Software Configuration

This chapter describes how to use the Cisco IOS command-line interface (CLI) to configure the router and includes the following sections:

- Copying Configuration Files—If you are configuring your router by using a configuration file on a Flash PC card, read only this section.

- Configuring the Router with the Cisco IOS CLI—If you are configuring your router using the Cisco IOS CLI, read this section.

- Using Cisco IOS Software—If you are not familiar with the Cisco IOS CLI, read this section.

Note   Before you perform any of the configuration processes in this chapter, the router must be connected to a terminal or PC according to the "Connecting the Router to a PC" section in the "Installation" chapter earlier in this guide. If you are configuring the router from a PC, you should also read the "Configuring the Router from a PC" later in this chapter.

Copying Configuration Files

This section describes how to copy configuration files to and from the Flash PC card (referred to as *the card* in the rest of this section) to RAM and NVRAM. You might need to do this if you do either of the following tasks:

- Distribute router configuration files on cards to end users

- Configure the router using a configuration file that was given to you on a card

This section describes two processes:

- Copying a Configuration File from a Card to the Router
- Copying a Configuration File from the Router to a Card

Copying a Configuration File from a Card to the Router

Use this procedure if your systems administrator gives you, or installed in the router, a Flash PC card containing a configuration file. This procedure assumes that your router has not yet been configured.

Follow these steps to copy a configuration from a card to the router:

Step 1 Confirm that the card containing the configuration file is installed in the router.

If the card that contains your configuration file is not installed in your router, install the card according to the "Installing a Flash PC Card" section in the "Installation" chapter earlier in this guide.

Step 2 Turn the router on by pressing the power switch to the on (|) position.

While the router is booting up, a series of messages display on your terminal or PC. Wait until this message is displayed:

```
--- System Configuration Dialog ---
Would you like to enter the initial configuration dialog?[yes/no]:
```

Step 3 Enter **n** to exit the automatic configuration dialog and begin the copy process:

```
--- System Configuration Dialog ---
Would you like to enter the initial configuration dialog?
[yes/no]: n
Press RETURN to get started!
```

Step 4 Press **Return** to enter user EXEC mode:

```
Router>
```

Step 5   Enter the **enable** command to enter privileged EXEC mode (the enable password does not show up on the monitor):

```
c1400> enable
Password:<password>
c1400#
```

Step 6   Enter the **copy** command as shown to copy the file from the card to the router NVRAM (running memory):

```
Router# copy flash:filename running-config
```

Step 7   Enter **Return** at the following prompt:

```
Destination file name [running-config]? <Return>
361 bytes copied in 1.344 secs (361 bytes/sec)
c1400#
```

You have finished copying a file from the card to the router RAM (running configuration).

Step 8   To save the configuration to NVRAM (the startup configuration), enter the **copy** command as shown:

```
c1400# copy running-config startup-config
Building configuration...
[OK]
c1400#
```

Copying a Configuration File from the Router to a Card

Follow the steps in this section if you want to give someone else a copy of the configuration file that you are using on your router. This procedure assumes that the router has been configured.

Follow these steps to copy a file in RAM (the running configuration) to the card:

Step 1   Be sure that there is only one configuration file on the Flash PC card.

Step 2   Enter the **enable** command and your enable or enable secret password to enter privileged EXEC mode (the enable password does not show up on the monitor):

```
c1400> enable
Password:<password>
c1400#
```

Step 3   Enter the **copy** command to copy the running configuration to the card:

```
c1400# copy running-config flash:
```

Step 4   At the following prompt, press **Return** to name the file the default (shown in parentheses):

```
Destination filename [running-config]? <Return>
```

Step 5   At the following prompt, enter **n**:

```
Erase flash: before copying? [confirm]? n
```

You will see output similar to this:

```
Verifying checksum... OK (0x4213)
419 bytes copied in 1.23 seconds (419 bytes/sec)
c1400#
```

You have finished copying a file to the card.

Configuring the Router with the Cisco IOS CLI

This section describes how to configure the router using the Cisco IOS software command-line interface. The configuration shown in this section is an example. Your configuration might be different depending on your network.

More information on router configuration, including commands and examples, can be found on the Documentation CD-ROM that came with your router. Follow these links from the CD-ROM home page:

Cisco Product Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0: Configuration Guides and Command References.

