CISCO SYSTEMS

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Release Notes for Cisco IOS Release 11.2(3) Software Feature Packs—Cisco 2500 Series Routers

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These release notes identify the Cisco Internetwork Operating System (Cisco IOS) Release 11.2 feature packs for Cisco 2500 series routers (Cisco and CiscoPro models). Product numbers for supported feature packs are as follows:

- CD25-C-11.2= (Cisco 2500 IP Feature Pack)

- CD25-CP/E-11.2= (Cisco 2500 IP Plus Feature Pack)

- CD25-CW-11.2= (Cisco 2500 IP Plus 40 Feature Pack)

- CD25-CY-11.2= (Cisco 2500 IP Plus 56 Feature Pack)

- CD25-B-11.2= (Cisco 2500 IP/IPX/AT/DEC Feature Pack)

- CD25-BP-11.2= (Cisco 2500 IP/IPX/AT/DEC Plus Feature Pack)

- CD25-BW-11.2= (Cisco 2500 IP/IPX/AT/DEC Plus 40 Feature Pack)

- CD25-BY-11.2= (Cisco 2500 IP/IPX/AT/DEC Plus 56 Feature Pack)

- CD25-A-11.2= (Cisco 2500 Enterprise Feature Pack)

- CD25-AP-11.2= (Cisco 2500 Enterprise Plus Feature Pack)

- CD25-AW-11.2= (Cisco 2500 Enterprise Plus 40 Feature Pack)

- CD25-AY-11.2= (Cisco 2500 Enterprise Plus 56 Feature Pack)

These release notes include tables that identify feature packs and tables that show the specific features comprising available feature sets for each supported Cisco router. These release notes also help you navigate the electronic documentation for Cisco IOS Release 11.2 documentation. The Cisco Router Software Loader, delivered on the same CD-ROM as the Cisco IOS feature sets, is designed to work from a PC running Microsoft Windows 95. These release notes also describe how to install the router software feature sets using a PC running Microsoft Windows 3.1.

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> **Note** Before running the Cisco Router Software Loader, read the section "Installation Tips," page 6.

These release notes contain the following sections:

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> **Note** A feature pack can contain multiple feature sets, and each feature set contains many features.

Platforms Supported

The Cisco Router Software Loader supports the following Cisco 2500 series routers:

- CiscoPro CPA2501, CPA2502, CPA2503, CPA2504, CPA2505, CPA2507, CPA2509, CPA2511, CPA2513, CPA2514, CPA2516, CPA2520, CPA2521, CPA2522, CPA2523, and CPA2524
- Cisco 2501, 2502, 2503, 2504, 2505, 2507, 2509, 2511, 2513, 2514, 2516, 2520, 2521, 2522, 2523, and 2524

Loading Cisco IOS Release 11.2 Software on CiscoPro Routers

The Router Software Loader contains an upgrade utility that permanently modifies a CiscoPro router so that it will accept the Cisco IOS Release 11.2 software images.

The utility changes the router's SysObjectID SNMP MIB (used for network management) from CiscoPro to that of a Cisco router. The software banner also changes so that it no longer identifies the router as a CiscoPro product.

> **Caution** If, when using the Router Software Loader, you select **Preconfigured router** and you uncheck the **Configure Ethernet interface 0** box (or **Token Ring 0**), the upgrade utility will load selected Cisco image successfully to the router's Flash memory, but the router will reboot in ROM monitor mode.

If this happens, log into the router via the console port with Telnet or terminal emulation software. At the prompt ("rommon 1>" or ">"), enter the **b flash** command. The router will reboot to the new image in Flash memory.

Caution   Remember that you must manually change the Configuration Register of the router back to the original setting it had before the loading process. After the router reboots, enter enable mode by typing **enable** <**Return**>, followed by the password if set. Enter configuration mode by typing **config t** <**Return**>, then enter the commands: **config-register 0x2102** <**Return**> and **exit** <**Return**>.

Note   After this upgrade, your router will no longer be recognized by CiscoVision. If you perform the permanent upgrade and currently use the CiscoVision network management application, CiscoWorks for Windows is a recommended replacement for network management purposes. You can upgrade your CiscoVision software to CiscoWorks Windows 2.1 by ordering one of the following: CPW-CVCW-U to Upgrade CiscoVision to CiscoWorks Windows (managing up to 50 nodes), or CPW-CVCW-ENT-U to Upgrade CiscoVision to CiscoWorks Windows (managing up to 500 nodes).

The upgrade utility must be in the same directory as the selected image. If it is not, the upgrade utility will inform you that the image is not present. If you use an image directory other than the one on the CD, make sure you copy the proper upgrade utility to that directory. The Cisco 2500 series upgrade utility is cpa25-upgrade-l.112-3.P.

Cisco Feature Pack Descriptions

This section describes the Cisco feature packs, listing the software feature sets comprising each pack. You can use this information to identify your feature pack set in conjunction with the corresponding information provided in the tables in the section "Cisco IOS Release 11.2 Feature Sets," page 10. Tables in that section identify which features are supported for a feature set on a specific platform.

Software Feature Packs

Table 1 identifies each feature pack as specified on the label of the CD containing the router software. It also lists the feature sets comprising the feature pack, giving the DOS and UNIX filenames of the images. The table provides a brief description of each feature set and the router platform on which the feature set runs.

Table 1   Cisco Feature Pack Feature Set Image Filenames

Feature Sets Included	DOS Filename	UNIX Filename	Description
Cisco 2500 IP Feature Pack Release 11.2 (model number CD25-C-11.2=)			
IP	80135403	c2500-i-l	IP feature set for Cisco 2500 series routers
Cisco 2500 IP Plus Feature Pack Release 11.2 (model number CD25-CP/E-11.2=)			
IP Plus	80135503	C2500-is-l	IP Plus feature set for Cisco 2500 series routers

