC-3 modules (WS-X5167 and WS-X5168).

scr[2]	(Sustainable cell rate) Average rate (in kbps) at which this virtual circuit transmits. Valid values are 0 to 622000 for the ATM dual PHY OC-12 modules (WS-X5161 and WS-X5162) and the ATM fabric integration module (WS-X5165); 0 to 155,000 for the ATM dual PHY OC-3 modules (WS-X5167 and WS-X5168).
mbs	(Maximum burst size) Value that relates to the maximum number of ATM cells the virtual circuit (VC) can transmit to the network at the peak rate of the PVC. Valid values are 0 and 2 to 255.

1. The minimum *pcr* rate is 64 kbps. If you specify a *pcr* greater than 0 and less than 64 kbps, the rate specified to the SAR is 64 kbps.
2. The minimum *scr* rate is 64 kbps. If you specify an *scr* greater than 0 and less than 64 kbps, the rate specified to the SAR is 64 kbps.

Defaults

If you omit the *pcr* argument, the PVC defaults to the highest bandwidth rate queue available (622,000 kbps). By default, the VC is configured to run as fast as possible. If you omit the **oam** keyword, OAM cells are not generated. If you use the **oam** keyword without specifying *seconds*, the default value of 10 seconds is used.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

The **atm pvc** command creates a PVC and attaches it to the VPI and VCI specified. You cannot specify both *vpi* and *vci* as 0.

The VPI is an 8-bit field in the header of the ATM cell. The VPI value is unique only on a single interface, not throughout the ATM network.

The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single interface, not throughout the ATM network.

The allowed VPI and VCI ranges vary depending on the value specified by the **atm vc-per-vp** command. The **atm vc-per-vp** command sets the VCI bits, and the number of VCI bits set determines the allowable VPI range.

If you are configuring an SVC, you must use this command to configure the PVC that handles the SVC call setup and termination. In this case, specify the **qsaal** keyword.

The *peak_rate* argument determines the size of the rate queue used. ATM PVC traffic-shaping software release 50.1(1) and later and 51.1(1) and later create rate queues dynamically to satisfy the specifications of **atm pvc** commands. When an **atm pvc** command specifies a **peak** rate that does not match any use-configured rate queue, a rate queue is created dynamically.

The **oam** keyword causes the Catalyst 5000 family and 2926G series switch to generate and echo OAM F5 loopback cells to verify connectivity. After OAM cell generation is enabled, OAM cells are transmitted periodically. The remote end must respond by echoing back the cells.

The **atm pvc** command on the ATM dual PHY OC-12 modules (WS-X5161 and WS-X5162), the ATM dual PHY OC-3 modules (WS-X5167 and WS-X5168), and the ATM fabric integration module (WS-X5165) supports RFC 1483 Ethernet-bridged AAL5/SNAP encapsulation only.

For the ATM dual PHY OC-12 modules (WS-X5161 and WS-X5162) and the ATM dual PHY OC-3 modules (WS-X5167 and WS-X5168), and the ATM fabric integration module (WS-X5165) with ATM module Release 11.3(6)WA4(9b) and later, traffic shaping supports multiple traffic classes:

- Unspecified bit rate (UBR)

  When configuring a PVC, if you enter a zero value for PCR and SCR (or do not specify any value), the channel is opened with a service type of UBR (with a maximum line rate).

- Constant bit rate (CBR) or 1/PCR

  While configuring a PVC, if you enter a zero value for SCR and non-zero PCR, the channel is opened with a service type of CBR at 1/PCR.

  Note The maximum burst size (MBS) specified is not relevant for this case.

- Variable bit rate (VBR)

  While configuring a PVC, if you enter non-zero values for PCR and SCR, the channel is opened with a service type of VBR.

  Note The MBS should be a value between 2 and 255. If you specify an MBS of 1, the channel is opened as 1/PCR rate-shaped.

The **atm pvc** command creates a PVC and attaches it to the specified VPI and VCI. The *vpi* and *vci* values cannot both be specified as 0. For example, if *vpi* is 0, then *vci* cannot be 0, and conversely, if *vci* is 0, then *vpi* cannot be 0.

The *pcr*, *scr*, and *mbs* arguments are only supported on the ATM dual PHY OC-12 modules (WS-X5161 and WS-X5162), the ATM dual PHY OC-3 modules (WS-X5167 and WS-X5168), and the ATM fabric integration module (WS-X5165).

Maximum *pcr* values are 0 to 622,000 for the ATM dual PHY OC-12 modules (WS-X5161 and WS-X5162) and the ATM fabric integration module (WS-X5165); 0 to 155,000 for the ATM dual PHY OC-3 modules (WS-X5167 and WS-X5168).

The minimum *pcr* or *scr* is 64 kbps. If you specify a *pcr* or *scr* greater than 0 and less than 64 kbps, the rate specified to the SAR is 64 kbps.

Examples

This example shows how to create a PVC to be used for ATM signaling for an SVC, using VPI 0 and VCI 5:

```
ATM(config-if)#atm pvc 1 0 5 qsaal
ATM(config-if)#
```

This example shows how to create a PVC in ATM PVC traffic-shaping software release 50.1, specifying the peak and average rates and OAM cell generation:

```
ATM(config-if)#atm pvc 1 0 5 aal5snap 155000 1000 oam
ATM(config-if)#
```

This example shows how to create a PVC in ATM PVC traffic-shaping Release 11.3(6)WA4(9b), specifying the PCR, SCR, and MBS:

```
ATM(config-if)#atm pvc 0 34 interface atm0/0/0 0 34
ATM(config-if)#
```

Related Commands **atm vc-per-vp**
show atm vc

atmsig close

Use the **atmsig close** command to disconnect a particular SVC.

atmsig close atm0 *vcd*

Syntax Description

atm0	Keyword to specify the **atm0** interface number to close the SVC, because VCs are numbered per interface.
vcd	Virtual circuit descriptor of the SVC to close.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to close SVC 2 on the ATM module:

```
ATM#atmsig close atm0 2
ATM#
```

atm sonet

Use the **atm sonet** command to set the mode of operation and control type for cell-rate decoupling on the SONET PLIM. To revert to the default value, use the **no** form of this command.

[no] atm sonet {**stm-1** | **sts-3c**} {**stm-4** | **sts-12c**}

Syntax Description

stm-1	Keyword to specify synchronous transport module level 1 (STM-1) operation. Supported by the ATM dual PHY OC-3 modules.
sts-3c	Keyword to specify synchronous transport signal level 3, concatenated (STS-3c) operation. Supported by the ATM dual PHY OC-3 modules.
stm-4	Keyword to specify synchronous transport module level 4 (STM-4) operation. Supported by the ATM dual PHY OC-12 modules.
sts-12c	Keyword to specify synchronous transport signal level 12, concatenated (STS-12c) operation. Supported by the ATM dual PHY OC-12 modules.

Defaults

The default is STS-3c operation for the ATM dual PHY OC-3 modules and STS-12c operation for the ATM dual PHY OC-12 modules.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

This command applies only to the ATM dual PHY OC-3 and OC-12 modules.

The **no atm sonet** command is the same as the **atm sonet sts-3c** command for the ATM dual PHY OC-3 modules and the **atm sonet sts-12c** command for the ATM dual PHY OC-12 modules.

Examples

This example shows how to set the mode for cell-rate decoupling on the SONET PLIM to stm-1:

```
ATM (config-if)#atm sonet stm-1
ATM (config-if)#
```

atm traffic-shape rate

Use the **atm traffic-shape rate** command to configure output throttling on your Catalyst 5000 family and 2926G series switch ATM module. The **no** form of this command returns the output rate to the default.

[**no**] **atm traffic-shape rate** *1-155*

Syntax Description

1-155	Number between 1 and 155 indicating Mbps.

Defaults

The default is 155 Mbps.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

This command is not supported by the ATM dual PHY OC-12 module.

Examples

This example shows how to set the output throttle to 50:

```
ATM(config-if)#atm traffic-shape rate 50
ATM(config-if)#
```

atm uni-version

Use the **atm uni-version** command to specify the UNI version (3.0 or 3.1) the switch should use when ILMI link autodetermination is unsuccessful or ILMI is disabled. The **no** form of this command restores the version to the default.

[**no**] **atm uni-version** *version_num*

Syntax Description

version_num	UNI version for the interface. Valid values are 3.0 or 3.1.

Defaults

The default UNI version is 3.0.

Command Types

Cisco IOS ATM command.

Command Modes

Global configuration.

Examples

This example shows how to set the UNI version to 3.1:

```
ATM(config)#atm uni-version 3.1
ATM(config)#
```

atm vc-per-vp

Use the **atm vc-per-vp** command to set the maximum number of VCIs to support per VPI. The **no** form of this command restores the default value.

[**no**] **atm vc-per-vp** *num*

Syntax Description

num	Maximum number of VCIs to support per VPI. Valid values are 32, 64, 128, 256, 512, and 1024.

Defaults

The default is that the maximum number of VCIs to support per VPI is 1024.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

This command controls the memory allocation in the Catalyst 5000 family and 2926G series switches for the VCI table. It defines the maximum number of VCIs to support per VPI; it does not designate the VCI numbers. Use the **atm pvc** command to designate the VCI number.

An invalid VCI causes a warning message to display.

Examples

This example shows how to set the maximum number of VCIs to support per VPI to 512:

```
ATM(config-if)#atm vc-per-vp 512
ATM(config-if)#
```

clear mpoa client cache

Use the **clear mpoa client cache** command to clear the ingress and egress cache entries of one or all MPCs.

clear mpoa client [**name** *mpc-name*] **cache** [**ingress** | **egress**] [**ip-address** *ip-address*]

Syntax Description

name *mpc-name*	(Optional) Keyword to specify the name of the MPC with the specified name.
ingress	(Optional) Keyword to clear ingress cache entries associated with the MPC.
egress	(Optional) Keyword to clear egress cache entries associated with the MPC.
ip-address *ip-address*	(Optional) Keyword to clear matching cache entries with the specified IP address.

Defaults

The system defaults are:

- All MPC cache entries are cleared.
- Both caches are cleared.
- Entries matching only the specified destination IP address are cleared.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to clear the ingress and egress cache entries for the MPC named ip_mpc:

```
ATM#clear mpoa client name ip_mpc cache
ATM#
```

Related Commands

show mpoa client cache

client-atm-address name

Use the **client-atm-address name** command to add a LANE address entry to the configuration server's database. The **no** form of this command removes a client address entry from the table.

[**no**] **client-atm-address** *atm-address-template* **name** *elan-name*

Syntax Description

atm-address-template	Template that specifies an ATM address explicitly or a specific part of an ATM address and uses wildcard characters for other parts of the ATM address. Wildcard characters can replace any nibble or group of nibbles in the prefix, the ESI, or the selector fields of the ATM address.
name	Keyword to specify the name of the ELAN.
elan-name	Name of the ELAN; the maximum length of *elan-name* is 32 characters.

Defaults

The default is that no address and no ELAN name are configured.

Command Types

Cisco IOS ATM command.

Command Modes

Database configuration.

Usage Guidelines

This command binds to the specified ELAN any client whose address matches the specified template. When a client comes up, it consults the LANE configuration server, which responds with the ATM address of the LANE server for the ELAN. The client then initiates join procedures with the LANE server.

You must create the ELAN specified by the *elan-name* argument using the **name server-atm-address** command before you use the **client-atm-address** command.

If an existing entry in the configuration server's database binds the LANE client ATM address to a different ELAN, the new command is rejected.

This command affects only the bindings in the named configuration server database. It has no effect on the LANE components themselves.

A LANE ATM address has the same syntax as an NSAP but is not a network-level address:

- A 13-byte prefix that includes the following fields defined by the ATM Forum: AFI field (1 byte), DCC or ICD field (2 bytes), DFI field (1 byte), Administrative Authority field (3 bytes), Reserved field (2 bytes), Routing Domain field (2 bytes), and Area field (2 bytes).
- A 6-byte system identifier (ESI).
- A 1-byte selector field.

LANE ATM address templates can use two types of wildcards: an asterisk (*) to match any single character and an ellipsis (...) to match any number of leading or trailing characters.

In LANE, a prefix template matches the prefix explicitly but uses wildcards for the ESI and selector fields. An ESI template matches the ESI field explicitly but uses wildcards for the prefix and selector.

In our implementation of LANE, the prefix corresponds to the specific subinterface of the interface.

Examples

This example uses an ESI template to specify the part of the ATM address corresponding to an interface. This template allows any client on any subinterface of the interface that corresponds to the displayed ESI value, no matter which switch the router is connected to, to join the engineering ELAN:

```
ATM(lane-config-database)#client-atm-address ...0800.200c.1001.** name engineering
```

This example uses a prefix template to specify the part of the ATM address corresponding to the switch. This template allows any client on the subinterface of any interface connected to the switch that corresponds to the displayed prefix to join the marketing ELAN:

```
ATM(lane-config-database)#client-atm-address 47.000014155551212f.00.00... name marketing
```

Related Commands

default-name
lane database
name

debug mpoa client

Use the **debug mpoa client** command to display MPC debug information.