Before You Begin

The configuration in this chapter is based on the following assumptions:

- The router is connected to one central-site router, which is located either at the central office of an ADSL service provider or at a corporate headquarters network.

- The router is using Point-to-Point Protocol (PPP) over ATM to connect to the central-site router.

Before you begin configuring, remember:

- You need to enter the commands in the order shown in the task tables. The task tables should be followed in the order that they appear.

- Required keywords are shown in bold. Enter these exactly as they appear in the table.

- Value examples are shown in italic. Substitute these values with values from your own network.

Configuring the Router

This section describes how to configure the router and contains the following sections:

- Configuring Global Parameters
- Configuring Passwords and Username
- Configuring the Ethernet Interface
- Configuring the ATM-25 or ADSL Interface
- Configuring Command-Line Access to the Router

Configuring Global Parameters

Use this table to configure the router for some global parameters.

Step	Task	Router Prompt	Command
1	Enter configuration mode.	Router#	**configure terminal**
2	Configure the router to show the dates and time of all debug messages. This step is optional, but recommended if you use debug commands to troubleshoot your configuration.	Router(config)#	**service timestamps debug datetime msec**

Step	Task	Router Prompt	Command
3	Configure the router to show the date and time of all log messages. This command is optional, but recommended if you use the verification steps described in this chapter. This feature is enabled for the command output example shown in this chapter.	`Router(config)#`	**service timestamps log datetime msec**

Configuring Passwords and Username

Use this table to configure the router with some security information, including the password used to access the router and the username and password used during PPP authentication.

Step	Task	Router Prompt	Command
1	Specify a password to prevent unauthorized access to the router. Passwords are case-sensitive.	`Router(config)#`	**enable password** *1400user*
2	Configure the router with a hostname, which is used in prompts and default configuration file names. For PPP authentication, the hostname entered with this command must match the username of the central-site router.	`Router(config)#`	**hostname** *c1400*
3	Specify the password used during CHAP and PAP authentication. The username entered with this command must match the hostname of the central-site router. Usernames and passwords are case-sensitive.	`c1400(config)#`	**username** *HQ* **password** *guessme*

Configuring the Ethernet Interface

Use this table to configure the Ethernet interface (which connects the router to your local network) with an IP address.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the Ethernet interface.	c1400(config)#	**interface ethernet0**
2	Configure this interface with an IP address and a subnet mask.	c1400(config-if)#	**ip address** *10.1.1.1 255.255.255.0*
3	Enable this interface and the configuration changes you have just made on the interface.	c1400(config-if)#	**no shutdown**
4	Exit configuration mode for this interface.	c1400(config-if)#	**exit**

Configuring the ATM-25 or ADSL Interface

Use this table to configure the ATM-25 interface (Cisco 1401 router) or ADSL interface (Cisco 1407 and Cisco 1417 routers), which connects your router to the ADSL line.

Step	Task	Router Prompt	Command
1	Enter configuration mode for the ATM-25 or ADSL interface. Use the **ATM0** keyword for both interface types.	c1400(config)#	**interface atm0**
2	Enable the interface.	c1400(config)#	**no shutdown**
3	Create a permanent virtual connection (PVC) on the ATM interface, identify the virtual path identifier and virtual channel identifier, and enter interface-ATM-VC configuration mode.	c1400(config-if)#	**pvc** *0/33*

Step	Task	Router Prompt	Command
4	Configure the ATM adaptation layer (AAL) and encapsulation type for the PVC, and assign a number to identify the virtual template. This command configures the interface for PPP routing.	c1400(config-if-atm-vc)#	**encap aal5mux ppp Virtual-Template**1
5	Exit interface-ATM-VC configuration mode.	c1400(config-if-atm-vc)#	**exit-vc**
6	Enter configuration mode for the virtual template.	c1400(config-if)#	**interface Virtual-Template**1
7	Configure the virtual template with an IP address and subnet mask.	c1400(config-if)#	**ip address** *10.0.0.1 255.0.0.0*
8	Exit configuration mode for the virtual template.	c1400(config-if)#	**exit**

Configuring Command-Line Access to the Router

Use this table to configure parameters that control access to the router.