Feature Sets Included	DOS Filename	UNIX Filename	Description
Remote Access Server	80146001	C2500-c-l	Remote access server feature set for Cisco 2500 series routers
Cisco 2500 IP Plus 40 Feature Pack Release 11.2 (model number CD25CW-11.2=)			
IP Plus 40	8135603	C2500-is40-l	IP Plus 40 feature set for Cisco 2500 series routers
Cisco 2500 IP Plus 56 Feature Pack Release 11.2 (model number CD25-CY-11.2=)			
IP Plus 56	80135703	C2500-is56-l	IP Plus 56 feature set for Cisco 2500 series routers
Cisco 2500 IP/IPX/AT/DEC Feature Pack Release 11.2 (model number CD25-B-11.2=)			
IP/IPX/AT/DEC	80135003	C2500-d-l	IP/IPX/AppleTalk/DECnet feature set for Cisco 2500 series routers
Cisco 2500 IP/IPX/AT/DEC Plus Feature Pack Release 11.2 (model number CD25-BP-11.2=)			
IP/IPX/AT/DEC Plus	80135103	C2500-ds-l	IP/IPX/AppleTalk/DECnet Plus feature set for Cisco 2500 series routers
Cisco 2500 IP/IPX/AT/DEC Plus 40 Feature Pack Release 11.2 (model number CD25-BW-11.2=)			
IP/IPX/AT/DEC Plus 40	80135203	C2500-ds40-l	IP/IPX/AppleTalk/DECnet Plus 40 feature set for Cisco 2500 series routers
Cisco 2500 IP/IPX/AT/DEC Plus 56 Feature Pack Release 11.2 (model number CD25-BY-11.2=)			
IP/IPX/AT/DEC Plus 56	80135303	C2500-ds56-l	IP/IPX/AppleTalk/DECnet Plus 56 feature set for Cisco 2500 series routers
Cisco 2500 Enterprise Feature Pack Release 11.2 (model number CD25-A-11.2=)			
Enterprise	80135803	C2500-j-l	Enterprise feature set for Cisco 2500 series routers
Cisco 2500 Enterprise Plus Feature Pack Release 11.2 (model number CD25-AP-11.2=)			
Enterprise Plus	80135903	C2500-js-l	Enterprise Plus feature set for Cisco 2500 series routers
Cisco 2500 Enterprise Feature Pack Release 11.2 (model number CD25-AW-11.2=)			
Enterprise Plus 40	80136003	C2500-js40-l	Enterprise Plus 40 feature set for Cisco 2500 series routers
Cisco 2500 Enterprise Feature Pack Release 11.2 (model number CD25-AY-11.2=)			
Enterprise Plus 56	80136103	C2500-js56-l	Enterprise Plus 56 feature set for Cisco 2500 series routers

Note The Cisco Router Software Loader version 4.0 (formerly known as CiscoPro Software Installer), contained on every Cisco IOS Release 11.2 software feature pack, supports both Ethernet and Token Ring interfaces.

Memory Requirements and Recommendations

This section includes two tables: Table 2 identifies the memory required to run each feature set; Table 3 describes the memory delivered by default and the available memory upgrades.

You can use Table 2 to identify the memory required for your configuration based on the image you run. You can then check this against Table 3 to determine how much memory is available on the router as the factory default and the upgrades that you can obtain to satisfy your requirements.

Table 2   Cisco 2500 Feature Set Memory Requirements

Feature Set	Description	Flash Memory Requirements	DRAM Memory Requirements
Cisco 2500 IP Feature Pack Release 11.2			
IP	IP feature set for Cisco 2500 series routers	8 MB	4 MB
Cisco 2500 IP Plus Feature Pack Release 11.2			
IP Plus	IP Plus feature set for Cisco 2500 series routers	8 MB	4 MB
Remote Access Server	Remote Access Server feature set for Cisco 2500 access servers	8 MB	4 MB
Cisco 2500 IP Plus 40 Feature Pack Release 11.2			
IP Plus 40	IP Plus 40 feature set for Cisco 2500 routers	8 MB	4 MB
Cisco 2500 IP Plus 56 Feature Pack Release 11.2			
IP Plus 56	IP Plus 56 feature set for Cisco 2500 routers	8 MB	4 MB
Cisco 2500 IP/IPX/AT/DEC Feature Pack Release 11.2			
IP/IPX/AT/DEC	IP/IPX/AppleTalk/DECnet feature set for Cisco 2500 routers	8 MB	4 MB
Cisco 2500 IP/IPX/AT/DEC Plus Feature Pack Release 11.2			
IP/IPX/AT/DEC Plus	IP/IPX/AppleTalk/DECnet Plus feature set for Cisco 2500 routers	8 MB	4 MB
Cisco 2500 IP/IPX/AT/DEC Plus 40 Feature Pack Release 11.2			
IP/IPX/AT/DEC Plus 40	IP/IPX/AppleTalk/DECnet Plus 40 feature set for Cisco 2500 routers	8 MB	4 MB
Cisco 2500 IP/IPX/AT/DEC Plus 56 Feature Pack Release 11.2			
IP/IPX/AT/DEC Plus 56	IP/IPX/AppleTalk/DECnet Plus 40 feature set for Cisco 2500 routers	8 MB	4 MB
Cisco 2500 Enterprise Feature Pack 11.2			
Enterprise	Enterprise Feature Pack for Cisco 2500 routers	8 MB	6 MB
Cisco 2500 Enterprise Plus Feature Pack 11.2			
Enterprise Plus	Enterprise Plus Feature Pack for Cisco 2500 routers	8 MB	6 MB
Cisco 2500 Enterprise Plus 40 Feature Pack 11.2			
Enterprise Plus 40	Enterprise Plus 40 Feature Pack for Cisco 2500 routers	8 MB	6 MB
Cisco 2500 Enterprise Plus 56 Feature Pack 11.2			
Enterprise Plus 56	Enterprise Plus 56 Feature Pack for Cisco 2500 routers	8 MB	6 MB

Table 3 shows the amount of both Flash and main memory delivered by default on a Cisco 2500 series router. It also lists the available memory upgrades.

> **Note** The actual default memory configuration on your particular router will vary depending on when the router was purchased.

Table 3   Cisco Access Default and Memory Upgrade Options

Memory Type	Default	Upgrade Options
Flash	8 MB	4-MB upgrade: MEM4F=
		8-MB upgrade: MEM8F=
Main	4 MB	8-MB upgrade: MEM8D=
		16-MB upgrade: MEM16D=

Installation Tips

This section describes several solutions to problems you might encounter when using the Router Software Loader. These solutions are additions to the loader's online help.

Recovering From a Connection Error

This installation tip provides a possible recovery solution in the event that you are unable to connect to your router. You can skip this section unless you are experiencing a connection error.

