



Understanding Basic Hardware Architecture and Cisco IOS Software

The information in this chapter applies to the Cisco AS5350XM and Cisco AS5400XM universal gateways. This chapter provides a brief profile of the Cisco AS5350XM and Cisco AS5400XM universal gateway hardware components and functionality, explains how to use the Cisco IOS command-line interface (CLI), and describes how to upgrade your Cisco IOS software:

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The Cisco AS5350XM and Cisco AS5400XM universal gateways are versatile data and voice communications platforms that provide the functions of a gateway, router, and digital modems in a single modular chassis.

The gateways are intended for Internet service providers (ISPs), telecommunications carriers, and other service providers that offer managed Internet connections, and also medium to large sites that provide both digital and analog access to users on an enterprise network.

Basic Hardware Architecture



Note

The cards that reside in the Cisco AS5350XM and Cisco AS5400XM chassis are of two types: trunk feature cards, which provide an T1, E1, or channelized T3 interface, and universal port, dial-only, and voice feature cards, which host the universal digital signal processors (DSPs) that dynamically handle voice, dial, or fax calls.

[Figure 1](#) shows the logical and physical system architecture for the Cisco AS5350XM and Cisco AS5400XM universal gateways, and illustrates the components used to process a call.



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Figure 1 Cisco AS5350XM and Cisco AS5400XM Basic System Architecture