Step	Task	Router Prompt	Command
1	Specify the console terminal line.	c1400(config)#	**line console** *0*
2	Set the interval that the router waits until user input is detected. If this interval passes before you have entered any commands, the router ends the console session. If this occurs, you must log into the router using the console and enable passwords.	c1400(config-line)#	**exec-timeout** *5*
3	Specify a virtual terminal for remote console access.	c1400(config-if)#	**line vty** *0 4*
4	Specify a password on the line.	c1400(config-line)#	**password** *lineaccess*
5	Enable password checking at terminal session login.	c1400(config-line)#	**login**
6	Exit configuration mode.	c1400(config-line)#	**end**

Using Cisco IOS Software

This section describes the conventions of the Cisco IOS CLI. If you are familiar with Cisco IOS software, you can skip this section.

Configuring the Router from a PC

To configure the router with a PC, the PC must have some type of terminal emulation software installed. The PC uses this software to send commands to your router.

Table 3-1 lists some common names for this software, based on the type of PC you are using.

Table 3-1   Terminal Emulation Software

PC Operating System	Software
Windows 98, Windows 95, Windows NT	HyperTerminal (included with Windows software)
Windows 3.1	Terminal (included with Windows software)
Macintosh	ProComm, VersaTerm (supplied separately)

You can use the terminal emulation to change settings for the type of device that is connected to the PC, in this case a router. Configure the software to the following settings so that your PC can communicate with your router:

- 9600 baud
- 8 data bits
- No parity
- 1 stop bit
- No flow control

Understanding Command Modes

This section describes the Cisco IOS command mode structure. Each command mode supports specific Cisco IOS commands. For example, the **interface** *type_number* command is used only in global configuration mode.

You use the following Cisco IOS command modes when configuring the scenarios described in this document:

- User EXEC
- Privileged EXEC
- Global configuration
- Interface configuration
- Router configuration
- Line configuration

Table 3-2 lists the command modes that are used in this guide, how to access each mode, the prompt you see in that mode, and how to exit that mode. The examples in the table use the hostname *1400*.

Table 3-2   Command Mode Summary

How to Enter	Prompt	How to Exit	About this Mode
User EXEC Mode			
Begin a session with your router.	1400>	Enter the **logout** command.	A subset of the commands available in this mode. Use this mode to
			• Change terminal settings.
			• Perform basic tests.
			• Display system information.

Table 3-2   Command Mode Summary (Continued)

How to Enter	Prompt	How to Exit	About this Mode
Privileged EXEC Mode			
Enter the **enable** command in user EXEC mode.	1400#	• To exit to user EXEC mode, enter the **disable** command. • To enter global configuration mode, enter the **configure** command.	Use this mode to configure your router operating parameters. You should configure your router with an enable password to prevent anyone from making unauthorized changes to the router configuration.
Global Configuration Mode			
Enter the **configure** command while in privileged EXEC mode.	1400(config)#	• To exit to privileged EXEC mode, enter the **exit** or **end** command, or press **Ctrl-Z**. • To enter interface configuration mode, enter the **interface** command.	Use this mode to configure parameters that apply to your router as a whole.
Interface Configuration Mode			
Enter the **interface** command (with a specific interface) in global configuration mode.	1400(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**. • To enter subinterface configuration mode, specify a subinterface with the **interface** command.	Use this mode to configure parameters for the LAN and WAN interfaces of your router: • Ethernet interface • ATM-25 interface • ADSL interface

Table 3-2   Command Mode Summary (Continued)

How to Enter	Prompt	How to Exit	About this Mode
Router Configuration Mode			
Enter your router command followed by the appropriate keyword in global configuration mode.	1400(config-router)#	• To exit to global configuration mode, enter the **end** command. • To exit to privileged EXEC mode, enter the **exit** command, or press **Ctrl-Z**.	Use this mode to configure an IP routing protocol.
Line Configuration Mode			
Specify a line with the **line vty** command in the global configuration mode.	1400(config-line)#	• To exit to global configuration mode, enter the **exit** command. • To enter privileged EXEC mode, enter the **end** command, or press **Ctrl-Z**.	Use this mode to configure parameters for the terminal line.