In some cases, you might receive the following error message while connecting to the target router:

```
"Failed to configure the router to enable the Cisco IOS software image and configuration
file upload and download operations. You may want to check the router to make sure that
the selected interface exists."
```

If you encounter this message, try increasing the Short Timeout value in the Options dialog box, especially if one of the following situations applies:

> **Note** Increasing the Short Timeout value may increase the time it takes for the Router Software Loader to connect to the target router.

- You are connecting to a router that requires the Token Ring interface to be configured. It sometimes takes the Token Ring interface longer to come up than the default Short Timeout value of 15 seconds. Try increasing the Short Timeout to 25 seconds.

- You are connecting to a router that has a large configuration file. Large configuration files may take longer than the default Short Timeout value of 15 seconds to be written to nonvolatile random-access memory.

- You are connecting to a Cisco AS5200. A Cisco AS5200 requires up to 45 seconds to write a configuration to nonvolatile random-access memory, due to the amount of interfaces that must be checked during this process. Increase the Short Timeout value to 50 seconds.

Enabling the Hub Port

This installation tip applies to the Cisco 2505, 2507, 2516, CPA2505, CPA2607, and CPA2516. When connecting to one of these routers via the Router Software Loader, you must first enable the hub port used to connect the router to your PC. To enable the hub port, you will need to log into the router via the console port. You can log into the console port using Telnet or terminal emulation software. (If you use terminal emulation software, configure the software settings to 9600 baud, no parity, 8 data bits, and 1 stop bit.)

An example of enabling the hub port follows:

Step 1 When the router boots up, enter the enable mode as follows:

```
router> enable
password: <password>
router#
```

Step 2 Enter the configuration mode and enable the hub port, as follows:

```
router# configure terminal
```

Step 3 Enter the following configuration commands, one per line and end with **Ctrl-Z**.

```
router(config)# hub ether 0 port number of PC connection
router(config-hub)# no shutdown
```

Step 4 Exit the configuration mode by entering the commands as follows:

```
router(config-hub)# exit
router(config)# exit
router#
```

Step 5 Log out of the router and start the Router Software Loader application.

RFF Platforms (Cisco 1600 Series, 2500 Series, CPA1600 Series, CPA2500 Series) with Partitioned Flash Memory

The following installation tip applies to any Cisco 1600 series or Cisco 2500 series router that has two or more Flash memory partitions. If you are unsure whether your router has multiple Flash memory partitions, issue the **show flash** command at the router prompt as shown in Step 4 of this section.

The Router Software Loader always copies to the default Flash memory partition of the router. In most cases, the default partition is partition 1. However, if your run-from-flash (RFF) router is running a Flash image located in partition 1, the default partition is partition 2. In this case, the Router Software Loader will copy the new image to partition 2, and reload the router with the image that still resides in partition 1.

We recommend that you unpartition your Flash memory *before* using the Router Software Loader to upgrade your router's Cisco IOS image.

Note If you are using a Cisco CPA1600 series or CPA2500 series router, you must unpartition your Flash memory before using the Router Software Loader to upgrade your router's Cisco IOS image. Otherwise, the router upgrade necessary to load the 11.2 images will transparently fail. In other words, the loader will indicate that the upgrade was completed when it actually was not.

To unpartition your Flash memory, take the following steps:

Step 1   Log into the router via the console port using Telnet or terminal emulation software. (If you use terminal emulation software, configure the software settings to 9600 baud, no parity, 8 data bits, and 1 stop bit.)

Step 2   When the router boots up, enter the enable mode, as follows:

```
router> enable
password: <password>
router#
```

Step 3   Erase the contents of the Flash memory partition except the one currently in use (this partition will be in the Read ONLY state in the partition listing), as shown below.

```
router# erase flash
Partition   Size    Used      Free      Bank-Size  State       Copy Mode
  1         8192K   3724K     4467K     8192K      Read ONLY   RXBOOT-manual
  2         8192K   3724K     4467K     8192K      Read/Write  Direct

System flash directory, partition 2:
File  Length   Name/status
  1   3813972  cpa25-y-l.111-6.1
[3814036 bytes used, 4574572 available, 8388608 total]

Erase flash device, partition 2? [confirm]
Are you sure? [yes/no]: y
Erasing device... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...erased

router#
```

Note   If you have more than two Flash memory partitions, you must perform the previous step for each of the partitions to be erased.

Step 4   Enter the **show flash** command to verify that the desired Flash memory partitions have been erased:

```
router# show flash
System flash directory, partition 1:
File  Length   Name/status
  1   3813972  cpa25-y-l.111-6.1
[3814036 bytes used, 4574572 available, 8388608 total]
8192K bytes of processor board System flash (Read ONLY)


System flash directory, partition 2:
No files in System flash
[0 bytes used, 8388608 available, 8388608 total]
8192K bytes of processor board System flash (Read/Write)
```

You are now ready to unpartition the Flash memory.

Step 5   Enter the configuration mode and enter the **partition** command to create a single Flash memory partition, as follows:

```
router# configure terminal
Enter configuration commands, one per line.  End with cntrl/z.
router(config)# partition flash 1
```

Step 6   Exit the configuration mode and verify that flash memory now has a single partition, as follows:

```
router(config)# exit
router# show flash

System flash directory:
File  Length   Name/status
 1   3813972  cpa25-y-l.111-6.1
[3814036 bytes used, 12963180 available, 16777216 total]
16384K bytes of processor board System flash (Read ONLY)

router#
```

You can now log out of the router and start the the Router Software Loader application.

Preserving the Router's Startup Configuration

As part of the connection procedure, the Router Software Loader writes the current running configuration of the router to the startup configuration in NVRAM. This operation overwrites the previous startup configuration file.

⚠ **Caution**   If your router is running in ROM monitor mode or from the bootstrap image in ROM, and if the current startup configuration was created while running a full Cisco IOS system image, you should copy the startup configuration file to a network server before running the Router Software Loader. Otherwise, you might lose several configuration commands that are not supported by the bootstrap image, such as all routing and bridging configurations. As an option, if the router has a valid Cisco IOS image in Flash memory, you can reboot the router from the image in Flash before running the Router Software Loader. This way, your configuration commands will not be lost when the Router Software Loader writes the image to NVRAM. To do this, log into the router via the console port using Telnet or terminal emulation software. (If you use terminal emulation software, configure the software settings to 9600 baud, no parity, 8 data bits, and 1 stop bit.) Then follow Step 1 through Step 7 to reboot from Flash memory.