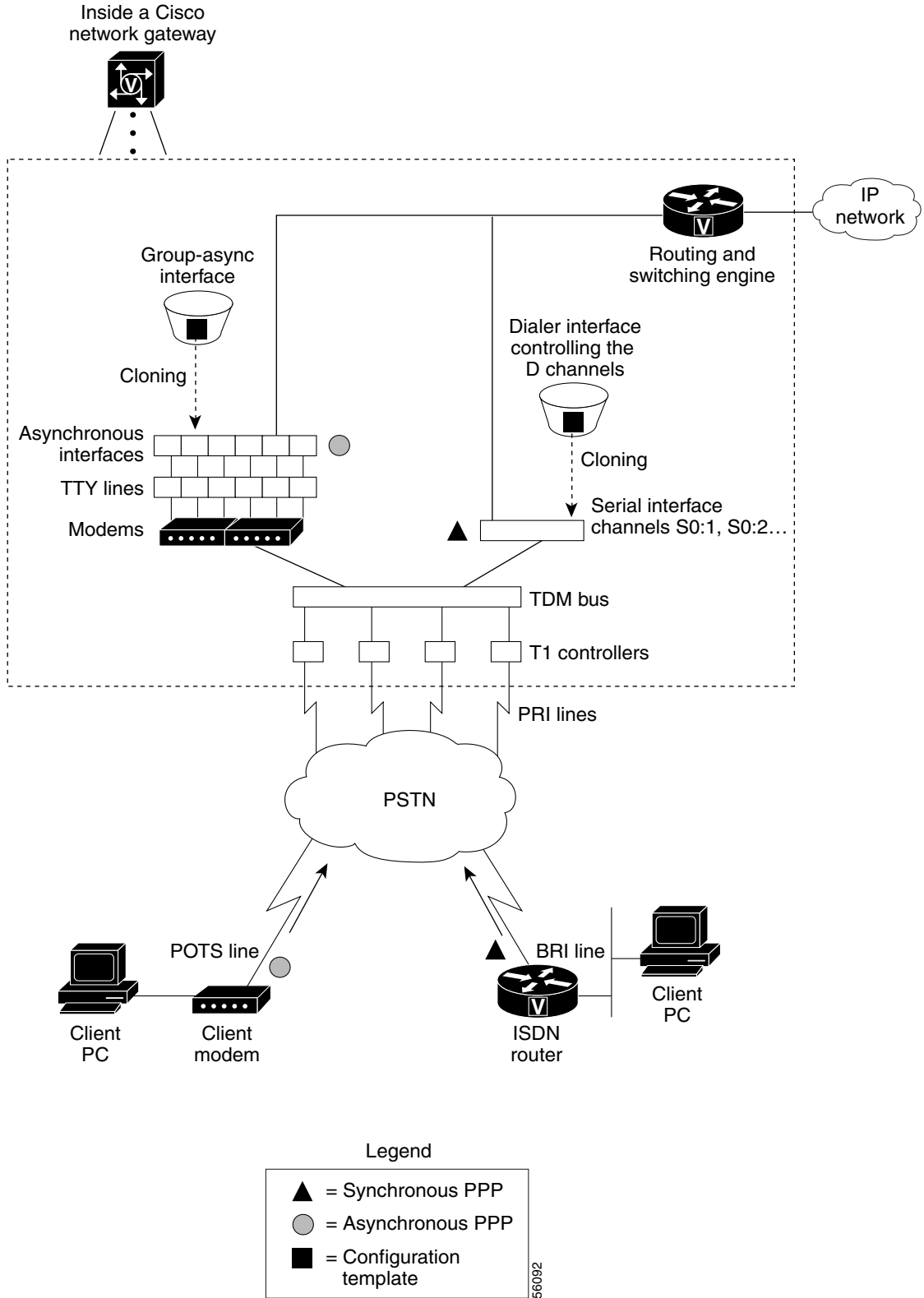


Figure 1 shows the following:

- Client modems and Integrated Services Digital Network (ISDN) routers dial into the gateway through the public switched telephone network (PSTN).
- Analog Point-to-Point Protocol (PPP) calls connect to modems inside the gateway.
- Each modem inside the gateway provides a corresponding TTY line and asynchronous interface for terminating character and packet mode services.
- Asynchronous interfaces clone their configurations from a group-async interface.
- Synchronous PPP calls connect to serial interface channels (for example, Se2/0:1 and Se2/0:2).
- Synchronous interfaces clone their configurations from a dialer interface.

One analog PPP call uses the following resources:

- One T1 DS0 channel
- One channel in a time-division multiplexing (TDM) bus
- One integrated modem
- One TTY line
- One asynchronous interface

One synchronous PPP call uses the following resources:

- One T1 DS0 channel
- One serial interface channel

Exploring the Cisco IOS File System

The Cisco IOS File System (IFS) feature provides a single interface to the following:

- Flash memory file system
- Network file system (TFTP, rcp, and FTP)
- Any other endpoint for reading or writing data (such as NVRAM, modem firmware, the running configuration, ROM, raw system memory and flash load helper log)



Note The Cisco AS5350XM and Cisco AS5400XM universal gateways use a Class C Flash File System.

IFS first appeared in Cisco IOS Releases 11.3 AA and 12.0. For more information about IFS, see the chapter “Using the Cisco IOS File System” in the *Cisco IOS Configuration Fundamentals Configuration Guide* for your software release.

Table 1 describes the memory locations.

Table 1 Memory Location Descriptions

Component	Description
CPU	750 MHz (Cisco AS5350XM and Cisco AS5400XM)
Processor memory	Stores the Cisco IOS image after it is initially read out of flash memory and decompressed (also known as main memory or DRAM). Also stores routing tables, call control blocks, and other data structures.
Packet I/O memory	Temporarily stores packets in transit.
System flash and flash memory	Stores Cisco IOS images, modem firmware/portware, and custom web pages.
NVRAM memory	Stores configurations in nonvolatile memory, which retains its contents when a unit is powered off.

To inspect the file system, enter the **show file systems** command and the **dir** command as shown in the following procedure.

Step 1 View the different file storage areas and file management functions:

```
Router# show file systems
File Systems:

      Size(b)      Free(b)      Type  Flags  Prefixes
      -----      -
      520184        520184      nvr   rw     nvr   :
      -             -            opa   rw     null:
      -             -            opa   rw     syst  :
      -             -            net   rw     tftp  :
      -             -            opa   wo     vfc:
* 32768000      22992256     fla   rw     fla   :
  7602176       4634364     fla   rw     fla   :
      -             -            opa   wo     lex:
      -             -            net   rw     rcp:
      -             -            net   rw     ftp:
```

In addition, verify that you have everything that you ordered (for example, 32 megabytes of flash memory). The asterisk (*) indicates the current directory.

Step 2 Display the objects in the system memory directory:

```
Router# dir system:
Directory of system:/

 4  dr-x          0          <no date>  memory
 1  -rw-         5026         <no date>  running-config
 2  dr-x          0          <no date>  ucode
14  dr-x          0          <no date>  vfiles
```



Note Remember to include the trailing colon (:) in **dir** commands.

Step 3 Inspect the contents of flash memory:

```
Router# dir flash:
Directory of flash:/
 1 -rw- 18442404 Oct 11 2004 16:52:54 +00:00 c5400-js-mz
 2 -rw- 11978 Sep 13 2004 13:27:22 +00:00 tb3-2-nemo-sip-stress.conf
 3 -rw- 18373376 Oct 05 2004 14:34:42 +00:00 c5400-js-mz-nm51520ef
 4 -rw- 18446620 Oct 06 2004 13:47:46 +00:00 c5400-js-mz.nemo.Sep30
```

In the example, the flash image is c5350-js-mz. The compressed file size is 1962796 bytes. The total flash memory size is 7602176 bytes. The number of free bytes is 4634364. The crashinfo file is a collection of useful information related to the current crash stored in system flash or flash memory.