[**no**] **debug mpoa client** {**all** | **data** | **egress** | **general** | **ingress** | **keep-alives** | **platform-specific**} [**name** *mpc-name*]

Syntax Description

all	Keyword to show debugging information for all MPC activity.
data	Keyword to show debugging information for data plane activity only. This keyword applies only to routers.
egress	Keyword to show debugging information for egress functionality only.
general	Keyword to show general debugging information only.
ingress	Keyword to show debugging information for ingress functionality only.
keep-alives	Keyword to show debugging information for keepalive activity only.
platform-specific	Keyword to show debugging information for specific platforms only. This keyword applies only to the Catalyst 5000 family and 2926G series ATM module.
name *mpc-name*	(Optional) Keyword to specify the name of the MPC with the specified name.

Defaults

The default is debugging is turned on for all MPCs.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to turn on debugging for the MPC ip_mpc:

```
ATM#debug mpoa client all name ip_mpc
```

Related Commands

show mpoa client cache

default-name

Use the **default-name** command to provide an ELAN name in the configuration server's database for those client MAC addresses and client ATM addresses that do not have explicit ELAN name bindings. Use the **no** form of this command to remove the default name.

[**no**] **default-name** *elan_name*

Syntax Description

elan_name	ELAN name for any LANE client MAC address or LANE client ATM address not explicitly bound to any ELAN name. The maximum length of *elan-name* is 32 characters.

Defaults

The default is that no name is configured.

Command Types

Cisco IOS ATM command.

Command Modes

Database configuration.

Usage Guidelines

This command affects only the bindings in the configuration server's database. It has no effect on the LANE components themselves.

The named ELAN must already exist in the configuration server's database before this command is used. If the default name-to-ELAN name binding already exists, the new binding replaces it.

Related Commands

client-atm-address name
lane database
name

disable—ATM

Use the **disable** command to exit privileged EXEC mode and return to user EXEC mode. After executing this command, the angle-bracket (>) prompt appears.

disable [*level*]

Syntax Description

level	(Optional) Option to reduce the privilege level.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Usage Guidelines

Use this command with the *level* option to reduce the privilege level. If you do not specify a level, it defaults to the user EXEC mode, which is level 1.

Examples

This example shows how to cause the system to exit privileged EXEC mode and return to user EXEC mode, as indicated by the angle bracket (>) prompt:

```
ATM#disable
ATM>
```

Related Commands

enable—ATM

display-databases

Use the **display-databases** command to display all the LECS database tables.

display-databases

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Database configuration.

Examples

This example shows how to display all the LECS database tables:

```
ATM(lane-config-database)#display-databases
  eng_dbase
  display-databases   <----- config table in context
```

editing

Use the **editing** command to enable enhanced editing mode. Use the **no** form of this command to disable enhanced editing mode.

[**no**] **editing**

Syntax Description

This command has no arguments or keywords.

Command Types

Cisco IOS ATM command.

Defaults

The default is enabled.

Command Modes

Line configuration.

Usage Guidelines

Table 7-1 describes the keys used to enter and edit commands. Ctrl indicates the Control key. You must press **Ctrl** simultaneously with the associated letter key. Esc indicates the Escape key. You must press **Esc** first, followed by the associated letter key. Keys are not case sensitive.

Table 7-1 Editing Command Keys

Keys	Function
Tab	Completes a partial command name entry. When you enter a unique set of characters and press the Tab key, the system completes the command name. If you enter a set of characters that could indicate more than one command, the system beeps to indicate an error. Enter a question mark (**?**) immediately following the partial command (no space). The system lists the commands that begin with that string.
Delete or Backspace	Erases the character to the left of the cursor.
Return	Processes a command when you are at the command line. At the ---More--- prompt on a terminal screen, pressing the **Return** key scrolls down a line.
Spacebar	Allows you to see more output on the terminal screen. Press the **Spacebar** when you see ---More--- on the screen to display the next screen.
Left Arrow[1]	Moves the cursor one character to the left. When you enter a command that extends beyond a single line, you can press the left arrow key repeatedly to scroll back to the system prompt and verify the beginning of the command entry.
Right Arrow[1]	Moves the cursor one character to the right.
Up Arrow[1] or Ctrl-P	Recalls commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall older commands.

Table 7-1 Editing Command Keys (continued)

Keys	Function
Down Arrow[1] or Ctrl-N	Returns to more recent commands in the history buffer after recalling commands with the up arrow or Ctrl-P. Repeat the key sequence to recall more recent commands.
Ctrl-A	Moves the cursor to the beginning of the line.
Ctrl-B	Moves the cursor back one character.
Ctrl-D	Deletes the character at the cursor.
Ctrl-E	Moves the cursor to the end of the command line.
Ctrl-F	Moves the cursor forward one character.
Ctrl-K	Deletes all characters from the cursor to the end of the command line.
Ctrl-L or Ctrl-R	Redisplays the system prompt and command line.
Ctrl-T	Transposes the character to the left of the cursor with the character located at the cursor.
Ctrl-U or Ctrl-X	Deletes all characters from the cursor back to the beginning of the command line.
Ctrl-V or Esc Q	Inserts a code to indicate to the system that the keystroke immediately following should be treated as a command entry, *not* as an editing key.
Ctrl-W	Deletes the word to the left of the cursor.
Ctrl-Y	Recalls the most recent entry in the delete buffer. The delete buffer contains the last ten items you deleted or cut. **Ctrl-Y** can be used with **Esc Y**.
Ctrl-Z	Ends configuration mode and returns to the EXEC prompt.
Esc B	Moves the cursor back one word.
Esc C	Capitalizes from the cursor to the end of the word.
Esc D	Deletes from the cursor to the end of the word.
Esc F	Moves the cursor forward one word.
Esc L	Changes to lowercase from the cursor to the end of the word.
Esc U	Capitalizes from the cursor to the end of the word.
Esc Y	Recalls the next buffer entry. The buffer contains the last ten items you deleted. Press **Ctrl-Y** first to recall the most recent entry. Then press **Esc Y** up to nine times to recall the remaining entries in the buffer. If you bypass an entry, press **Esc Y** to cycle back to it.

1. The arrow keys function only with ANSI-compatible terminals such as VT100.

Examples

This example shows how to disable enhanced editing mode on virtual terminal line 3:

```
ATM#config terminal
Enter configuration commands, one per line.  End with Ctrl-Z.
ATM(config)#line vty 3
ATM(config-line)#no editing
ATM(config-line)#
```

Related Commands session

enable—ATM

Use the **enable** command to enter privileged EXEC mode.

enable

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Usage Guidelines

If the system administrator has set a password with the **enable password** command, you are prompted to enter the password before gaining access to privileged EXEC mode. The password is case sensitive. The default password on the ATM module is **atm**.

Examples

This example shows how to cause the system to enter privileged command mode, as indicated by the pound sign (#):

```
ATM>enable
Password: <password>
ATM#
```

Related Commands

disable—ATM

end

Use the **end** command to exit configuration mode.

end

Syntax Description This command has no arguments or keywords.

Defaults This command has no default setting.

Command Types Cisco IOS ATM command.

Command Modes Global configuration.

Usage Guidelines You can also press **Ctrl-Z** to exit configuration mode.

Examples This example shows how to exit configuration mode and return to EXEC mode:

```
ATM(config)#end
ATM#
```

Related Commands **exit**

exit

Use the **exit** command at the system prompt to exit any command mode or close an active terminal session and terminate the EXEC.

exit

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Available in all command modes.

Usage Guidelines

When you enter the **exit** command at the EXEC level, the EXEC session is ended. Use the **exit** command at the configuration level to return to privileged EXEC mode. Use the **exit** command in interface and line command modes to return to global configuration mode. Use the **exit** command in subinterface configuration mode to return to interface configuration mode. You can also press **Ctrl-Z** in any configuration mode to return to privileged EXEC mode.

Examples

This example shows how to exit an active session:

```
ATM>exit
```

Related Commands

enable—ATM
end

help

Use the **help** command to display a brief description of the help system.

help

Syntax Description

This command has no arguments or keywords.

Command Types

Cisco IOS ATM command.

Command Modes

Available in all ATM command modes.

Usage Guidelines

To list all commands available for a particular command mode, enter a question mark (**?**) at the system prompt.

To obtain commands that begin with a particular character string, enter the abbreviated command entry and then a question mark (**?**). This form of help is called word help, because it lists only the keywords or arguments that begin with the abbreviation you entered.

To list associated keywords or arguments for a command, enter a question mark (**?**) in place of a keyword or argument on the command line. This form of help is called command syntax help, because it lists the keywords or arguments that apply based on the command, keywords, and arguments you have already entered.

Examples

This example shows how to display a brief description of the help system:

```
ATM#help
Help may be requested at any point in a command by entering
a question mark '?'.  If nothing matches, the help list will
be empty and you must backup until entering a '?' shows the
available options.
Two styles of help are provided:
1. Full help is available when you are ready to enter a
   command argument (e.g. 'show ?') and describes each possible
   argument.
2. Partial help is provided when an abbreviated argument is entered
   and you want to know what arguments match the input
   (e.g. 'show pr?'.)
```

This example shows how to use word help to display the privileged EXEC commands that begin with the letters *co*:

```
ATM#co?
configure copy
```

history—ATM

Use the **history** command to enable the command history function or to change the command history buffer size for a particular line. Use the **no** form of this command to disable the command history feature.

[**no**] **history** [**size** *number-of-lines*]

Syntax Description

size *number-of-lines*	(Optional) Keyword to specify the number of command entries that the system will record in its history buffer. The range of *number-of-lines* is 0 to 256.

Defaults

The default is *number-of-lines* is set to 10.

Command Types

Cisco IOS ATM command.

Command Modes

Line configuration.

Usage Guidelines

The **history** command provides a record of EXEC commands you have entered. This feature is useful for recalling long or complex commands or entries, such as access lists.

The **history** command enables the history function with the last buffer size specified or with the default of ten lines if there was no prior setting. The **history size** *number-of-lines* command sets the number of command entries stored in the command history buffer.

The **no history** command disables the history feature but remembers the buffer size if it was set to a value other than the default. The **no history size** command resets the buffer size to the default.

Table 7-2 lists the keys and functions you can use to recall commands from the command history buffer.

Table 7-2 History Keys

Key	Function
Up Arrow or Ctrl-P[1]	Recalls commands in the history buffer in a backward sequence, beginning with the most recent command. Repeat the key sequence to recall older commands.
Down Arrow or Ctrl-N[1]	Returns to more recent commands in the history buffer after recalling commands with the up arrow or Ctrl-P. Repeat the key sequence to recall more recent commands.

1. The arrow keys function only with ANSI-compatible terminals such as VT100s.

Examples

This example shows how to configure virtual terminal line 4 with a history buffer size of 35 lines:

```
ATM#config terminal
Enter configuration commands, one per line. End with Ctrl-Z.
ATM(config)#line vty 4
ATM(config-line)#history size 35
ATM(config-line)#
```

Related Commands

show history

interface

Use the **interface** command within privileged EXEC mode to enter the interface configuration mode.

interface *atm_num*[*.sub_interface_num* **mul**] | *loopback_num*

Syntax Description

atm_num	Number of the ATM interface; valid values are from 0 to 4294967295.
.sub_interface_num	(Optional) Number of the subinterface.
mul	(Optional) Keyword to specify multipoint.
loopback_num	Loopback interface number; valid values are from 0 to 2147483647.

Defaults

This command has no default settings.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration and subinterface configuration.

Usage Guidelines

If you do not specify the **mul** keyword when entering a subinterface number, the CLI does not accept the command.

Examples

This example shows how to enter interface configuration mode for interface atm0:

```
ATM(config)#interface atm0
ATM(config-if)#
```

This example shows how to enter subinterface configuration mode for subinterface atm0.1:

```
ATM(config-if)#interface atm0.1
ATM(config-subif)#
```

lane auto-config-atm-address

Use the **lane auto-config-atm-address** command to specify that the ATM address is computed automatically for the LECS or the LES and LEC, depending on whether the **config** keyword is used. Use the **no** form of this command to remove the previously assigned ATM address.

[**no**] **lane** [**config**] **auto-config-atm-address**

Syntax Description

config (Optional) Keyword to specify the LECS ATM address.

Defaults

The default is that no specific ATM address or method is set.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

When the **config** keyword is not present, this command causes the LES and LEC on the subinterface to use the automatically assigned ATM address for the LECS.