Refer to the following steps to determine the operation mode of your particular router, and then how to reboot the router to run the image in Flash memory:

Step 1   After logging into the router, observe the command prompt.

If the prompt appears as a "rommon 1>" or ">," the router is operating in ROM monitor mode.

Step 2   To boot the router from the image in Flash memory, enter the following command:

```
> b flash
```

The router will now load the Flash memory image. When the image is loaded, you can log out and start the Router Software Loader application.

If the prompt appears as "[router name](boot)>" or "[router name](boot)#," the router is running the bootstrap image.

Step 3   Enter the **show version** command at the prompt and examine the Configuration Register value shown in the last line of the **show version** output.

Step 4   If your router shows the "[router name](boot)>" prompt, enter the **enable** command and supply the password if necessary.

Step 5 If the last digit of the Configuration Register is greater than 1, enter the **reload** command to reboot the router to run the image in Flash memory.

Step 6 If the last digit of the Configuration Register is less than 2, you must change the Configuration Register value before reloading, as follows:

```
router# configure terminal
```

Step 7 Enter the following configuration commands, one per line and end with **Ctrl-Z**:

```
router(config)# config-register 0x2102
router(config)# exit
router# reload
```

The router will now reboot and load the image in Flash memory. (If you were logged in via Telnet, you will be logged out automatically when the reboot operation begins.)

After the router reboots, you can log out and start the Router Software Loader application.

Cisco IOS Release 11.2 Feature Sets

This section identifies specific features supported on Cisco 2500 series routers. Table 4 lists feature sets that are identical to their Cisco counterparts. Features marked with "yes" are supported; features marked with "–" are not supported. Features marked with "Plus" are offered only in the Plus feature sets, not in the basic feature set. Features marked with "Encrypt," indicate the addition of 40-bit (Plus 40) or 56-bit (Plus 56) data encryption feature sets. You can use the information given in the tables provided in this section in conjunction with the information provided in the section "Cisco Feature Pack Descriptions," page 3, to determine which features a particular feature set supports.

Table 4   Cisco IOS Release 11.2 Feature Sets for Cisco 2500 Series Routers

Features	IP Routing	IP/IPX/AppleTalk/DEC	Enterprise
LAN Support			
Apollo Domain	–	–	Yes
AppleTalk 1 and 2[1]	–	Yes	Yes
Banyan VINES	–	–	Yes
Concurrent routing and bridging (CRB)	Yes	Yes	Yes
DECnet IV	–	Yes	Yes
DECnet V	–	–	Yes
GRE	Yes	Yes	Yes
Integrated routing and bridging (IRB)[2]	Yes	Yes	Yes
IP	Yes	Yes	Yes
LAN extension host	Yes	Yes	Yes
Multiring	Yes	Yes	Yes
Novell IPX[3]	–	Yes	Yes
OSI	–	–	Yes
Source-route bridging[4]	–	–	–
Transparent and translational bridging	Yes	Yes	Yes

Features	IP Routing	IP/IPX/AppleTalk/DEC	Enterprise
XNS	–	–	Yes
WAN Services			
Combinet Packet Protocol (CPP)	Yes	Yes	Yes
Dialer profiles	Yes	Yes	Yes
Frame Relay	Yes	Yes	Yes
Frame Relay SVC Support (DTE)	–	–	Yes
Frame Relay traffic shaping	Yes	Yes	Yes
Half bridge/half router for CPP and PPP	Yes	Yes	Yes
HDLC	Yes	Yes	Yes
IPXWAN 2.0	–	Yes	Yes
ISDN[5]	Yes	Yes	Yes
Multichassis Multilink PPP (MMP)	–	–	Yes
PPP[6]	Yes	Yes	Yes
SMDS	Yes	Yes	Yes
Switched 56	Yes	Yes	Yes
Virtual Private Dial-up Network (VPDN)	–	Yes	Yes
X.25[7]	Yes	Yes	Yes
WAN Optimization			
Bandwidth-on-demand	Yes	Yes	Yes
Custom and priority queuing	Yes	Yes	Yes
Dial backup	Yes	Yes	Yes
Dial-on-demand	Yes	Yes	Yes
Header[8], link and payload compression	Yes	Yes	Yes
Snapshot routing	Yes	Yes	Yes
Weighted fair queuing	Yes	Yes	Yes
IP Routing			
BGP	Yes	Yes	Yes
BGP4[9]	Yes	Yes	Yes
EGP	Yes	Yes	Yes
Enhanced IGRP	Yes	Yes	Yes
Enhanced IGRP Optimizations	Yes	Yes	Yes
ES-IS	–	–	Yes
IGRP	Yes	Yes	Yes
IS-IS	–	–	Yes
Named IP Access Control List	Yes	Yes	Yes
Network Address Translation (NAT)	Plus	Plus	Plus
NHRP	Yes	Yes	Yes
On Demand Routing (ODR)	Yes	Yes	Yes
OSPF	Yes	Yes	Yes

Features	IP Routing	IP/IPX/AppleTalk/DEC	Enterprise
OSPF Not-So-Stubby-Areas (NSSA)	Yes	Yes	Yes
OSPF On Demand Circuit (RFC 1793)	Yes	Yes	Yes
PIM	Yes	Yes	Yes
Policy-based routing	Yes	Yes	Yes
RIP	Yes	Yes	Yes
RIP Version 2	Yes	Yes	Yes
Other Routing			
AURP	–	Yes	Yes
IPX RIP	–	Yes	Yes
NLSP	–	Yes	Yes
RTMP	–	Yes	Yes
SMRP	–	Yes	Yes
SRTP	–	–	Yes
Multimedia and Quality of Service			
Generic traffic shaping	Yes	Yes	Yes
Random Early Detection (RED)	Yes	Yes	Yes
Resource Reservation Protocol (RSVP)	Yes	Yes	Yes
Management			
AutoInstall	Yes	Yes	Yes
Automatic modem configuration	Yes	Yes	Yes
HTTP Server	Yes	Yes	Yes
RMON events and alarms	Yes	Yes	Yes
RMON full (Cisco 3011 WAN module only)[10]	Plus	Plus	Plus
SNMP	Yes	Yes	Yes
Telnet	Yes	Yes	Yes
Security			
Access lists	Yes	Yes	Yes
Access security	Yes	Yes	Yes
Extended access lists	Yes	Yes	Yes
Kerberized login	–	–	Yes
Kerberos V client support	–	–	Yes
Lock and key	Yes	Yes	Yes
MAC security for hubs[11]	Yes	Yes	Yes
MD5 routing authentication	Yes	Yes	Yes
Network layer encryption (40-bit or export controlled 56-bit DES)[12]	Encrypt	Encrypt	Encrypt
RADIUS	Yes	Yes	Yes
Router authentication	Encrypt	Encrypt	Encrypt
TACACS+[13]	Yes	Yes	Yes