Note For more information on crashinfo files, see the *Retrieving Information from the Crashinfo File* document, available online at <http://www.cisco.com/warp/public/63/crashinfo.html>.

Step 4 Display the contents of flash memory:

```
Router# pwd
flash:
Router# dir
 1 -rw- 9950528 Jan 01 2000 00:48:59 c5350-js-mz.121-1.XD1.bin

32768000 bytes total (22817344 bytes free)
```

The Cisco IOS image named c5350-js-mz.121-1.XD1.bin is present.

Step 5 Inspect the NVRAM directory:

```
Router# dir nvram:
Directory of nvram:/

 1 -rw- 0 <no date> startup-config
 2 ---- 0 <no date> private-config

520184 bytes total (520184 bytes free)
```

In the example, the startup-config and private-config are present. The private-config file is a secure file that is part of the startup configuration. It supports encryption technologies, but it is not user accessible.

Exploring Cisco IOS Software

This section describes what you need to know about the Cisco IOS software (the software that runs the gateway) before you configure the gateway using the CLI.

Understanding these concepts saves you time if you have no or minimal experience using the Cisco IOS software.

Getting Help

Use the question mark (?) and arrow keys to help you enter commands, where `Router>` is the prompt for the top level of the Cisco IOS software for the Cisco AS5350XM or Cisco AS5400XM universal gateway.

**Note**

The examples in this guide show prompts for either a Cisco AS5350XM or a Cisco AS5400XM universal gateway. However, regardless of the prompt or output shown, all examples apply to either type of gateway.

- For a list of available commands, enter a question mark:
Router> ?
- To complete a command, enter a few known characters followed by a question mark (with no space):
Router> s?
- For a list of command variables, enter the **show** command followed by a space and a question mark:
Router> show ?
- To redisplay a command you previously entered, press the Up Arrow key. You can continue to press the Up Arrow key for more commands.

Understanding Command Modes

You need to use many different command modes to configure the gateway. Each command mode restricts you to a subset of commands.

**Tip**

If you are having trouble entering a command, check the prompt, and then enter the question mark (?) for a list of available commands. You might be in the wrong command mode or using the wrong syntax.

In the following example, notice how the prompt changes after each command to indicate a new command mode:

```
Router> enable
Router> password
Router# configure terminal
Router(config)# interface gigabitethernet 0/0
Router(config-if)# ip address 172.16.254.250
Router(config-if)# exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

The last message is normal and does not indicate an error. Press **Return** to get the Router> prompt.

**Note**

You can press **Ctrl-Z** at any time to immediately return to enable mode (Router#), instead of entering **exit**, which returns you to the previous mode.

Finding Command Options

This section explains how to display options for a command. To display options for a command, enter a ? at the configuration prompt, or after entering part of a command followed by a space. The configuration parser displays options available with the command. For example, if you were in global configuration mode, typed the command **arap**, and wanted to see all the keywords and arguments for that command, you would type **arap ?**

	Command	Purpose
Step 1	Router> enable Password: <i>password</i> Router#	Enters enable mode. Enters the password. You are in enable mode when the prompt changes to Router#.
Step 2	Router# config terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)#	Enters global configuration mode. You are in global configuration mode when the prompt changes to Router (config)#.
Step 3	Router(config)# controller t1 1/? <0-1> Controller port number Router(config)# controller t1 1/0	Specifies the T1 controller that you want to configure using the controller T1 number global configuration command.
Step 4	Router(config-controller)# ? Controller configuration commands: cablelength Specify cable length for a DS1 link channel-group Specify timeslots to channel-group mapping for an interface default Set a command to its defaults description Controller specific description ds0 ds0 commands ds0-group Replacement of cas-group Configure group of timeslots to a particular signaling type exit Exit from controller configuration mode fdl Specify the FDL standard for a DS1 data link framing Specify the type of Framing on a DS1 link help Description of the interactive help system linecode Specify the line encoding method for a DS1 link loopback Put the entire T1 line into loopback no Negate a command or set its defaults pri-group Configure the specified timeslots for PRI shutdown Shut down a DS1 link (send Blue Alarm)	Displays controller configuration commands.
Step 5	Router(config-controller)# ds0-group ? <0-23> Channel number	Displays the options for the ds0-group controller configuration command. This command is used to configure the channel-associated signaling on a T1 controller.
Step 6	Router(config-controller)# ds0-group 1 ? timeslots List of timeslots in the ds0-group	Displays the only command (timeslots) available in ds0-group 1 .

It might take a minute or two to save the configuration to NVRAM. After the configuration has been saved, the following appears:

```
[OK]
Router#
```

**Timesaver**

You can use the question mark (?) and arrow keys to help you enter commands.

**Timesaver**

Each command mode restricts you to a set of commands. If you are having difficulty entering a command, check the prompt and then enter the question mark (?) for a list of available commands. You might be in the wrong command mode or using the wrong syntax.

**Timesaver**

If you want to disable a feature, enter the keyword **no** before the command; for example, **no ip routing**.

**Timesaver**

You need to save your configuration changes to NVRAM so that they are not lost if there is a system reload or power outage.

Upgrading to a New Cisco IOS Release

Obtain new Cisco IOS features and more stable code by upgrading to a new Cisco IOS release.

Step 1 Display the contents of flash memory:

```
Router# cd flash:
Router# dir
Directory of flash:/

1  -rw-      9950528   Jan 01 2000 00:48:59  c5350-js-mz.121-1.XD1.bin

32768000 bytes total (13041600 bytes free)
```

Step 2 Copy the new image from the remote TFTP server into flash memory. Make sure that you specify your own TFTP server's IP address and Cisco IOS filename. If you encounter issues with upgrading the image, be sure that you can ping the TFTP server and that appropriate directory permissions are configured on the TFTP server. To see the bangs (!) during the download operation, enable line wrap in your terminal emulation software.

**Note**

If you have available space for two images, leave both images in flash memory. If necessary, you can easily revert back to the previous image. Enter the **boot system flash newiosname.bin** command to point to the new image filename. By default, the first image in flash memory is loaded.

If you do not have available space, during the copy operation the system displays a message telling you to delete the current file and squeeze the flash memory to make room for the new image. Enter the **delete flash:version** command, followed by the **squeeze flash** command, to perform this delete-and-squeeze operation. Then proceed with the copy operation.

- Step 5** Reload the Cisco AS5350XM or Cisco AS5400XM universal gateway to run the new image. If you erased the old Cisco IOS image, make sure that the **boot system flash oldiosname.bin** command is not enabled and pointing to the old image filename; otherwise, the gateway becomes stuck trying to reload the old image over and over again.

```
Router# reload
Proceed with reload? [confirm]

System Bootstrap, Version 12.0(20000106:234457) [tombnyg-rommon_1_6 106],
SOFTWARE REV 1.6
Copyright (c) 1994-2000 by cisco Systems, Inc.
AS5400XM platform with 524288 Kbytes of main memory

Self decompressing the image : #####
##### [OK]
Self decompressing the image : #####
#####
#####
#####
#####
##### [OK]
Press RETURN to get started!
```



Note Most sections of the boot sequence have been omitted from the example.

For more information about TFTP, see the *Loading and Maintaining System Images and Microcode* document, available online at http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/fun_c/fcprt2/fcimages.htm



Tip

On system reload, if the console session freezes or displays unusual characters on the screen, you may have a console session mismatch between the Cisco IOS console line speed and the terminal server speed. This mismatch may occur because of the program settings of your console or your terminal server speed.



Note

Before you proceed to correct session mismatch, verify that your problem is not due to a defective cable or improper cable connection. Check your cable connection or replace the cable and reload the system again.

To correct a console session mismatch, do one of the following:

- Change your console line speed.
- Change your terminal server speed.
- If the above two solutions do not correct the console session, install the console jumper on the motherboard to set your default console port speed to 9600 bps.

Changing Console Line Speed



Caution

Changing your console line speed on an active Cisco AS5350XM or Cisco AS5400XM universal gateway results in a temporary loss of synchronization between the console line and terminal port speeds. At this point, the gateway may recognize a false **send break** command that may result in your system crashing.

To avoid this problem, you can do one of the following:

- If the configuration register on your Cisco AS5350XM or Cisco AS5400XM already has the Break Abort Effect bit set (mask is 0x0100), then you are protected and the false send break event does not occur. (You can change the configuration register to have this bit set, but the change does not take effect until your gateway is rebooted.)
- If the configuration register does not have the Break Abort Effect bit set (mask 0x0100), then disconnect the cable on the console port and either log in to the Cisco AS5350XM or Cisco AS5400XM universal gateway through the AUX port or telnet in through a VTY session. Change the console line speed and the related terminal server speed, and then reconnect the console cable.

Log in to your Cisco AS5350XM or Cisco AS5400XM universal gateway through the AUX port or Telnet VTY session. Enter the **show running-config** command and determine the speed your line console is set for. Possible console speeds are 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200. The default setting is 9600.

If your gateway is in ROM monitor mode, then the AUX port is not functioning. You must then change the terminal server port speed through your console port connection until the `rommon>` prompt is displayed. See [Appendix B, “ROM Monitor.”](#)

Changing Gateway Line Speed

The following example shows how to configure line speed on a Cisco AS5350XM or Cisco AS5400XM universal gateway, beginning in global configuration mode:

```
Router(config)# line 3
Router(config-line)# speed speed_value
```

Upgrade the ROM Monitor Image

Use the **upgrade rom-monitor** command to upgrade the ROM monitor to a new version. The Cisco AS5350XM and Cisco AS5400XM universal gateways have two ROM monitor images. The original image shipped with your system is a read-only image that cannot be erased or altered in the field; the second image is read-and-write upgradable by the field. This eliminates or reduces the need to physically replace the hardware in order to get a new image.

The **upgrade rom-monitor** commands allow you to:

- Load the upgrade ROM monitor image.
- Configure your system to point to the upgrade ROM monitor image at the next reboot of your router.
- Select the read-only ROM monitor image for execution on the next reboot.
- Display both ROM monitor image versions and which ROM monitor image is currently selected.

**Note**

If the upgrade ROM monitor image fails to boot, the router will mark this ROM monitor image as invalid and revert to the read-only image.

The first time a new ROM monitor image is loaded, you must allow the system to boot ROM monitor before doing any additional resets or power cycling. If the ROM monitor-loading process is interrupted, the system interprets this as a bootup failure of the new ROMmon image and reverts to the read-only image.

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	upgrade rom-monitor file {archive: [file-path] cns: [file-path] flash: [file-path] ftp: [file-path] http: [file-path] null: [file-path] nvram: [file-path] pram: [file-path] rcp: [file-path] system: [file-path] tftp: [file-path]} Example: Router# upgrade rom-monitor file tftp: //00.0.00.0/biff/AS5350_RMFUR.srec	Loads the upgrade ROM monitor image from a specified source directory filename. In the example, you are loading the ROM monitor image from a TFTP server using a TFTP path name.

Selecting a ROM Monitor Image for Execution

This section contains the procedure to select a ROM monitor image for execution on the next reboot. Use this procedure if you want to replace the upgrade ROM monitor image, which has been selected, with the read-only ROM monitor image. The read-only ROM monitor image will then be booted on the next reload of the gateway.

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables Privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	upgrade rom-monitor preference [readonly upgrade] Example: Router# upgrade rom-monitor preference readonly	When in Cisco IOS, this command in Privileged EXEC mode selects either the read-only or upgrade ROM monitor image as the image to be booted on the next reload. <ul style="list-style-type: none"> In this example, you are selecting the read-only ROM monitor image. One reason could be that the upgrade image has features or side effects you do not like.

Verifying the ROM Monitor Image

To verify whether the upgrade ROM monitor or the read-only ROM monitor image has been installed, perform the following steps.

Step 1 enable

Enables privileged EXEC mode. Enter your password if prompted.

```
Router> enable
```

Step 2 show rom-monitor

When in Cisco IOS, this command in privileged EXEC mode shows both the read-only and the upgrade ROM monitor image versions, as well as which ROM monitor image is running.

```
Router# show rom-monitor
```

```
ReadOnly ROMMON version is:
System Bootstrap, Version 12.3(12r)PI6, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2004 by cisco Systems, Inc.
```

```
Upgrade ROMMON version is:
System Bootstrap, Version 12.3(12r)PI6, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2004 by cisco Systems, Inc.
```

```
Currently running ROMMON from ReadOnly region
ROMMON from ReadOnly region is selected for next boot
```

Where to Go Next

At this point you should go to these references:

- [Chapter 2, “Verifying Basic Setup,”](#) to analyze your system and execute basic tasks and system configuration before configuring the Cisco AS5350XM or Cisco AS5400XM universal gateway using the CLI to prepare your system for data call processing.



Tip

The following publications are available on the Documentation DVD, or on the World Wide Web from the Cisco home page.

- Cisco IOS publications *Dial Solutions Configuration Guide* and *Dial Solutions Command Reference* provide additional basic configuration information. For more advanced configuration topics, see the Cisco IOS software configuration guide, feature modules, and command reference publications that pertain to your Cisco IOS software release.
- For troubleshooting information, see the *System Error Messages* and *Debug Command Reference* publications.

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