When the **config** keyword is present, this command assigns the automatically generated ATM address to the LECS configured on the interface. Multiple commands that assign ATM addresses to the LECS can be issued on the same interface to assign different ATM addresses to the LECS. Commands that assign ATM addresses to the LECS include **lane auto-config-atm-address**, **lane config-atm-address**, and **lane fixed-config-atm-address**.

Examples

This example shows how to associate the LECS with the database named network1 and how to specify that the LECS ATM address is automatically assigned:

```
ATM(config-if)#lane config auto-config-atm-address
lane database network1
name eng server-atm-address 39.0000014155551211.0800.AA00.1001.02
name mkt server-atm-address 39.0000014155551211.0800.AA00.4001.01
lane config network1
lane auto-config-atm-address
ATM(config-if)#
```

Related Commands

lane config database
lane config-atm-address

lane bus-atm-address

Use the **lane bus-atm-address** command to define the ATM address for the LANE BUS. Use the **no** form of this command to remove the ATM address for the BUS.

[**no**] **lane bus-atm-address** *bus_name atm-addr*

Syntax Description

bus_name	Name of the BUS.
atm-addr	ATM address of the BUS.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to define the ATM address for the LANE BUS:

```
ATM(config-if)#lane bus-atm-address
ATM(config-if)#
```

lane client

Use the **lane client** command to activate a LANE client on the specified subinterface. Use the **no** form of this command to remove a previously activated LANE client on the subinterface.

[**no**] **lane client** [**ethernet** *vlan_num* [*elan-name*]]

Syntax Description

ethernet	Keyword to indicate the type of ELAN attached to the interface.
vlan_num	Number of the VLAN that corresponds to the specified ELAN.
elan-name	(Optional) Name of the ELAN. This argument is optional because the client obtains its ELAN name from the configuration server. Maximum length for *elan-name* is 32 characters.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

If you already entered a **lane client** command on the subinterface for a different ELAN, the client initiates termination procedures for that ELAN and joins the new ELAN.

If you do not provide an *elan-name* value, the client contacts the server to find which ELAN to join. If you provide an *elan-name* value, the client consults the configuration server to ensure that no conflicting bindings exist.

Examples

This example shows how to activate the LANE client for a VLAN 3 called eng:

```
ATM(config-subif)#lane client ethernet vlan 3 eng
```

Related Commands

lane client-atm-address

lane client-atm-address

Use the **lane client-atm-address** command to specify an ATM address and to override automatic ATM address assignment for the LANE client on the specified subinterface. Use the **no** form of this command to remove the ATM address previously specified for the LANE client on the specified subinterface and revert to automatic address assignment.

[**no**] **lane client-atm-address** *atm-address-template*

Syntax Description

atm-address-template	ATM address or a template in which wildcard characters are replaced by any nibble or group of nibbles of the prefix bytes, the ESI bytes, or the selector byte of the automatically assigned ATM address.

Defaults

The default is automatic ATM address assignment.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

If you use this command on a selected subinterface, but with a different ATM address than was used previously, it replaces the LANE client's ATM address.

A LANE ATM address has the same syntax as an NSAP (but it is not a network-level address):

- A 13-byte prefix that includes the following fields defined by the ATM Forum: AFI field (1 byte), DCC or ICD field (2 bytes), DFI field (1 byte), Administrative Authority field (3 bytes), Reserved field (2 bytes), Routing Domain field (2 bytes), and Area field (2 bytes).
- A 6-byte ESI.
- A 1-byte selector field.

LANE ATM address templates can use two types of wildcards: an asterisk (*) to match any single character and an ellipsis (...) to match any number of leading or trailing characters. The values of the characters replaced by wildcards come from the automatically assigned ATM address.

In LANE, a prefix template matches the ATM address prefix explicitly but uses wildcards for the ESI and selector fields. An ESI template matches the ESI field explicitly but uses wildcards for the prefix and selector.

In our implementation of LANE, the prefix corresponds to the switch, the ESI corresponds to the ATM interface, and the Selector field corresponds to the specific subinterface of the interface.

Examples

This example shows how to use an ESI template to specify the part of the ATM address corresponding to the interface; the remaining parts of the ATM address come from automatic assignment, designated by the double asterisks:

```
ATM(config-if)#lane client-atm-address...0800.200C.1001.**
```

This example shows how to use a prefix template to specify the part of the ATM address corresponding to the switch; the remaining parts of the ATM address come from automatic assignment, designated by the ellipses:

```
ATM(config-if)#lane client-atm-address 47.000014155551212f.00.00...
```

Related Commands

lane client

lane client mpoa client name

Use the **lane client mpoa client name** command to bind a LEC to the named MPC. Use the **no** form of this command to unbind the named MPC from a LEC.

[**no**] **lane client mpoa client name** *mpc-name*

Syntax Description

mpc-name Name of the specific MPC.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

When you enter this command, the named MPC binds to a LEC. The named MPC must exist before this command is accepted. If you enter this command before a LEC is configured (not necessarily running), a warning message is issued.

Examples

This example shows how to bind a LEC on a subinterface to the MPC:

```
ATM (config-subif)#lane client mpoa client name ip_mpc
ATM (config-subif)#
```

Related Commands

show mpoa client

lane client qos

Use the **lane client qos** *database_name* command to apply the database to an interface. Use the **no** form of this command to remove the database from the interface.

[**no**] **lane client qos** *database_name*

Syntax Description

database_name Name of the QoS database.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to apply a LANE QoS database to a subinterface:

```
ATM (config-subif)#lane client qos fred
ATM (config-subif)#
```

Related Commands

atm-address
lane qos database
show lane qos database

lane config-atm-address

Use the **lane config-atm-address** command to specify the ATM address of a given configuration server. Use the **no** form of this command to remove an assigned ATM address.

[**no**] **lane config-atm-address** *atm-address-template*

Syntax Description

atm-address-template	ATM address or template in which wildcard characters are replaced by any nibble or group of nibbles of the prefix bytes, the ESI bytes, or the selector byte of the automatically assigned ATM address.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

This command causes the LANE client on the subinterface to use the specified ATM address (rather than the ATM address provided by the ILMI) to locate the configuration server.

A LANE ATM address has the same syntax as an NSAP (but it is not a network-level address):

- A 13-byte prefix that includes the following fields defined by the ATM Forum: AFI field (1 byte), DCC or ICD field (2 bytes), DFI field (1 byte), Administrative Authority field (3 bytes), Reserved field (2 bytes), Routing Domain field (2 bytes), and Area field (2 bytes).
- A 6-byte ESI.
- A 1-byte selector field.

LANE ATM address templates can use two types of wildcards: an asterisk (*) to match any single character and an ellipsis (...) to match any number of leading or trailing characters. The values of the characters replaced by wildcards come from the automatically assigned ATM address.

In LANE, a prefix template explicitly matches the ATM address prefix but uses wildcards for the ESI and selector fields. An ESI template explicitly matches the ESI field but uses wildcards for the prefix and selector.

In our implementation of LANE, the prefix corresponds to the switch, the ESI corresponds to the ATM interface, and the Selector field corresponds to the specific subinterface of the interface.

Examples

This example shows how to specify the ATM address of the LANE configuration server:

```
ATM(config-subif)#lane config-atm-address 39.000000000000014155551211.0800200c1001.00
```

Related Commands show lane

lane config database

Use the **lane config database** command to associate a named configuration table (database) with the configuration server on the selected ATM interface. Use the **no** form of this command to remove the association between a named database and the configuration server.

[**no**] **lane config database** *database-name*

Syntax Description

database-name Name of the LANE database.

Defaults

The default is that no configuration server is defined, and no database name is provided.

Command Types

Cisco IOS ATM command.

Command Modes

Global configuration.

Usage Guidelines

This command is valid only on a major interface, not a subinterface, because only one LANE configuration server can exist for a switch cloud.

The named database must exist before you enter the **lane config database** command. See the **lane database** command for more information.

You cannot enter multiple **lane config database** commands on the same interface. You must delete an existing association using the **no** form of this command before you can enter a new association.

Activating a LANE client requires the **lane config database** command and one of these commands: **lane fixed-config-atm-address**, **lane auto-config-atm-address**, or **lane config-atm address**.

Examples

This example shows how to associate a named configuration database with the configuration server:

```
ATM(config)#interface atm0
ATM(config-if)#lane config database test
```

Related Commands

lane auto-config-atm-address
lane config-atm-address
lane database

lane database

Use the **lane database** command to create a named configuration database that can be associated with a configuration server when one is configured. Use the **no** form of this command to delete all entries in the specified database.

[**no**] **lane database** *database-name*

Syntax Description

database-name Database name (32 characters maximum).

Defaults

The default is that no name is provided.

Command Types

Cisco IOS ATM command.

Command Modes

Global configuration.

Usage Guidelines

A LANE database contains entries that bind an ELAN name to the ATM address of the LANE server, bind LANE client MAC addresses to an ELAN name, and bind LANE client ATM address templates to an ELAN name.

Entering the **lane database** command places you in database configuration mode, in which you can enter the **client-atm-address name**, **default name**, **mac-address name**, and **name server-atm-address** commands to create entries in the specified database. When you are done creating entries, type **Ctrl-Z** or **exit** to return to global configuration mode.

Examples

This example shows how to create a configuration database named test:

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane qos database test
ATM(lane-config-database)#end
```

Related Commands

client-atm-address name
default-name
name

lane le-arp

Use the **lane le-arp** command to add a static entry to the LE ARP table of the LANE client configured on the subinterface. Use the **no** form of this command to remove a static entry.

[**no**] **lane le-arp** *mac-addr atm-addr*

Syntax Description

mac-addr	MAC address to bind to the specified ATM address.
atm-addr	ATM address to bind to the specified MAC address.

Defaults

The default is that no static address bindings are provided.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

This command only adds or removes a static entry binding a MAC address to an ATM address. It does not add or remove dynamic entries. Removing the static entry for a specified ATM address from an LE ARP table does not release Data Direct VCCs established to that ATM address. However, clearing a static entry clears any fast-cache entries that were created from the MAC address-to-ATM address binding.

Static LE ARP entries are not aged and are not removed automatically.

To remove dynamic entries from the LE ARP table of the LANE client on the specified subinterface, enter the **clear lane le-arp** command.

Examples

This command adds a static entry to the LE ARP table:

```
ATM(config-if)#lane le-arp 0800.aa00.0101 47.000014155551212f.00.00.0800.200C.1001.01
```

Related Commands

show lane le-arp

lane qos database

Use the **lane qos database** command to create the LANE QoS database. Use the **no** form of this command to delete the specified database.

[**no**] **lane qos database** *name*

Syntax Description

name	Database name (32 characters maximum).

Defaults

The default is that no name is provided.

Command Types

Cisco IOS ATM command.

Command Modes

Global configuration.

Examples

This example shows how to create a configuration database named test:

```
ATM# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
ATM(config)#lane qos database test
ATM(lane-config-database)#end
```

Related Commands

atm-address
lane client qos
show lane qos database

lane qos iptos trust

Use the **lane qos iptos trust** global configuration command to change the LANE QoS mode to trusted. Use the **no** form of the command to change the LANE QoS mode to untrusted.

[**no**] **lane qos iptos trust**

Syntax Description

iptos	Keyword to specify the IP Type of Service header.
trust	Keyword to specify the trusted command mode.

Defaults

The default LANE QoS command mode is untrusted.

Command Modes

Global configuration.

Examples

This example shows how to set the mode to trusted:

```
ATM(config)# lane qos iptos trust
ATM(config)
```

Related Commands

atm-address
lane client qos
show lane qos database

lane register

Use the **lane register** command to register a LANE client connected by a PVC to the LANE server on the subinterface. Use the **no** form of this command to remove a prior entry.

[**no**] **lane register** *vcd mac-addr atm-addr*

Syntax Description

vcd	Virtual channel descriptor of the Server Direct PVC through which the LANE client is connected to the LANE server.
mac-addr	MAC address of the LANE client.
atm-addr	ATM address of the LANE client.

Defaults

The default is that no PVC is defined, and no MAC address and ATM address are provided.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

Ordinarily, SVCs are used instead of PVCs for communications within ELANs, and registration occurs dynamically via the LANE protocol. Use the **lane register** command only when you use PVCs.

If you use PVCs instead of SVCs for Server Direct circuits between the LANE server and LANE clients, use this command on the LANE server to identify the MAC address and the ATM address of the LANE client at the other end of a virtual circuit. If the client at the other end has a different ATM address, it is not allowed to join the ELAN.

Use the **lane pvc** command on a LANE client and the **lane register** command on a LANE server to enable PVCs, instead of SVCs alone, for LANE. The *vcd* value in the **lane register** command must match the *vcd* value in a **lane pvc** command and in an **atm pvc** command.

If you use PVCs for the Control Direct VCCs, you must also use PVCs for the Control Distribute VCCs. If you use PVCs for the Multicast Send VCCs, you must also use PVCs for the Multicast Forward VCCs.

Examples

This example shows how to register a LANE client connected by a PVC to the LANE server on the subinterface:

```
ATM(config)#interface atm0.1
ATM(config-subif)#lane register 98 0800.aa00.0101 47.000014155551212f.00.00.0800.200C.1001.01
ATM(config-subif)#end
```

Related Commands show lane

lane server-atm-address

Use the **lane server-atm-address** command to configure the LES ATM address. Use the **no** form of this command to delete the specified LES.

[**no**] **lane server-atm-address** *les_name atm-address-template*

Syntax Description

les_name	Name of the LES.
atm-address-template	ATM address or template in which wildcard characters are replaced by any nibble or group of nibbles of the prefix bytes, the ESI bytes, or the selector byte of the automatically assigned ATM address.

Defaults

The default is Ethernet.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

For complete information on using ATM address templates, refer to the "Configuring ATM LANE Emulation" chapter in the *Software Configuration Guide* for your switch.

Examples

This example shows how to configure the LES ATM address:

```
ATM(config-if)#lane server-atm-address 39.000000000000014155551211.0800200c1001.00.
ATM(config-if)#
```

lane server-bus

Use the **lane server-bus** command to configure the LES and BUS for the specified ELAN on the subinterface. Use the **no** form of this command to delete the specified LES/BUS.

[**no**] **lane server-bus** {**ethernet** | **tokenring**} *elan_name* [**elan-id** *id*]

Syntax Description

ethernet	Keyword to specify an Ethernet network.
tokenring	Keyword to specify a Token Ring network.
elan_name	Name of the ELAN.
elan-id	(Optional) Keyword to specify the ELAN ID.
id	ELAN ID of the ELAN.

Defaults

The default is Ethernet.

Note Only emulated Ethernet LANs are supported.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

The LES/BUS of an ELAN must be co-located.

The maximum length of the *elan_name* is 32 characters.

If you have already entered the **lane server-bus** command on the subinterface for a different ELAN, the LES terminates procedures with all LECs and appears as the LES for the new ELAN.

To participate in MPOA, a LEC must have an ELAN ID. The **lane server-bus** command enables the LEC to obtain the ELAN ID from the LES when the LEC bypasses the LECS phase.

Caution If an ELAN ID is supplied, ensure that it corresponds to the same ELAN ID value specified in the LECS for the same ELAN.

You can also enter the **name elan-id** command to obtain the ELAN ID from the LECS. The **no** form of this command removes a previously configured LES/BUS on the subinterface.

Examples

This example shows how to enable the LES/BUS for an Ethernet ELAN:

```
ATM(config-subif)#lane server-bus ethernet default
ATM(config-subif)#end
```

Related Commands

lane server-atm-address
name

mac-address

Use the **mac-address** command to set the MAC layer address.

mac-address *ieee-address*

Syntax Description

ieee-address	48-bit IEEE MAC address written as a dotted triplet of 4-digit hexadecimal numbers.

Defaults

The default is no MAC layer address is set.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

If you have a LECS, LES, or BUS configured on an ATM module, and you replace the supervisor engine or move the ATM module from one slot to another, you can enter the **mac-address** command to modify the default ATM address network service access points (NSAPs). This way, if you replace the supervisor engine or move the ATM module from one slot to another, the NSAP is taken from the MAC address instead of the supervisor engine.

Examples

This example shows how to set the MAC layer address, where xx.xxxx is an appropriate second half of the MAC address to use:

```
ATM(config-if)#mac-address 5000.5axx.xxxx
```

mpoa client config name

Use the **mpoa client config name** command to define an MPC with a specified name. Use the **no** form of this command to delete the MPC.

[**no**] **mpoa client config name** *mpc-name*

Syntax Description

mpc-name Name of the specific MPC.

Defaults

The system defaults are as follows:

- shortcut-frame-count default is 10 frames.
- shortcut-frame-time default is 1 second.
- ATM address is autogenerated.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

When you enter this command, you are placed in the MPC configuration/definition mode. From here, you can enter subcommands to define or change MPC variables specific only to this MPC. Note that the MPC is not functional until it is attached to a hardware interface.

Examples

This example shows how to create or modify the MPC named ip_mpc:

```
ATM> enable
ATM#configure
ATM (config)#mpoa client config name ip_mpc
mpoa-client-config#
```

Related Commands

atm-address
shortcut-frame-count
shortcut-frame-time

mpoa client name

Use the **mpoa client name** command to attach an MPC to a major ATM interface. Use the **no** form of this command to break the attachment.

[**no**] **mpoa client name** *mpc-name*

Syntax Description

mpc-name Name of the specific MPC.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

The **mpoa client name** command provides an interface to the MPC through which the MPC can set up and receive calls.

When you enter this command on a major interface that is up and operational, the named MPC becomes operational. After the MPC is fully operational, it can register its ATM address.

Examples

This example shows how to attach the MPC ip_mpc to an interface:

```
ATM (config)#mpoa client config name ip_mpc
mpoa-client-config#interface atm 1/0
config-if#mpoa client name ip_mpc
config-if#
```

Related Commands

show mpoa client
mpoa client config name
show mpoa default-atm-addresses

mpoa server config name

Use the **mpoa server config name** command to define an MPS with the specified name. Use the **no** form of this command to delete an MPS.

[**no**] **mpoa server config name** *mps-name*

Syntax Description

mps-name Name of the specific MPS.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Global configuration.

Usage Guidelines

The **mpoa server config name** command defines an MPS with the specified name. The MPS does not start functioning until it is attached to a specific hardware interface. Once that attachment is complete, the MPS starts functioning. When you configure or create an MPS, you automatically enter the MPS configuration mode.

You can define the MPS variables specific to an MPS, only after that MPS is defined with a specified name. After you enter this command, you may enter further commands to change MPS variables that are specific only to this MPS.

Examples

This example shows how to attach the MPC ip_mpc to an interface:

```
ATM (config)#mpoa client config name ip_mpc
mpoa-client-config#interface atm 1/0
config-if#mpoa client name ip_mpc
config-if#
```

Related Commands

show mpoa client
mpoa client config name
show mpoa default-atm-addresses

mtu

Use the **mtu** command to set the interface MTU.

mtu *size*

Syntax Description

size	MTU size in bytes. Valid values are from 64 to 17944. Valid ATM values are 1500, 4528, and 9218 for Ethernet; and 4490 and 9180 for Token Ring.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

This command is not supported by these modules:

- ATM LANE single PHY OC-3 (WS-X5153, WS-X5154, and WS-X5155)
- ATM LANE dual PHY OC-3 (WS-X5156, WS-X5157, and WS-X5158)
- ATM dual PHY DS3 (WS-X5166)
- ATM dual PHY OC-12 (WS-X5161 and WS-X5162)
- ATM dual PHY OC-3 (WS-X5167 and WS-X5168)

Examples

This example shows how to set the MTU to 1500 for an Ethernet module:

```
ATM (config-if)#mtu 1500
ATM (config-if)#
```

Related Commands

show vlan

name

Use the **name** command to assign a unique ELAN name to an LES and to configure an ELAN. Use the **no** form of this command to delete the specified ELAN name.

[**no**] **name** *elan-name* **elan-id** *id* {**local-seg-id** | **new-name** | **preempt** | **restricted** | **server-atm-address** | **un-restricted**} *atm-addr*

Syntax Description

elan_name	Name of the ELAN.
elan_id	Keyword to specify the ELAN ID of the ELAN.
id	ELAN ID of the ELAN.
local-seg-id	Keyword to specify the local segment number for this emulated TR LAN.
new-name	Keyword to introduce a new name for this ELAN.
preempt	Keyword to turn on higher priority LES preemption.
restricted	Keyword to close this ELAN to access by name only.
server-atm-address	Keyword to specify the LES-NSAP address for this ELAN.
un-restricted	Keyword to open this ELAN to access by name only.
atm-addr	ATM address of the LANE client.

Defaults

The default has higher priority LES preemption off.

Command Types

Cisco IOS ATM command.

Command Modes

Database configuration.

Usage Guidelines

Use this command when setting up the LECS database on Catalyst 5000 family and 2926G series switches or when configuring the address of a LES/BUS.

When you enter the **name** *elan-name* **elan-id** *id* **preempt** command to turn on higher priority LES preemption, if the primary LANE server (LES) fails, a switchover to a secondary LES occurs. But when a LES that is ranked higher in the priority list becomes active, the active LES is switched to the new LES (with the higher priority).

If you use the default configuration, the second switchover to the new LES does not occur, regardless of the priority. Use the **no** form of the command to turn off higher priority LES preemption.

The **new-name** and **preempt** keywords are supported in Catalyst 5000 and 2926G series ATM software release 3.2(8) and later.

Examples

This example shows how to configure the LES ATM NSAP address for the default ELAN:

```
ATM(lane-config-database)#name default server-atm-address
47.009181000000061705b7701.00400BFF0011.00
ATM(lane-config-database)#
```

Related Commands

lane database
default-name

reload—ATM

Use the **reload** command to halt and perform a cold restart on the module.

reload

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Usage Guidelines

The **reload** command halts the ATM module. If you set the ATM module to restart on error, it reboots itself. Use the **reload** command after you enter configuration information into a file and save to the startup configuration.

Once you have confirmed the reload, you are logged out of the session and returned to the Console> prompt.

You cannot reload from a virtual terminal if the system is not set up for automatic booting. This restriction prevents the system from dropping to the ROM monitor and taking the system out of the remote user's control.

If you modify your configuration file, the system prompts you to save the configuration. During a save operation, the system asks you if you want to proceed with the save if the CONFIG_FILE environment variable points to a startup configuration file that no longer exists. If you say "yes" in this situation, the system goes to **setup** mode upon reload.

Examples

This example shows how to reload the system from the privileged EXEC prompt:

```
ATM#reload

System configuration has been modified. Save? [yes/no]: y
Building configuration...
[OK]
Proceed with reload? [confirm]
Console>
```

shortcut-frame-count

Use the **shortcut-frame-count** command to specify the maximum number of times a packet can be routed to the default router within the shortcut-frame time before an MPOA resolution request is sent. Use the **no** form of this command to restore the default shortcut-setup frame count value.

[**no**] **shortcut-frame-count** *count*

Syntax Description

count	Shortcut-setup frame count.

Defaults

The default is 10 frames.

Command Types

Cisco IOS ATM command.

Command Modes

MPC configuration.

Examples

This example shows how to set the shortcut-setup frame count to 5 for the MPC:

```
mpoa-client-config#shortcut-frame-count 5
mpoa-client-config#
```

Related Commands

atm-address
mpoa client config name
shortcut-frame-time

shortcut-frame-time

Use the **shortcut-frame-time** command to set the shortcut-setup frame time (in seconds) for the MPC. Use the **no** form of this command to restore the default shortcut-setup frame-time value.

[**no**] **shortcut-frame-time** *time*

Syntax Description

time	(Optional) Shortcut-setup frame time in seconds.

Defaults

The default is 1 second.

Command Types

Cisco IOS ATM command.

Command Modes

MPC configuration.

Examples

This example shows how to set the shortcut-setup frame time to 7 for the MPC:

```
mpoa-client-config#shortcut-frame-time 7
mpoa-client-config#
```

Related Commands

atm-address
mpoa client config name
shortcut-frame-count

show atm ilmi-status atm

Use the **show atm ilmi-status atm** command to display ILMI-related information.

show atm ilmi-status atm *mod_num/subcard_num/port_num*

Syntax Description

mod_num/	Number of the module.
subcard_num	Number of the submodule.
port_num	Number of the port for the ATM interface.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display ILMI-related information.