Features	IP Routing	IP/IPX/AppleTalk/DEC	Enterprise
IBM Support (Optional)			
BAN for SNA Frame Relay support	Plus	Plus	Yes
Bisync	Plus	Plus	Yes
Caching and filtering	Plus	Plus	Yes
DLSw+ [14]	Plus	Plus	Yes
Downstream PU (DSPU) concentration	Plus	Plus	Yes
Frame Relay SNA support (RFC 1490)	Plus	Plus	Yes
Native Client Interface Architecture (NCIA) Server	Plus	Plus	Yes
NetView Native Service Point	Plus	Plus	Yes
QLLC	Plus	Plus	Yes
Response Time Reporter (RTR)	Plus	Plus	Yes
SDLC integration	Plus	Plus	Yes
SDLC transport (STUN)	Plus	Plus	Yes
SDLC-to-LAN conversion (SDLLC)	Plus	Plus	Yes
SNA and NetBIOS WAN optimization via local acknowledgment	Plus	Plus	Yes
SRB/RSRB[15]	Plus	Plus	Yes
SRT	Plus	Plus	Yes
TG/COS	–	–	Yes
TN3270	–	–	Yes
Protocol Translation			
LAT	–	–	Yes
Rlogin	–	–	Yes
Remote Node[16]			
ARAP 1.0/2.0[17]	–	Yes	Yes
Asynchronous master interfaces	Yes	Yes	Yes
ATCP	–	Yes	Yes
CPPP	Yes	Yes	Yes
CSLIP	Yes	Yes	Yes
DHCP	Yes	Yes	Yes
IP pooling	Yes	Yes	Yes
IPX and ARAP on virtual async interfaces	–	–	Yes
IPXCP[8]	–	Yes	Yes
MacIP	–	Yes	Yes
NASI	–	Yes	Yes
NetBEUI over PPP	Yes	Yes	Yes
PPP	Yes	Yes	Yes
SLIP	Yes	Yes	Yes

Features	IP Routing	IP/IPX/AppleTalk/DEC	Enterprise
Terminal Services[16]			
LAT[18]	–	–	Yes
Rlogin	Yes	Yes	Yes
Telnet	Yes	Yes	Yes
TN3270	–	–	Yes
X.25 PAD	Yes	Yes	Yes
Xremote	–	–	Yes

1. Includes AppleTalk load balancing.
2. IRB supports IP, IPX, and AppleTalk; it is supported for transparent bridging, but not for SRB; it is supported on all media-type interfaces except X.25 and ISDN bridged interfaces; IRB and concurrent routing and bridging (CRB) cannot operate at the same time.
3. The Novell IPX feature includes display SAP by name, IPX Access Control List violation logging, and plain-English IPX access lists.
4. Translational bridging is fast switched by default but can be disabled.
5. ISDN support includes calling line identification (ANI), X.25 over B channel, ISDN subaddressing, and applicable WAN optimization features
6. PPP includes support for LAN protocols supported by the feature set, address negotiation, PAP and CHAP authentication, Multilink PPP, and PPP compression.
7. X.25 includes X.25 switching.
8. IPX header compression (RFC 1553) is available in the feature sets that support IPX.
9. BGP4 includes soft configuration, multipath support, and prefix filtering with inbound route maps.
10. The Cisco 3011 WAN module is derived from the Cisco 2503 router.
11. This feature does not apply to the Cisco 3011 WAN module.
12. For more details, see the description of the new data encryption options in the see the beginning of the section "Cisco IOS Packaging."
13. TACACS+ Single Connection and TACACS+ SENDAUTH enhancements are supported.
14. Cisco IOS Release 11.2 introduces several DLSw+ enhancements available in the Plus, Plus 40, and Plus 56 feature sets.
15. SRB/RSRB is fast switched. This enhancement is on by default but can be disabled.
16. Supported on access severs (with limited support on router auxiliary ports).
17. The Cisco 4000, Cisco 4500, and Cisco 4700 products do not support ARAP 1.0/2.0.
18. Use of LAT requires a terminal license (FR-L8-10.X= for an 8-user license or FR-L16-10.X= for a 16-user license).

Installing the Router Software Using Microsoft Windows 3.1

In addition to the Cisco IOS feature sets, the CD-ROM also contains the Router Software Loader, which you can use to download the software to the router. The booklet included with the CD-ROM explains how to install the software on a PC running Windows 95, but you can also install the software using Windows 3.1.

Note   You must use these procedures to load any software feature set onto a router that contains no Ethernet or Token Ring interfaces.

This section describes how to install the software images from the CD-ROM using a PC running Windows 3.1. The process requires that you first obtain a Trivial File Transfer Protocol (TFTP) application or a remote copy protocol (rcp) application, which you can use to set up your PC as a TFTP server or an rcp server. You can use either the **copy tftp flash** or **copy rcp flash** command to download the software images to the router from a system running Windows 3.1.

Note   If you do not already have a TFTP or rcp application, you can choose from a number of applications that are available from independent software vendors. In addition, a number of TFTP programs are available as shareware from public sources on the World Wide Web.

Installation Process

This section provides steps that enable you to install the router software using a TFTP application and a PC running Windows 3.1.

Note This is a two-part process. In the first part, which begins at Step 6, you will download the upgrade utility. In the second part, which begins at Step 15, you will download the Cisco IOS 11.2 images (referenced by the DOS names in Table 1) that you want on your particular router.

To install the software using an rcp application, follow the same steps but use rcp instead of TFTP. You must also substitute the **copy rcp flash** command for the **copy tftp flash** command in Step 8. See the next section, "Command Reference Information for TFTP and rcp," for detailed information about the **copy rcp flash** and **copy tftp flash** commands.