Getting Help

You can use the question mark (?) and arrow keys to help you enter commands. Here is how to get help while in any command mode:

• Enter a question mark to list the commands that are available in the current mode. You can restrict the list to all commands starting with a specific letter by entering that letter, followed by a question mark (no space):

```
Router (config-if)# s?
  shutdown
  snapshot
  snmp
  standby
```

- Enter a command, a space, and a question mark to list the available keywords (and a short definition of the keywords) that can be used with the command:

```
Router (config-if)# snapshot ?
  client Enable client control of Snapshot routing
  server Send routing updates out this link when updates are received
```

- Enter a command, a keyword, a space, and a question mark to list the range of values (and a short definition of the values) that you can enter with the command:

```
Router (config-if)# snapshot client ?
  <5-1000> duration, in minutes, of each active period
```

- Enter a few known characters to have the router complete the command. In this example, the command is **show hosts**:

```
Router> sh ho
Default domain is not set
Name/address lookup uses domain service
Name servers are 255.255.255.25
```

- To redisplay a command you previously entered, press the up-arrow key. You can continue to press the up-arrow key for more commands. The commands are shown in reverse order.

Enable Secret and Enable Passwords

Because many privileged-level EXEC commands are used to set operating parameters, you should password-protect these commands to prevent unauthorized use.

You use two commands to do this:

- **enable secret** *password* (a very secure, encrypted password)
- **enable** *password* (a less secure, unencrypted password)

You must enter an enable secret password to gain access to privileged EXEC mode commands.

The Cisco IOS software does not allow you to enter the same password for both the enable and the enable secret passwords. You will see this error message:

```
The enable password you have chosen is the same as your enable secret.
This is not recommended. Re-enter the password.
```

An enable secret password can contain from 1 to 25 uppercase and lowercase alphanumeric characters. An enable password can contain any number of uppercase and lowercase alphanumeric characters. In both cases, a number cannot be the first character. Spaces are also valid password characters; for example, *two words* is a valid password. Leading spaces are ignored; trailing spaces are recognized.

If you lose or forget your enable password, refer to the "Troubleshooting" appendix later in this guide.

Entering Configuration Mode

To make any configuration changes to your router, you must be in configuration mode. This section describes how to enter configuration mode while using a terminal or PC that is connected to your router CONSOLE port.

Take these steps to enter configuration mode:

Step 1   After your router boots up, enter **no** when the following question displays:

```
Would you like to enter the initial configuration dialog [yes]: no
```

Step 2   If you have configured your router with an enable password, enter the **enable** command, and enter the enable password when you are prompted for it.

The enable password does not show on the screen when you enter it. This example shows how to enter configuration mode on a Cisco 1400 router:

```
Router> enable
Password: <enable_password>
Router#
```

Enable mode is indicated by the pound sign (#) in the prompt. You can now make changes to your router configuration.

Step 3   Enter the **configure terminal** command to enter configuration mode, indicated by (config) # in the prompt:

```
Router# configure terminal
Router(config)#
```

You can now make changes to your router configuration.

Using Commands

This section provides some tips about entering Cisco IOS commands with the CLI.

Abbreviating Commands

You only have to enter enough characters for the router to recognize the command as unique. This example shows how to enter the **show configuration** command:

```
1400# show conf
Using 385 out of 7506 bytes
!
version 11.2
no service udp-small-servers
no service tcp-small-servers
.
.
.
```

Command-Line Error Messages

Table 3-3 lists some error messages you might encounter while using the CLI to configure your router.

Table 3-3   Common CLI Error Messages

Error Message	Meaning	How to Get Help
`% Ambiguous command:  "show con"`	You did not enter enough characters for your router to recognize the command.	Re-enter the command followed by a question mark (?) with no space between the command and the question mark.
		The possible keywords that you can enter with the command are displayed.
`% Incomplete command.`	You did not enter all of the keywords or values required by this command.	Re-enter the command followed by a question mark (?) with no space between the command and the question mark.
		The possible keywords that you can enter with the command are displayed.
`% Invalid input detected at '^' marker.`	You entered the command incorrectly. The error occurred where the caret mark (^) appears.	Enter a question mark (?) to display all of the commands that are available in this command mode.

Undoing Commands

To disable a feature or undo a command you entered, you can enter the keyword **no** before most commands; for example, to disable IP routing on an interface, enter **no ip routing**.

Saving Configuration Changes

You must enter the **copy running-config startup-config** command to save your configuration changes to NVRAM so that they are not lost if there is a system reload or power outage. This example shows how use this command to save your changes:

```
1400# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
```

It might take a minute or two to save the configuration to NVRAM. After the configuration has been saved, the privileged EXEC prompt will appear:

```
1400#
```