```
ATM#show atm ilmi-status atm 0/0/3
Interface : ATM0/0/3 Interface Type : Private UNI (Network-side)
ILMI VCC : (0, 16) ILMI Keepalive : Enabled (5 Seconds)
Addr Reg State:   UpAndNormal
Peer IP Addr:     0.0.0.0
Peer MaxVPIbits:  8               Peer MaxVCIbits:  14
Configured Prefix(s) :
47.0091.8100.0000.0041.0b0a.1081
47.0091.8100.0000.0060.3e5a.db01
47.0091.8100.5670.0000.0000.1122
```

Table 7-3 describes the fields shown in the **show atm ilmi-status atm** output.

Table 7-3 show atm ilmi-status Command Output Fields

Field	Description
Interface	Number of the module, submodule, and port of the specified ATM interface.
Interface Type	Type of interface for the specified ATM interface.
ILMI VCC	Number of the current ILMI VCC for the specified ATM.
ILMI Keepalive	Status and the set time for the ILMI for the specified ATM.
Configured Prefix	Prefix for the ATM.

show atm interface atm0

Use the **show atm interface atm0** command to display information about the ATM interface.

show atm interface atm0

Note The interface number **atm0** must always be used for the Catalyst 5000 family and 2926G series ATM module.

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display statistics on the ATM module:

```
ATM#show atm interface atm0
ATM interface ATM0:
AAL enabled:  AAL5 , Maximum VCs: 4096, Current VCCs: 2
Tx buffers 32, Rx buffers 32, Exception Queue: 32, Raw Queue: 32
VP Filter: 0x0, VCIs per VPI: 1024, Max. Datagram Size:1580
PLIM Type:SONET - 155Mbps, TX clocking: LINE
0 input, 0 output, 0 IN fast, 0 OUT fast
Config. is ACTIVE
ATM#
```

Table 7-4 describes the fields in the **show atm interface atm0** output.

Table 7-4 show atm interface atm0 Command Output Fields

Field	Description
ATM interface	ATM interface number.
AAL enabled	AAL type currently enabled.
Maximum VCs	Maximum number of virtual connections this interface can support.
Current VCCs	Number of virtual connections currently active on the interface.
Tx buffers	Number of transmit buffers on the interface.
Rx buffers	Number of receive buffers on the interface.

Table 7-4 show atm interface atm0 Command Output Fields (continued)

Field	Description
VCIs per VPI	Maximum number of VCIs to support per VPI (as configured using the **atm vc-per-vp** command).
Max. Datagram Size	Maximum datagram size supported by the interface.
PLIM Type	PLIM type and speed.
TX clocking	Transmit clocking method used on the interface.
input	Number of packets received from process switch.
output	Number of packets sent to process switch.
IN fast	Number of packets received from fast process switch.
OUT fast	Number of packets sent to fast process switch.
Config. is	Status of the configuration: ACTIVE or VALID in *n* SECONDS. ACTIVE indicates that the current Catalyst 5000 family and 2926G series switch configuration has been loaded into the switch and is being used. VALID in *n* SECONDS indicates that the configuration will be active in *n* seconds. There is a 5-second inactive period whenever a new configuration is sent to the Catalyst 5000 family and 2926G series switch.

show atm traffic

Use the **show atm traffic** command to display current global ATM traffic information to and from all ATM networks connected to the ATM module.

show atm traffic

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows sample output from the **show atm traffic** command:

```
ATM#show atm traffic
949 Input packets
948 Output packets
0 Broadcast packets
0 Packets received on non-existent VC
0 Packets attempted to send on non-existent VC
0 OAM cells received
0 OAM cells sent
ATM#
```

Table 7-5 describes the fields in the **show atm traffic** output.

Table 7-5 show atm traffic Command Output Fields

Field	Description
Input packets	Total number of input ATM packets.
Output packets	Total number of nonbroadcast output ATM packets.
Broadcast packets	Total number of broadcast output ATM packets.
Packets received on nonexistent VC	Number of packets received addressed to a virtual connection that is not configured.
Packets attempted to send on nonexistent VC	Number of packets attempted to send to a virtual connection that is not configured.
OAM cells received	Number of OAM cells received.
OAM cells sent	Number of OAM cells sent.

Related Commands

atm pvc

show atm vc

Use the **show atm vc** command to display the active ATM virtual connections (PVCs and SVCs) and traffic information.

show atm vc [*vcd*]

Syntax Description

vcd	(Optional) Number of the virtual connection for which information is displayed.

Defaults

If you do not specify a *vcd*, the command displays information for all SVCs. The output is in summary form (one line per VC).

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display statistics for all VCs:

```
ATM#show atm vc
                                        AAL /          Peak   Avg.  Burst
Interface     VCD   VPI   VCI Type  Encapsulation  Kbps   Kbps  Cells Status
ATM0            1     0     5  PVC  AAL5-SAAL           0      0     0 INACTIVE
ATM0            2     0    16  PVC  AAL5-ILMI           0      0     0 INACTIVE
ATM#
```

Table 7-6 describes the fields in the **show atm vc** output.

Table 7-6 show atm vc Command Output Fields

Field	Description
Interface	Interface on which the VC is configured.
VCD	VCD of the VC.
VPI	VPI of the VC.
VCI	VCI of the VC.
Type	Type of virtual connection (PVC or SVC).
AAL/Encapsulation	AAL type and encapsulation type configured for the virtual connection.
Status	Status of the virtual connection (ACTIVE or INACTIVE).

show atm vlan

Use the **show atm vlan** command to display the active VLAN-to-PVC bindings.

show atm vlan [*vlan_num*]

Syntax Description

vlan_num	(Optional) Number of the VC about which information is displayed. The range of *vlan_num* is 1 to 1023.

Defaults

If you do not specify a *vlan_num*, all active VLAN-to-PVC bindings are displayed.

Command Types

Cisco IOS ATM command.

Command Modes

Privileged EXEC.

Examples

After entering the **show atm vlan** command, you see this display:

```
ATM#show atm vlan
VCD     VLAN-ID
10      5
11      5
ATM#
```

The display shows the VCD of the VC and the VLAN-ID of the VLAN to which the VC belongs.

show history

Use the **show history** command to list the commands you have entered in the current EXEC session.

show history

Syntax Description

This command has no arguments or keywords.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Usage Guidelines

The command history feature provides a record of EXEC commands you have entered. The number of commands the history buffer records is determined by the **history size** line configuration command or the **terminal history size** EXEC command.

Table 7-7 lists the keys and functions you can use to recall commands from the command history buffer.

Table 7-7 History Keys

Key	Function
Up arrow or Ctrl-P [1]	Recalls commands in the history buffer in a backward sequence, beginning with the most recent command. Repeat the key sequence to recall older commands.
Down arrow or Ctrl-N [1]	Returns to more recent commands in the history buffer after recalling commands with Ctrl-P or the up arrow. Repeat the key sequence to recall more recent commands.

1. The arrow keys function only with ANSI-compatible terminals such as VT100s.

Examples

This example shows how to list the command history:

```
ATM#show history
  enable
  show atm traffic
  show atm vlan
  show lane
  show history
ATM#
```

show lane

Use the **show lane** command to display global and per-VCC LANE information for all the LANE clients configured on an interface, a subinterface, or an ELAN.

show lane [**interface atm0**[**.***subinterface*] | **name** *elan-name*] [**brief**]

Note This command displays exactly the same information as the **show lane client** command.

Syntax Description

interface atm0	(Optional) Keyword to specify ATM interface 0.
.*subinterface*	(Optional) Number of the subinterface; the period (.) is required.
name *elan-name*	(Optional) Keyword to specify the name of an ELAN; the maximum length of *elan-name* is 32 characters.
brief	(Optional) Keyword to display only global information, not per-VCC information.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows sample output of the **show lane** command:

```
ATM#show lane
LE Client ATM0.2  ELAN name: blue  Admin: up  State: operational
Client ID: 1
HW Address: 0040.0bf0.0020   Type: ethernet            Max Frame Size: 1516
ATM Address: 39.000000550055005500550055.00400BF00020.02

 VCD  rxFrames  txFrames  Type       ATM Address
 0         0         0  configure 39.000000550055005500550055.00000C0425C2.00
 14        3         4  direct    39.000000550055005500550055.00000C0425C0.01
 15        1         0  distribute39.000000550055005500550055.00000C0425C0.01
 16        0         8  send      39.000000550055005500550055.00000C0425C1.01
 17        14        0  forward   39.000000550055005500550055.00000C0425C1.01
 18        25        28 data      39.000000550055005500550055.00400BF00420.00

ATM#
```

Table 7-8 describes the fields in the **show lane** output.

Table 7-8 show lane Command Output Fields

Field	Description
LE Client	Interface or subinterface this LANE client is on.
ELAN name	Name of the ELAN this client is linked to.
State	Status of this LANE client. Possible states include initialState, lecsConnect, configure, join, busConnect, and operational.
HW Address	MAC address, in dotted hexadecimal notation, assigned to this LANE client.
Type	ELAN type.
Max Frame Size	Maximum frame size on this ELAN.
ATM Address	ATM address of the LANE client.
VCD	VCD for the VCCs established for this LANE client.
rxFrames	Number of frames received on the VCC.
txFrames	Number of frames transmitted on the VCC.
Type	Type of VCC. Possible VCC types are configure, direct, distribute, send, forward, and data.
ATM Address	ATM address of the LANE component at the other end of the VCC.

Related Commands

show lane bus
show lane client
show lane config
show lane default-atm-addresses
show lane le-arp
show lane server

show lane bus

Use the **show lane bus** command to display LANE information for the BUSs configured on all servers, on a specified interface, or on an ELAN.

show lane bus [**interface atm0**[**.***subinterface*] | **name** *elan-name*] [**brief**]

Syntax Description

interface atm0	(Optional) Keyword to specify ATM interface 0.
.*subinterface*	(Optional) Number of the subinterface; the period (.) is required.
name *elan-name*	(Optional) Keyword to specify an ELAN; the maximum length of *elan-name* is 32 characters.
brief	(Optional) Keyword to display only global information, not per-VCC information.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display information about all LANE BUSs:

```
ATM#show lane bus
LE BUS ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.009181000000061705B8301.00400B020012.01
data forward: vcd 16, 4 members, 31324 packets, 0 unicasts

lecid  vcd     pkts   ATM Address
    1   13        0 47.009181000000061705B8301.00400B020010.01
    2   19        0 47.009181000000061705B8301.00400B010040.01
    3   22    31321 47.009181000000061705B8301.00400BC5D430.01
    4  171        3 47.009181000000061705B8301.0060705B8302.00
```

Table 7-9 describes the fields in the **show lane bus** output.

Table 7-9 show lane bus Output Fields

Field	Description
LE BUS	Interface or subinterface on which the BUS is configured.
ELAN name	Name of the ELAN with which the BUS is associated.
State	State of the BUS.
type	Type of ELAN.
Max Frame Size	Maximum frame size allowed on the ELAN.

Table 7-9 show lane bus Output Fields (continued)

Field	Description
ATM address	ATM address of the BUS.
data forward	Information about data forwarding performed by the BUS.

Related Commands

show lane
show lane client
show lane config
show lane default-atm-addresses
show lane le-arp
show lane server

show lane client

Use the **show lane client** command to display global and per-VCC LANE information for all the LANE clients configured on an interface, a subinterface, or an ELAN.

show lane client [**interface atm0**[*.subinterface*] | **name** *elan-name*] [**brief**]

Note This command displays the same output as the **show lane** command.

Syntax Description

interface atm0	(Optional) Keyword to specify ATM interface 0.
.subinterface	(Optional) Number of the subinterface. The period (.) is required.
name *elan-name*	(Optional) Keyword to specify the name of an ELAN. The maximum length of *elan-name* is 32 characters.
brief	(Optional) Keyword to display only global information, not per-VCC information.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display LANE client information:

```
ATM#show lane client
LE Client ATM0.2  ELAN name: blue  Admin: up  State: operational
Client ID: 1
HW Address: 0040.0bf0.0020   Type: ethernet            Max Frame Size: 1516
ATM Address: 39.000000550055005500550055.00400BF00020.02

 VCD  rxFrames  txFrames  Type       ATM Address
 0         0         0  configure 39.000000550055005500550055.00000C0425C2.00
 14        3         4  direct    39.000000550055005500550055.00000C0425C0.01
 15        1         0  distribute39.000000550055005500550055.00000C0425C0.01
 16        0         8  send      39.000000550055005500550055.00000C0425C1.01
 17        14        0  forward   39.000000550055005500550055.00000C0425C1.01
 18        25        28 data      39.000000550055005500550055.00400BF00420.00

ATM#
```

For a description of the fields in the **show lane client** command output, see Table 7-13.

Related Commands

show lane
show lane bus
show lane config
show lane default-atm-addresses
show lane le-arp

show lane config

Use the **show lane config** command to display LANE information about the LECS.

show lane config [**interface atm0**] [**brief**]

Syntax Description

interface atm0	(Optional) Keyword to specify the ATM interface.
brief	(Optional) Keyword to display only global information, not per-VCC information.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display information about the LECS:

```
ATM#show lane config
LE Config Server ATM0 config table: test
Admin: up  State: operational
LECS Mastership State: active master
list of global LECS addresses (0 seconds to update):
47.009181000000061705B8301.00400B020013.00  <-------- me
47.009181000000061705B8301.00400B010043.00 connected outgoing call (vcd 24)
ATM Address of this LECS: 47.009181000000061705B8301.00400B020013.00 (auto)
 vcd  rxCnt  txCnt  callingParty
   7      4      4  47.009181000000061705B8301.00400B020011.01 LES default 0 active
  26      0      0  47.009181000000061705B8301.00400B010041.01 LES default 1 backup
cumulative total number of unrecognized packets received so far: 0
cumulative total number of config requests received so far: 151
cumulative total number of config failures so far: 143
    cause of last failure: no configuration
    culprit for the last failure: 47.009181000000061705B8301.0060705B8302.00
ATM#
```

Table 7-10 describes the fields in the **show lane config** output.

Table 7-10 show lane config Output Fields

Field	Description
LE Config Server ATM0 config table	LECS table.
State	Operational state of the LECS.
LECS Mastership State	Master state of the LECS.

Table 7-10 show lane config Output Fields (continued)

Field	Description
list of global LECS addresses (0 seconds to update)	ATM addresses of the LECS on the network (and the number of seconds until the list is next updated).
ATM Address of this LECS	ATM address of the LECS configured on this interface.
cumulative total number of unrecognized packets received so far	Number of unrecognized packets received by the LECS.
cumulative total number of config requests received so far	Number of configuration requests received by the LECS.
cause of last failure	Cause of the last configuration failure.
culprit for the last failure	ATM address of the device that caused the last configuration failure.

Related Commands

show lane
show lane bus
show lane client
show lane default-atm-addresses
show lane le-arp
show lane server

show lane default-atm-addresses

Use the **show lane default-atm-addresses** command to display default ATM addresses for the LEC, LES/BUS, and LECS.

show lane default-atm-addresses

Syntax Description

This command has no arguments or keywords.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Usage Guidelines

If the two PHYs of the ATM dual PHY card connect to different switches, and if you configure the ATM card to have a LES/BUS or LECS, you must determine the addresses to be used if the first PHY goes down. See the **atm preferred phy** command for more information.

Examples

After entering the **show lane default-atm-addresses** command, you see this display:

```
ATM#show lane default-atm-addresses
interface ATM0:
LANE Client:        ...00E0B06F1840.**
LANE Server:        ...00E0B06F1841.**
LANE Bus:           ...00E0B06F1842.**
LANE Config Server: ...00E0B06F1843.00
note: ** is the subinterface number byte in hex
ATM#
```

The display shows the last 12 digits of the default LEC, LES, BUS, and LECS ATM addresses (followed by the subinterface number).

Related Commands

atm preferred phy
show lane default-atm-addresses

show lane le-arp

Use the **show lane le-arp** command to display the LE ARP table of the LANE client configured on an interface or any of its subinterfaces, on a specified subinterface, or on an ELAN.

show lane le-arp [**interface atm0**[*.subinterface*] | **name** *elan-name*]

Syntax Description

interface atm0	(Optional) Keyword to specify ATM interface 0.
.subinterface	(Optional) Number of the subinterface; the period (.) is required.
name *elan-name*	(Optional) Keyword to specify the name of an ELAN; the maximum length of *elan-name* is 32 characters.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display the LANE ARP table of the LEC:

```
ATM#show lane le-arp
Hardware Addr   ATM Address                                  VCD  Interface
0000.0c15.a2b5  39.000000000000000000000000.00000C15A2B5.01  39  ATM 0.1
0000.0c15.f3e5  39.000000000000000000000000.00000C15F3E5.01  25* ATM 0.1
ATM#
```

Table 7-11 describes the fields in the **show lane le-arp** output.

Table 7-11 show lane le-arp Command Output Fields

Field	Description
Hardware Addr	MAC address, in dotted hexadecimal notation, assigned to the LANE component at the other end of the specified VCD.
ATM Address	ATM address of the LANE component at the other end of the specified VCD.
VCD	Virtual channel descriptor.
Interface	Interface or subinterface used to reach the specified component.

Related Commands

show lane
show lane le-arp

show lane qos database

Use the **show lane qos database** command to display the contents of a specific LANE QoS database.

show lane qos database *name*

Syntax Description

name	LANE QoS database to display.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display the contents of a LANE QoS database:

```
ATM# show lane qos database fred
QOS: fred
    configured cos values: 4-7, usage: 1
    dst nsap: 47.009181000000061705B0C01.00E0B0951A40.0A
    cos: 7, pcr: 500000, mcr: 100000
```

Related Commands

lane qos database
lane client qos

show lane server

Use the **show lane server** command to display LANE information for the LESs configured on all servers, on a specified interface, or on an ELAN.

show lane server [**interface atm0**[**.***subinterface*] | **name** *elan-name*] [**brief**]

Syntax Description

interface atm0	(Optional) Keyword to specify ATM interface 0.
.*subinterface*	(Optional) Number of the subinterface; the period (.) is required.
name *elan-name*	(Optional) Keyword to specify an ELAN; the maximum length of *elan-name* is 32 characters.
brief	(Optional) Keyword to display only global information, not per-VCC information.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display LANE information for the LES:

```
ATM#show lane server
LE Server ATM0.1  ELAN name: default  Admin: up  State: operational
type: ethernet         Max Frame Size: 1516
ATM address: 47.009181000000061705B8301.00400B020011.01
LECS used: 47.009181000000061705B8301.00400B020013.00 connected, vcd 8
control distribute: vcd 12, 4 members, 9086 packets

proxy/ (ST: Init, Conn, Waiting, Adding, Joined, Operational, Reject, Term)
lecid ST vcd    pkts Hardware Addr  ATM Address
   1P O    9       2 0040.0b02.0010 47.009181000000061705B8301.00400B020010.01
   2P O   18       2 0040.0b01.0040 47.009181000000061705B8301.00400B010040.01
   3P O   21    9084 0040.0bc5.d430 47.009181000000061705B8301.00400BC5D430.01
   4  O  170       2 0060.705b.8302 47.009181000000061705B8301.0060705B8302.00
ATM#
```

Table 7-12 describes the fields in the **show lane server** output.

Table 7-12 show lane server Command Output Fields

Field	Description
LE Server	LES for this interface.
ELAN name	Name of the ELAN associated with this LES.
State	Operational state of the LES.

Table 7-12 show lane server Command Output Fields (continued)

Field	Description
type	ELAN type.
Max Frame Size	Maximum frame size allowed on the ELAN.
ATM address	ATM address of the LES.
LECS used	ATM address of the LECS used by the LES, the connection state, and the VCD used.

Related Commands **show lane**
show lane server

show mpoa client

Use the **show mpoa client** command to display a summary of information regarding one or all MPCs.

show mpoa client [**name** *mpc-name*] [**brief**]

Syntax Description

name *mpc-name*	(Optional) Keyword to specify the name of the MPC.
brief	(Optional) Keyword to specify the output limit of the command.

Defaults

The default is that all MPC information is displayed.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Usage Guidelines

If you omit the **name** keyword, the command displays information for all MPCs.

Examples

This example shows output from the **show mpoa client** command:

```
ATM#show mpoa client name ip_mpc brief
MPC Name: ip_mpc, Interface: ATM1/0, State: Up
MPC actual operating address: 47.00918100000000613E5A2F01.0010A6943825.00
Shortcut-Setup Count: 1, Shortcut-Setup Time: 1
Lane clients bound to MPC ip_mpc: ATM1/0.1
Discovered MPS neighbours                   kp-alv   vcd     rxPkts     txPkts
47.00918100000000613E5A2F01.006070174824.00     59    30         28          2
Remote Devices known                                 vcd     rxPkts     txPkts
47.00918100000000613E5A2F01.00000C5A0C5D.00           35          0         10
ATM#
```

Table 7-13 describes the fields in the **show mpoa client** output.

Table 7-13 show mpoa client Command Output Fields

Field	Description
MPC Name	Name specified for the MPC.
Interface	Interface to which the MPC is attached.
State	Current state of the MPC.
MPC actual operating address	ATM address of the MPC.

Table 7-13 show mpoa client Command Output Fields

Field	Description
Shortcut-Setup Count	Current number specified by the **shortcut-frame-count** command.
Shortcut-Setup Time	Current value specified by the **shortcut-frame-time** command.
Lane clients bound to MPC ip_mpc	List of LANE clients currently bound to the MPC ip_mpc.
Discovered MPS neighbours	List of learned MPS addresses.
kp-alv	Number of seconds until the next keepalive message should be received.
vcd	Number that identifies the virtual connection.
rxPkts	Number of packets received from the learned MPS.
txPkts	Number of packets transmitted to the learned MPS.
Remote Devices known	List of other devices (typically other MPCs) not in this ELAN.
vcd	Number that identifies the virtual connection to that MPC.
rxPkts	Number of packets received from the learned remote device.
txPkts	Number of packets transmitted to the learned remote device.

Related Commands **mpoa client name**

show mpoa client cache

Use the **show mpoa client cache** command to display the ingress or egress cache entries matching the IP addresses for the MPCs.

show mpoa client [**name** *mpc-name*] **cache** [**ingress** | **egress**] [**ip-address** *ip-address*]

Syntax Description

name *mpc-name*	(Optional) Keyword to specify the name of the MPC.
ingress	(Optional) Keyword to display ingress cache entries associated with an MPC.
egress	(Optional) Keyword to display egress cache entries associated with an MPC.
ip-address *ip-address*	(Optional) Keyword to display cache entries that match the specified IP address.

Defaultss

The system defaults are:

- All MPC information is displayed.
- Both caches are shown.
- All IP address entries are shown.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Usage Guidelines

The more optional parameters specified, the more filtering is applied to the **show** command.

Examples

This example shows output from the **show mpoa client cache** command for a specific MPC:

```
ATM#show mpoa client ip_mpc cache
MPC Name: ip-mpc, Interface: ATM1/0, State: Up
MPC actual operating address: 47.00918100000000613E5A2F01.0010A6943825.00
Shortcut-Setup Count: 1, Shortcut-Setup Time: 1
Number of Ingress cache entries: 1
MPC Ingress Cache Information:
Dst IP addr     State   vcd Expires Egress MPC Atm address
20.20.20.1      RSVLD    35   11:38 47.00918100000000613E5A2F01.00000C5A0C5D.00
Number of Egress cache entries: 1
MPC Egress Cache Information:
Dst IP addr         Dst MAC       Src MAC     MPSid  Elan Expires  CacheId  Tag
10.10.10.1      0000.0c5a.0c58 0060.7017.4820     9     2   11:55        1    1
ATM#
```

Table 7-14 describes the fields in the **show mpoa client cache** output.

Table 7-14 show mpoa client cache Command Output Fields

Field	Description
MPC Name	Name specified for the MPC.
Interface	Interface to which the MPC is attached.
State	Current state of the MPC (up or down).
MPC actual operating address	ATM address of the MPC.
Shortcut-Setup Count	Current number specified by the **shortcut-frame-count** command.
Number of Ingress cache entries	Number of entries in the ingress cache.
MPC Ingress Cache Information:	
Dst IP addr	IP address of the destination.
State	State of the ingress cache entry[1].
vcd	Number that identifies the virtual connection.
Expires	Time in minutes/seconds until the ingress cache entry expires.
Egress MPC Atm address	ATM address of the egress MPC.
Number of Egress cache entries	Number of entries in the egress cache.
MPC Egress Cache Information:	
Dst IP addr	IP address of the destination.
Dst MAC	MAC address of the destination.
Src MAC	MAC address of the source.
MPSid	Unique number representing the egress MPS.
Elan	ELAN identifier of the ELAN serving this destination IP address.
Expires	Time in minutes/seconds until the egress cache entry expires.

Table 7-14 show mpoa client cache Command Output Fields (continued)

Field	Description
CacheID	Cache identifier.
Tag	Tag identifier.

1. Valid states are initialized, trigger, refresh, hold_down, resolved, and suspended.

Related Commands **clear mpoa client cache**

show mpoa client statistics

Use the **show mpoa client statistics** command to display all the statistics collected by an MPC.

show mpoa client [**name** *mpc-name*] **statistics**

Syntax Description

name *mpc-name* (Optional) Keyword to specify the name of the MPC.

Defaults

The defaults are that all the statistics collected by an MPC are displayed.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Usage Guidelines

This command displays all the statistics collected by an MPC.

Examples

This example shows output from the **show mpoa client statistics** command for the MPC ip_mpc:

```
ATM#show mpoa client name ip_mpc statistics
MPC Name: ip_mpc, Interface: ATM1/0, State: Up
MPC actual operating address: 47.00918100000000613E5A2F01.0010A6943825.00
Shortcut-Setup Count: 1, Shortcut-Setup Time: 1

                            Transmitted       Received
MPOA Resolution Requests              2              0
MPOA Resolution Replies               0              2
MPOA Cache Imposition Requests        0              0
MPOA Cache Imposition Replies         0              0
MPOA Cache Purge Requests             0              0
MPOA Cache Purge Replies              0              0
MPOA Trigger Request                  0              0
NHRP Purge Requests                   0              0


Invalid MPOA Data Packets Received: 0
ATM#
```

Related Commands

show mpoa client

show mpoa default-atm-addresses

Use the **show mpoa default-atm-addresses** command to display the default ATM addresses for the MPC.

show mpoa default-atm-addresses

Syntax Description

This command has no keywords or arguments.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows output from the **show mpoa default-atm-addresses** command when the switch prefix is NOT available:

```
ATM#show mpoa default-atm-addresses
interface ATM1/0:
MPOA Server: ...006070174824.**
MPOA Client: ...006070174825.**
note: ** is the MPS/MPC instance number in hex

interface ATM2/0:
MPOA Server: ...006070174844.**
MPOA Client: ...006070174845.**
note: ** is the MPS/MPC instance number in hex
ATM#
```

This example shows output from the **show mpoa default-atm-addresses** command when the switch prefix is available:

```
ATM#show mpoa default-atm-addresses
interface ATM1/0:
MPOA Server: 47.0091810000000613E5A2F01.006070174824.**
MPOA Client: 47.0091810000000613E5A2F01.006070174825.**
note: ** is the MPS/MPC instance number in hex

interface ATM2/0:
MPOA Server: 47.10000000000000000000000.006070174844.**
MPOA Client: 47.10000000000000000000000.006070174845.**
note: ** is the MPS/MPC instance number in hex
ATM#
```

Related Commands

atm-address

show sscop

Use the **show sscop** command to show SSCOP details for all ATM interfaces.

show sscop

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows sample output from the **show sscop** command:

```
ATM#show sscop
SSCOP details for interface ATM0
   Current State = Idle,   Uni version = 3.0
   Send Sequence Number: Current = 0,  Maximum = 10
   Send Sequence Number Acked = 0
   Rcv Sequence Number: Lower Edge = 0, Upper Edge = 0, Max = 10
   Poll Sequence Number = 0, Poll Ack Sequence Number = 0
   Vt(Pd) = 0
   Connection Control:  timer = 1000
   Timer currently Inactive
   Timer_Keepalive = 30000
   Current Retry Count = 0, Maximum Retry Count = 10
   AckQ count = 0, RcvQ count = 0, TxQ count = 0
   Local connections currently pending = 0
   Max local connections allowed pending = 50
   Statistics -
      Pdu's Sent = 0, Pdu's Received = 0, Pdu's Ignored = 0
      Begin = 0/0, Begin Ack = 0/0, Begin Reject = 0/0
      End = 0/0, End Ack = 0/0
      Resync = 0/0, Resync Ack = 0/0
      Sequenced Data = 0/0, Sequenced Poll Data = 0/0
      Poll = 0/0, Stat = 0/0, Unsolicited Stat = 0/0
      Unassured Data = 0/0, Mgmt Data = 0/0, Unknown Pdu's = 0
ATM#
```

Table 7-15 describes the possible fields (depending on the port type queried) in the **show sscop** output.

Note Interpreting the output of the **show sscop** command requires a thorough understanding of SSCOP. This information is used by Cisco technicians to help diagnose network problems.

Table 7-15 show sscop Command Output Fields

Field	Description
SSCOP details for interface	Interface for which details are returned.
Current State	Current SSCOP state for the interface.
Uni version	Version of UNI configured on the interface.
Send Sequence Number	Current and maximum send sequence number.
Send Sequence Number Acked	Sequence number of packets already acknowledged.
Rcv Sequence Number	Sequence number of packets received.
Poll Sequence Number	Current poll sequence number.
Poll Ack Sequence Number	Poll sequence number already acknowledged.
Vt(Pd)	Number of Pd frames sent that triggers the sending of a Poll frame.
Connection Control	Timer value for establishing and terminating SSCOP, and indicates whether the timer is active or inactive.
Timer_Keepalive	Timer value used to send keepalives on an idle link.
Current Retry Count	Current count of the retry counter.
Maximum Retry Count	Maximum number of retries allowed.
AckQ count	Current value of the acknowledgment queue count.
RcvQ count	Current value of the receive queue count.
TxQ count	Current value of the transmit queue count.
Local connections currently pending	Current number of local connections pending.
Max local connections allowed pending	Maximum number of pending local connections.
Pdu's Sent	Total number of SSCOP frames sent.
Pdu's Received	Total number of SSCOP frames received.
Pdu's Ignored	Number of invalid SSCOP frames ignored.
Begin	Number of Begin frames sent/received.
Begin Ack	Number of Begin Ack frames sent/received.
Begin Reject	Number of Begin Reject frames sent/received.
End	Number of End frames sent/received.
End Ack	Number of End Ack frames sent/received.
Resync	Number of Resync frames sent/received.
Resync Ack	Number of Resync Ack frames sent/received.
Sequenced Data	Number of Sequenced Data frames sent/received.

Table 7-15 show sscop Command Output Fields (continued)

Field	Description
Sequenced Poll Data	Number of Sequenced Poll Data frames sent/received.
Poll	Number of Poll frames sent/received.
Stat	Number of Stat frames sent/received.
Unsolicited Stat	Number of Unsolicited Stat frames sent/received.
Unassured Data	Number of Unassured Data frames sent/received.
Mgmt Data	Number of Mgmt Data frames sent/received.
Unknown Pdu's	Number of Unknown SSCOP frames sent/received.

Related Commands

sscop cc-timer
sscop keepalive-timer
sscop max-cc
sscop poll-timer
sscop receive-window
sscop send-window

show version—ATM

Use the **show version** ATM command to display version information for the ATM module.

show version

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default setting.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to display version information for the ATM module:

```
ATM#show version
Cisco Internetwork Operating System Software
IOS (tm) C5kATM Software (ALC-A-M), Version 11.2(11P), RELEASE SOFTWARE (fc1)
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Mon 02-Mar-98 13:46 by integ
Image text-base: 0x40010000, data-base: 0x401CB9E0

ROM: System Bootstrap, Version 3.2(11P), SOFTWARE

ATM uptime is 4 weeks, 1 day, 17 hours, 17 minutes
System restarted by power-on
Running default software

cisco C5kALC (68ec030) processor (revision 0x00) with 11264K bytes of memory.
Processor board ID 1610612736, with hardware revision

Last reset from
Authorized for ATM software set. (0x0)
1 Ethernet/IEEE 802.3 interface(s)
1 ATM network interface(s)
127K bytes of non-volatile configuration memory.

Configuration register is 0x1901
ATM#
```

Table 7-16 describes the fields in the **show version** output.

Table 7-16 show version Command Output Fields

Field	Description
Version	Version information for the Catalyst 5000 family and 2926G series ATM module software.
Compiled	Date and time the software was compiled.

Table 7-16 show version Command Output Fields (continued)

Field	Description
ROM: System Bootstrap, Version	Bootstrap version.
ATM Module uptime is	Amount of uninterrupted time that the system has been up and running.
System restarted by	Status on how the system was last booted, either as a result of normal system startup or of system error. For example, an attempt to access a nonexistent address results in this bus error: `System restarted by bus error at PC 0xC4CA, address 0x210C0C0`
Running default software	If the software was booted over the network, the Internet address of the boot host is shown. If the software was loaded from onboard ROM, this line reads "Running default software." In addition, the names and sources of the host and network configuration files are shown.
cisco....	The remaining output shows the hardware configuration and any nonstandard software options.
Configuration register is	Configuration register contents, displayed in hexadecimal notation.

shutdown

Use the **shutdown** command to shut down a physical interface. Use the **no** form of this command to restart the interface.

[**no**] **shutdown**

Syntax Description

This command has no arguments or keywords.

Defaults

The interface is enabled.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to access and shut down the atm0 interface:

```
ATM(config)#interface atm0
ATM(config-if)#shutdown
ATM(config-if)#
```

This example shows how to access and then restart the atm0 interface:

```
ATM(config)#interface atm0
ATM(config-if)#no shutdown
ATM(config-if)#
```

sscop cc-timer

Use the **sscop cc-timer** command to change the SSCOP connection control timer value. Use the **no** form of this command to restore the default value.

[**no**] **sscop cc-timer** *msecs*

Syntax Description

msecs	Number of microseconds between Begin messages; the range of *msecs* is from 1 to 60000.

Defaults

The default SSCOP connection control timer value is 10 seconds.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

The SSCOP connection control timer determines the time between transmission of SSCOP BGN, END, or RS PDUs as long as an acknowledgment has not been received.

Examples

This example shows how to set the SSCOP connection control timer value to 15 microseconds:

```
ATM(config-if)#sscop cc-timer 15
```

Related Commands

show sscop

sscop keepalive-timer

Use the **sscop keepalive-timer** command to change the SSCOP keepalive timer value. Use the **no** form of this command to restore the default value.

[**no**] **sscop keepalive-timer** *msecs*

Syntax Description

msecs	Number of microseconds the ATM module waits between transmission of poll PDUs when no SD or SDP PDUs are queued for transmission or are outstanding pending acknowledgments. The range of *msecs* is from 1 to 60000.

Defaults

The default SSCOP keepalive timer value is 30 seconds.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to set the SSCOP keepalive timer to 15 microseconds:

```
ATM(config-if)#sscop keepalive-timer 15
```

Related Commands

show sscop

sscop max-cc

Use the **sscop max-cc** command to change the SSCOP connection control retry count. Use the **no** form of this command to restore the default value.

[**no**] **sscop max-cc** *retries*

Syntax Description

retries	Number of times that SSCOP attempts to transmit BGN (establishment), END (release), or RS (resynchronization) PDUs as long as an acknowledgment has not been received; the range of *retries* is from 1 to 127.

Defaults

The default SSCOP connection control retry count is 10 retries.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to set the SSCOP connection control retry count to 20:

```
ATM(config-if)#sscop max-cc 20
```

Related Commands

show sscop

sscop max-stat

Use the **sscop max-stat** command to change the SSCOP number of entries in a Stat frame. Use the **no** form of this command to restore the default value.

[**no**] **sscop max-stat** *entries*

Syntax Description

entries	Number of entries in a Stat frame; the range of *entries* is from 1 to 255.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to set the SSCOP entries in a Stat frame to 50:

```
ATM(config-if)#sscop max-stat 50
```

Related Commands

show sscop

sscop poll-timer

Use the **sscop poll-timer** command to change the SSCOP poll timer value. Use the **no** form of this command to restore the default value.

[**no**] **sscop poll-timer** *msecs*

Syntax Description

msecs	Number of microseconds the ATM module waits between transmission of POLL PDUs; the range of *msecs* is from 1 to 60000.

Defaults

The default SSCOP poll timer value is 10 seconds.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Usage Guidelines

The SSCOP poll timer controls the maximum time between transmission of POLL PDUs when SD or SDP PDUs are queued for transmission or are outstanding pending acknowledgments.

Examples

This example shows how to set the SSCOP poll timer to 15 microseconds:

```
ATM(config-if)#sscop poll-timer 15
```

Related Commands

show sscop

sscop receive-window

Use the **sscop receive-window** command to change the size of the SSCOP receiver window. Use the **no** form of this command to restore the default value.

[**no**] **sscop receive-window** *packets*

Syntax Description

packets	Number of packets the interface receives before it sends an acknowledgment to the ATM switch; the range of *packets* is from 1 to 127.

Defaults

The default size of the SSCOP receiver window is 7 packets.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to set the size of the SSCOP receiver window to 10 packets:

```
ATM(config-if)#sscop receive-window 10
```

Related Commands

show sscop

sscop send-window

Use the **sscop send-window** command to change the size of the SSCOP transmitter window. Use the **no** form of this command to restore the default value.

[**no**] **sscop send-window** *packets*

Syntax Description

packets	Number of packets the interface can send before it must receive an acknowledgment from the ATM switch; the range of *packets* is from 1 to 127.

Defaults

The default size of the SSCOP transmitter window is 7 packets.

Command Types

Cisco IOS ATM command.

Command Modes

Interface configuration.

Examples

This example shows how to set the size of the SSCOP transmitter window to 10 packets:

```
ATM(config-if)#sscop send-window 10
```

Related Commands

show sscop

terminal

Use the **terminal** command to set the number of lines displayed on-screen. Use the **no** form of this command to return the screen length to the default.

[**no**] **terminal length** [*screen-length*]

Syntax Description

screen-length	(Optional) Number of lines to display on-screen. The range of *screen-length* is from 0 to 512. A value of 0 disables pausing between screens of output.

Defaults

The default screen length is 24 lines.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to set the terminal length to 0 so that output scrolls on the screen without pausing:

```
ATM> terminal length 0
```

ubr+cos

Use the **ubr+cos** command to map the CoS value or range of values to a UBR+ VCC. Use the **no** form of this command to remove the configuration.

[**no**] **ubr+ cos** {*value* | *range*}

Syntax Description

value	Single CoS value
range	Range of CoS values.

Defaults

The default CoS range for a UBR+ VCC is from 4 to 7.

Command Types

Cisco IOS ATM command.

Command Modes

EXEC.

Examples

This example shows how to map traffic with CoS values between 5 and 7 to a UBR+ VCC:

```
ATM(lane-qos)# ubr+ cos 5-7
ATM(lane-qos)#
```

write terminal

Use the **write terminal** command to display the configuration information currently in running memory.

write terminal

Syntax Description

This command has no arguments or keywords.

Command Types

Switch command.

Command Modes

Privileged EXEC.

Usage Guidelines

You can also use this command in ATM EXEC mode to display the current ATM configuration information.

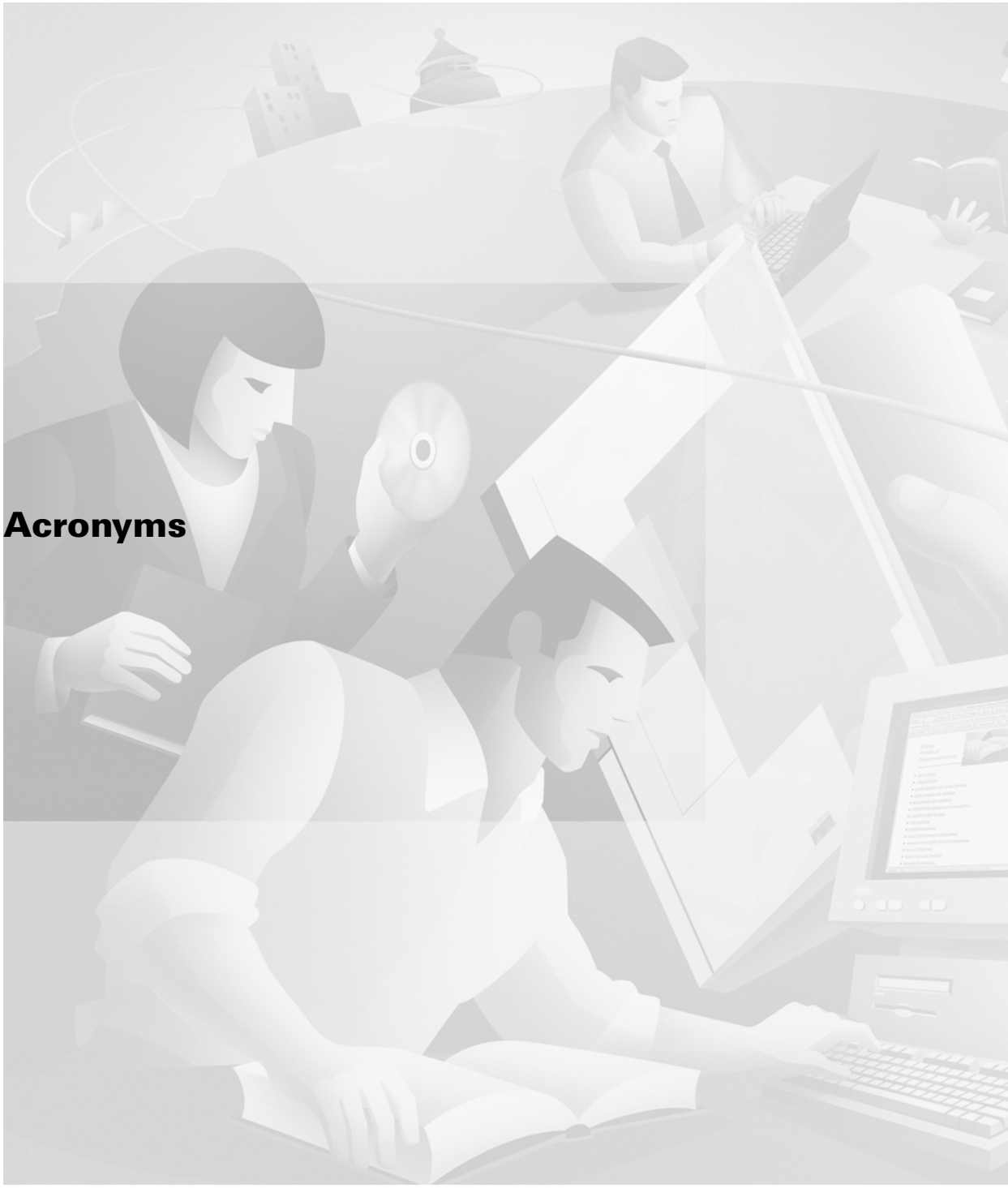
Examples

This example shows how to display the current ATM configuration information:

```
ATM#write terminal
Building configuration...

Current configuration:
!
version 11.2
!
hostname ATM
!
!
!
interface ATM0
 atm preferred phy A
 atm pvc 1 0 5 qsaal
 atm pvc 2 0 16 ilmi
 lane client ethernet 100
!
!
line con 0
line vty 0 4
 no login
!
end

ATM#
```



Acronyms

APPENDIX A

Acronyms

Table A-1 defines the acronyms used in this publication.

Table A-1 List of Acronyms

Acronym	Expansion
AAL	ATM adaptation layer
ACE	access control entry
ADM	add-drop multiplexer
AFI	authority and format identifier
AMP	active monitor present
APaRT	Automated Packet Recognition/Translation
ARP	Address Resolution Protocol
ATM	Asynchronous Transfer Mode
BDPU	bridge protocol data unit
BRF	Bridge Relay Function
BUS	broadcast and unknown server
CAM	content-addressable memory
CAS	column address strobe
CBR	constant bit rate
CDDI	Copper Data Distributed Interface
CDP	Cisco Discovery Protocol
CGMP	Cisco Group Management Protocol
CLI	command-line interface
COPS	Common Open Policy Service
CoS	class of service
CRC	cyclic redundancy check
CRF	Concentrator Relay Function
DCC	Data Country Code
DEC	Digital Equipment Corporation
DFI	domain-specific part format identifier

Table A-1 List of Acronyms (continued)

Acronym	Expansion
DHCP	Dynamic Host Configuration Protocol
DISL	Dynamic Inter-Switch Link
DMP	data movement processor
DNS	Domain Name System
DRiP	Dual Ring Protocol
DSAP	destination service access point
DTP	Dynamic Trunking Protocol
DTR	dedicated Token Ring, data terminal ready
EARL	Enhanced Address Recognition Logic
ECMA	European Computer Manufacturers Association
EEPROM	electrically erasable programmable read-only memory
EIA	Electronic Industries Association
ELAN	emulated local area network
ESI	end-system identifier
FCS	frame check sequence
FDDI	Fiber Distributed Data Interface
FDX	full duplex
FLX	fixed configuration module with long-haul, single-mode Gigabit fiber
FSSRP	Fast Simple Server Redundancy Protocol
FSX	fixed configuration module with short-haul, multi-mode Gigabit fiber
FTP	foil twisted-pair
GARP	General Attribute Registration Protocol
GBIC	Gigabit Interface Converter
GMRP	GARP Multicast Registration Protocol
GSP	Gigabit Switch Platform
GVRP	GARP VLAN Registration Protocol
HDX	half duplex
ICD	International Code Designator
ICMP	Internet Control Message Protocol
IDP	initial domain part
IGMP	Internet Group Management Protocol
ILMI	Integrated Local Management Interface
IMPL	initial microprogram load
IP	Internet Protocol
IPC	Interprocessor Communication
IPX	Internetwork Packet Exchange

Table A-1 List of Acronyms (continued)

Acronym	Expansion
ISL	Inter-Switch Link
ISO	International Organization of Standardization
KDC	Key Distribution Center
LAN	local area network
LANE	LAN emulation
LAT	local-area transport
LCP	Link Control Protocol
LEC	LAN Emulation Client
LECS	LAN Emulation Configuration Server
LEM	link error monitor
LER	link error rate
LES	LAN Emulation Server
LLC	logical link control
MAC	Media Access Control
MAP	Manufacturing Automation Protocol
MBS	maximum burst size
MCP	Master Communication Processor
me1	Mueslix E1
MIB	Management Information Base
MII	media-independent interface
MLS	Multilayer Switching
MLS-RP	Multilayer Switching-Route Processor
MLSP	Multilayer Switching Protocol
MM	multi-mode
MOP	Maintenance Operation Protocol
MOTD	message-of-the-day
MPC	Multiprotocol over ATM client
MPOA	Multiprotocol over ATM
MPS	Multiprotocol over ATM server
MTU	maximum transmission unit
NAUN	nearest active upstream neighbor
NBMA	non-broadcast multi-access
NBS	non-bused spare
NDE	NetFlow Data Export
NFFC	NetFlow Feature Card
NFFC II	Enhanced NetFlow Feature Card

Table A-1 List of Acronyms (continued)

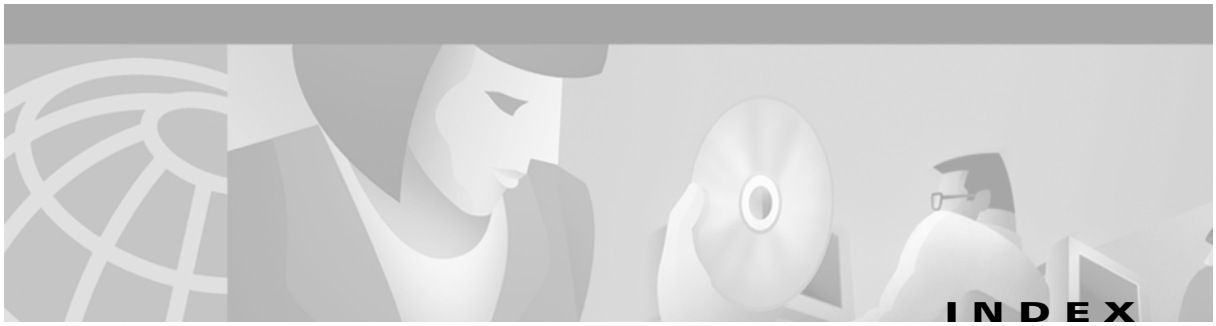
Acronym	Expansion
NFLS	NetFlow LAN Switching
NHC	Next Hop Client
NHRP	Next Hop Resolution Protocol
NHS	Next Hop Server
NMP	Network Management Processor
NNI	Network-to-Network Interface
NSAP	network service access point
NTP	Network Time Protocol
NVRAM	nonvolatile RAM
OAM	Operation, Administration, and Maintenance
OOB	out-of-band
OSI	Open System Interconnection
PAgP	Port Aggregation Protocol
PAM	port adapter module
PCM	pulse code modulation
PCMCIA	Personal Computer Memory Card International Association
PCR	peak cell rate
PDU	protocol data unit
PHY	physical sublayer
PLCP	physical layer convergence procedure
PLIM	physical layer interface module
PPP	Point-to-Point Protocol
PVC	permanent virtual circuit (or permanent virtual connection in ATM terminology)
QoS	quality of service
RADIUS	Remote Authentication Dial-In User Service
RAS	row address strobe
RCD	RAS-to-CAS Delay
RCP	Remote Copy Protocol
RIF	routing information field
RMON	remote monitoring
ROM	read-only memory
RP	Route Processor
RSM	Route Switch Module
SAID	Security Association Identifier
SAMBA	synergy advanced multipurpose bus arbiter
SAP	service access point

Table A-1 List of Acronyms (continued)

Acronym	Expansion
SAR	segmentation and reassembly
SCP	Serial Control Protocol
SCR	sustainable cell rate
SDP	Session Description Protocol
SE	search engine
SLIP	Serial Line Internet Protocol
SM	single-mode
SMP	standby monitor present
SMT	station management
SNA	System Network Architecture
SNAP	Subnetwork Access Protocol
SNMP	Simple Network Management Protocol
SPAN	Switched Port Analyzer
SRB	source-route bridging
SRT	source-route transparent bridging
SSCOP	Service-Specific Connection Oriented Protocol
SSRP	Simple Server Redundancy Protocol
STP	1) Spanning Tree Protocol 2) shielded twisted-pair
STPX	Spanning Tree Protocol Extensions (MIB)
SVC	switched virtual circuit
TACACS+	Terminal Access Controller Access Control System Plus
TCP/IP	Transmission Control Protocol/Internet Protocol
TFTP	Trivial File Transfer Protocol
TGT	ticket granting ticket
TIA	Telecommunications Industry Association
TLV	type-length value
TopN	Utility that allows the user to analyze port traffic by reports
ToS	type of service
TrBRF	Token Ring Bridge Relay Function
TrCRF	Token Ring Concentrator Relay Function
TRT	token rotation timer
TTL	Time To Live
TTY	teletype
TVX	valid transmission
UART	Universal Asynchronous Receiver/Transmitter
UBR	unspecified bit rate

Table A-1 List of Acronyms (continued)

Acronym	Expansion
UDLD	Unidirectional Link Detection Protocol
UDP	User Datagram Protocol
UNI	User-Network Interface
UTC	Coordinated Universal Time
VBR	variable bit rate
VC	virtual circuit
VCC	virtual channel connection
VCD	virtual channel descriptor
VCI	virtual circuit identifier
VCR	virtual configuration register
VLAN	virtual LAN
VMPS	VLAN Membership Policy Server
VPI	virtual path identifier
VQP	VLAN Query Protocol
VTP	VLAN Trunk Protocol
WRED	Weighted Random Early Detect
WRR	Weighted Round Robin



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