Step 1 Install any TFTP application on the PC. (Not provided by Cisco.)

Step 2 Launch the TFTP application on the PC, usually by double-clicking the application icon or its filename.

Step 3 Set up the PC as a TFTP server using the TFTP application setup or configuration facility.

The user interface of most TFTP applications includes a setup facility that allows you to specify the PC as a server. For example, from the TFTP menu of one application, you can select **Settings** to display a panel that includes a checkbox beside the word Server. To configure the local PC as a server, click in this checkbox.

Caution Be certain to set up your local PC as a TFTP server. If you overlook this step, you will not be able to copy the new software images. If you are using rcp instead of TFTP, you should also be certain to set up your local PC as an rcp server before you copy the software images.

Step 4 Establish a console session from your local PC (which is now configured as a TFTP server) to the router. You can do this in two ways:

- Connect the PC's COM port to the router's console port.

  This is the recommended method. If you use this method, you will remain connected to the router when you reload the router to cause the image to take effect (in Step 13).

- Establish a Telnet session from the PC to the router. If you use this method, you will lose your connection to the router when you reload the router to cause the image to take effect (in Step 13).

Step 5 Connect your PC's Ethernet port to the router's Ethernet port using the 10BaseT crossover cable provided.

Note Use straight-through cables if you are connecting through a 10BaseT hub.

In the following steps, you will upgrade your CiscoPro router to a Cisco Enterprise router. If you have a CiscoPro CPA1000, CPA1600, CPA2500 or CPA4500 router and plan to install an 11.2 image on the router, you must perform Step 6 through Step 13. These steps upgrade your router to allow Enterprise images to run on it. Refer to the Note   on page 3 for details.

Step 6   From the console, enter the following configuration command:

```
# config terminal
```

Step 7   From the console, enter the following configuration command:

```
# config-reg 0x2102
```

Step 8   At the router prompt, enter the following command to copy the router upgrade utility from the CD-ROM drive of the PC to the router:

(In the next series of steps, you download the Cisco IOS 11.2 images that you want installed on your upgraded router.)

```
# copy tftp flash
```

Note   If you are using rcp, enter **copy rcp flash** instead.

Step 9   When prompted, enter the IP address of your local Windows 3.1–based PC, as in the following example:

```
Address or name of remote host [255.255.255.255]? 131.108.1.1
```

This is the IP address of your local PC, not the router.

Step 10   When prompted, enter the full pathname of the image to be copied to the router as in the following example:

```
Source file name? d:\cpswinst\images\cpa25-upgrade-1.112-3.P
```

Note   The upgrade image file on the Feature Pack CD has a long filename (cpa25-upgrade-l.112-3.P); note that it will be displayed in 8.3 formats by DOS as cpa25-~1.P.

Step 11   In response to the following prompt, enter the destination filename and press **Enter** to indicate that you want to copy the image:

```
Destination file name [d:\cpswinst\images\cpa25-upgrade-1.112-3.p]?
cpa25-upgrade-1.112-3.P
```

(This is the name of the image file on the router, not the full pathname of the image on the CD-ROM on the PC.)

During the transfer process, messages indicate that the software has accessed the file you have specified and is loading it.

Step 12   Enter **yes** or **no** in response to the prompt asking if you want to erase the existing image in the router's Flash memory before copying the new one:

```
Erase flash device before writing? [confirm] yes
```

When copying to Flash memory, the system provides an option to erase existing internal Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.

The exclamation point (!) indicates that the copy process is taking place. Each exclamation point indicates that ten packets have been transferred successfully. A series of "V" characters indicates that a checksum verification of the image is occurring after the image is written to Flash memory.

Step 13 Enter the **reload** command to reload the router:

```
# reload
```

At this point your CiscoPro router has been upgraded to a Cisco Enterprise router. Because the original Cisco IOS image, which resided in Flash memory, was erased during the upgrade process, the router should now be running in bootstrap (boot)# mode.

Step 14 At the router prompt, enter the following command to copy the new software image from the CD-ROM drive of the PC to the router:

```
(boot)# copy tftp flash
```

In the next series of steps, you download the Cisco IOS 11.2 images that you want installed on your upgraded router.

Step 15 When prompted, enter the IP address of your local Microsoft Windows 3.1-based PC as in the following example:

```
Address or name of remote host [255.255.255.255]? 131.108.1.1
```

This is the IP address of your local PC, not that of the router.

Step 16 When prompted, enter the full pathname of the Cisco IOS 11.2 image to be copied to the router as in the following example:

```
Source file name? d:\cpswinst\images\80135403.bin
```

This example specifies the IP feature set for Cisco 2500 series routers.

Step 17 In response to the prompt, enter the destination filename and press **Enter** to indicate that you want to copy the image.

This is the name of the image file on the router, not the full pathname of the image on the CD-ROM attached to the PC.

```
Destination file name [d:\cpswinst\images\]?c2500-i-l
```

During the transfer process, the software displays messages indicating that it has accessed the file you have specified and is loading it.

Step 18 Enter **yes** or **no** in response to the prompt asking if you want to erase the existing image copy resident in the router's Flash memory before copying the new one.

```
Erase flash device before writing? [confirm] yes
```

When copying to internal Flash memory, the system provides an option to erase existing internal Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.

The exclamation point (!) indicates that the copy process is taking place. Each exclamation point (!) indicates that ten packets have been transferred successfully. A series of "V" characters indicates that a checksum verification of the image is occurring after the image is written to Flash memory.

Step 19   Enter the **reload** command to reload the router:

```
(boot)# reload
```

Command Reference Information for TFTP and rcp

This section includes detailed information about the **copy rcp flash** and **copy tftp flash** commands. This information supplements the information provided in the steps described in the section "Installation Process," page 15.

copy rcp flash

To copy a file from a network server to the router or to another destination using rcp, use the **copy rcp flash** EXEC command:

copy rcp flash

Syntax Description

flash   Specifies internal Flash memory as the destination of the copy operation.

Command Mode

EXEC

Usage Guidelines

The rcp protocol requires that a client send the remote username of an rcp request to the server. When you enter the **copy rcp flash** command, by default the Cisco IOS software sends the username associated with the current teletype (TTY), if that name is valid. For example, if the user is connected to the router through Telnet and the user was authenticated through the **username** command, then the software sends that username as the remote username.

Note   TTY lines are commonly used for access services for Cisco routers. The concept of TTY originated with UNIX. For UNIX systems, each physical device is represented in the file system. Terminals are called TTY devices, which stands for teletype, the original UNIX terminal.

If the TTY username is invalid, the software uses the host name as the both the remote and local usernames. To specify a different remote username to be sent to the rcp server, use the **ip rcmd remote-username** command. You can also specify the path of an existing directory along with the remote username.

> **Caution** The remote username must be associated with an account on the destination server. If you do not use the **ip rcmd remote-username** command to specify the name of a remote user associated with an account on the server, then the remote username associated with the current TTY process must be associated with an account on the server. If there is no username for the current TTY process, then the host name must be associated with an account on the server. If the network administrator of the destination server did not establish accounts for the remote username used, this command will not execute successfully when a default remote username is used.

If you copy a system image from a PC used as a file server, the remote host computer must support the remote shell (rsh) protocol.

Use the **copy rcp flash** command to copy a system image from a network server to the router's internal Flash memory using rcp. The Cisco IOS software prompts for the address of the rcp server and rcp filename. When you enter this command, the system provides an option to erase existing Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.

Before booting from Flash memory, verify that the checksum of the image in internal Flash memory matches the checksum listed in the README file distributed with the system software image. The checksum of the image in Flash memory is displayed at the bottom of the screen when you issue the **copy rcp flash** command. The README file was copied to the rcp server automatically when you installed the system software image.

> **Caution** If the checksum value does not match the value in the README file, do not reboot the router. Re-enter the **copy rcp flash** command and compare the checksums again. If the checksum is repeatedly wrong, copy the original system software image back into Flash memory *before* you reboot the router from Flash memory. If you have a corrupted image in Flash memory and try to boot from Flash memory, the router starts the system image contained in ROM (assuming booting from a network server is not configured). If ROM does not contain a fully functional system image, the router cannot function and must be reconfigured through a direct console port connection.

Examples

The following example shows how to use the **copy rcp flash** command on a Cisco 4500 router. The interface might differ slightly on other systems. This example copies a system image named file1 from the netadmin1 directory on the remote server named SERVER1.CISCO.COM with an IP address of 131.108.101.101 to Flash memory. To ensure that enough Flash memory is available to accommodate the system image to be copied, the Cisco IOS software allows you to erase the contents of Flash memory first.

```
Router1# configure terminal

Router1(config)# rcmd remote-username netadmin1
Router(config)# Ctrl-Z
Router# copy rcp flash

System flash directory, partition 2:
File   Length    Name/status
  1    984       file1 [deleted]
  2    984       file1
[2096 bytes used, 8386512 available, 8388608 total]
Address or name of remote host [255.255.255.255]? 131.108.101.101
Source file name? file1
Destination file name [file1]?
Accessing file 'file1' on 131.108.101.101...
Loading dirt/ssangiah/file1 .from 131.108.101.101 (via Ethernet0): ! [OK]
```

```
Erase flash device before writing? [confirm]
Flash contains files. Are you sure you want to erase? [confirm]

Copy 'file1' from server
  as 'file1' into Flash WITH erase? [yes/no] yes
Erasing device... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...erased
Loading file1 from 131.108.101.101 (via Ethernet0): !
[OK - 984/8388608 bytes]

Verifying checksum...  OK (0x14B3)
Flash copy took 0:00:01 [hh:mm:ss]
```

The following example shows sample output resulting from copying a system image into a partition of Flash memory. The system prompts only if there are two or more read/write partitions or one read-only and one read/write partition and dual Flash memory bank support in boot ROMs. If the partition entered is not valid, the process terminates. You have the option to enter a partition number, a question mark (**?**) for a directory display of all partitions, or a question mark and a number (**?***number*) for a directory display of a particular partition. The default is the first read/write partition.

```
Router# copy rcp flash

System flash partition information:
Partition   Size     Used    Free    Bank-Size   State       Copy-Mode
    1       4096K    2048K   2048K   2048K       Read Only   RXBOOT-FLH
    2       4096K    2048K   2048K   2048K       Read/Write  Direct

[Type ?<no> for partition directory; ? for full directory; q to abort]
Which partition? [default = 2]
```

If the partition is read-only and has dual Flash memory bank support in boot ROMs, the session continues as follows:

```
                           ****  NOTICE  ****
Flash load helper v1.0
This process will accept the copy options and then terminate
the current system image to use the ROM based image for the copy.
Routing functionality will not be available during that time.
If you are logged in via telnet, this connection will terminate.
Users with console access can see the results of the copy operation.
                           ---- ******** ----
Proceed? [confirm]
System flash directory, partition 1:
File  Length   Name/status
  1   3459720  master/igs-bfpx.100-4.3
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/igs-bfpx-100.4.3
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

If the partition is read/write, the session continues as follows:

```
System flash directory, partition 2:
File  Length   Name/status
  1   3459720  master/igs-bfpx.100-4.3
[3459784 bytes used, 734520 available, 4194304 total]
```

```
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/igs-bfpx.100-4.3
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Accessing file 'master/igs-bfpx.100-4.3' on ABC.CISCO.COM...
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

Related Commands
boot config
boot system flash
cd
copy flash rcp
ip rcmd remote-username
verify flash

copy tftp flash

To copy a file from a TFTP server to the router or to another destination, use the **copy tftp flash** EXEC command.

> **copy tftp flash**

Syntax Description

flash   Specifies internal Flash memory as the destination of the copy
                                    operation.

Command Mode
EXEC

Usage Guidelines
The system prompts for the address of the TFTP server and TFTP filename if you do not provide them at the command line. When copying to internal Flash memory, the system provides an option to erase existing internal Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.

Before booting from Flash memory, verify that the checksum of the image in Flash memory matches the checksum listed in the README file distributed with the system software image. The checksum of the image in Flash memory is displayed at the bottom of the screen when you enter the **copy tftp flash** command. The README file was copied to the TFTP server automatically when you installed the system software image.

> ⚠️ **Caution** If the checksum value is not correct according to the value in the README file, do not reboot the router. Enter the **copy tftp flash** command and compare the checksums again. If the checksum is repeatedly wrong, copy the original system software image back into Flash memory *before* you reboot the router from Flash memory. If you have a corrupted image in Flash memory and try to boot from Flash memory, the router starts the system image contained in ROM (assuming booting from a network server is not configured). If ROM does not contain a fully functional system image, the router cannot function and must be reconfigured through a direct console port connection.

Examples

The following example shows sample output of copying a system image named file1 into Flash memory:

```
Router# copy tftp flash

System flash directory, partition 2:
File  Length    Name/status
  1   984       file1 [deleted]
  2   984       file1
[2096 bytes used, 8386512 available, 8388608 total]
Address or name of remote host [255.255.255.255]? 223.255.254.254
Source file name? file1
Destination file name [file1]?
Accessing file 'file1' on 223.255.254.254...
Loading dirt/ssangiah/file1 .from 223.255.254.254 (via Ethernet0): - [OK]

Erase flash device before writing? [confirm]
Flash contains files. Are you sure you want to erase? [confirm]

Copy 'file1' from server
  as 'file1' into Flash WITH erase? [yes/no] yes
Erasing device... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...erased
Loading file1 from 223.255.254.254 (via Ethernet0): !!!!...
[OK - 984/8388608 bytes]

Verifying checksum...  OK (0x14B3)
Flash copy took 0:00:01 [hh:mm:ss]
```

The exclamation point (!) indicates that the copy process is taking place. Each exclamation point indicates that ten packets have been transferred successfully. A series of "V" characters indicates that a checksum verification of the image is occurring after the image is written to Flash memory.

The following example shows sample output resulting from copying a system image into a partition of Flash memory. The system will prompt only if there are two or more read/write partitions or one read-only and one read/write partition and dual Flash memory bank support in boot ROMs. If the partition entered is not valid, the process terminates. You can enter a partition number, a question mark (**?**) for a directory display of all partitions, or a question mark and a number (**?***number*) for directory display of a particular partition. The default is the first read/write partition.

```
Router# copy tftp flash

System flash partition information:
Partition   Size    Used    Free    Bank-Size   State       Copy-Mode
    1       4096K   2048K   2048K   2048K       Read Only   RXBOOT-FLH
    2       4096K   2048K   2048K   2048K       Read/Write  Direct

[Type ?<no> for partition directory; ? for full directory; q to abort]
Which partition? [default = 2]
```

If the partition is read-only and has dual Flash memory bank support in boot ROMs, the session continues as follows:

```
                        ****  NOTICE  ****
Flash load helper v1.0
This process will accept the copy options and then terminate
the current system image to use the ROM based image for the copy.
Routing functionality will not be available during that time.
If you are logged in via telnet, this connection will terminate.
Users with console access can see the results of the copy operation.
                        ---- ******** ----
Proceed? [confirm]
System flash directory, partition 1:
File  Length   Name/status
  1   3459720  master/igs-bfpx.100-4.3
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/igs-bfpx-100.4.3
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

If the partition is read/write, the session continues as follows:

```
System flash directory, partition 2:
File  Length   Name/status
  1   3459720  master/igs-bfpx.100-4.3
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/igs-bfpx.100-4.3
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Accessing file 'master/igs-bfpx.100-4.3' on ABC.CISCO.COM...
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

Related Commands
copy flash tftp
verify
verify flash

Additional Release Note Information

For detailed information about this software release, see the Cisco IOS release notes shipped with your router and also located on the Documentation CD-ROM. Information about the feature pack described in this release note includes the following:

- New features

- Important notes

- Caveats

Note The release notes shipped with your router are designed as reference material. The feature pack release notes (this document) should be sufficient for installing your software.

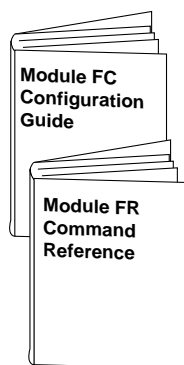## About Cisco IOS Software Electronic Documentation

Cisco IOS software documentation is provided on the Documentation CD that is included with your feature pack. Documentation about Cisco IOS Release 11.2(3) and 11.2(3)P describes the software images included on this feature pack CD.

To locate this documentation, you can either use the Documentation CD or go to www.cisco.com, select **Products and Ordering**, **Documentation**, **Cisco IOS Software Configuration**, and **Cisco IOS Release 11.2**. The documentation for Cisco IOS Release 11.2 is organized as follows:

- Release Notes—use the *Cisco IOS Release 11.2(3) Release Notes* and *Cisco IOS Release 11.2(3)P Release Notes.*

- Feature Guides—use the *Cisco IOS Release 11.2(3)P Feature Guide.*

- Eight modules that comprise the configuration guides and command references, which are described in Figure 1.

- *Cisco IOS Software Command Summary*—summarizes the commands in the command reference publications. For each command, the summary provides complete syntax, the purpose of the command, and a description of each keyword and argument in the command syntax.

- *System Error Messages*—describes system error messages reported by Cisco IOS software.

- *Cisco Management Information Base (MIB) User Quick Reference*—describes the Cisco Systems private, or local, Management Information Base (MIB), which is provided with all Cisco software releases and with CiscoWorks router management software. A MIB file contains variables that can be set or read to provide information on network devices and interfaces. The Cisco MIB is a set of variables that are private extensions to the Internet standard MIB II.

- *Debug Command Reference*—provides information about using debug commands to troubleshoot your network. The *Debug Command Reference* is intended for network administrators who already know how to configure a router and are familiar with all relevant network equipment.

- Caveats

**Figure 1   Cisco IOS Configuration Guides and Command References**

Module FC
Configuration
Guide

Module FR
Command
Reference

Module P1C
Configuration
Guide

Module P1R
Command
Reference

Module P2C
Configuration
Guide

Module P2R
Command
Reference

Module P3C
Configuration
Guide

Module P3R
Command
Reference

Module WC
Configuration
Guide

Module WR
Command
Reference

Module FC/FR:
**Configuration
Fundamentals**
• Access Server and
  Router Product
  Overview
• Cisco IOS Software
  Configuration Basics
• Images and
  Configuration Files
• Interface Configuration
• System Management
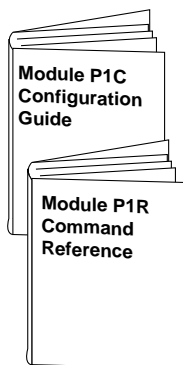
Module P1C/P1R:
**Network Protocols,
Part 1**
• IP Addressing
• IP Services
• IP Routing Protocols
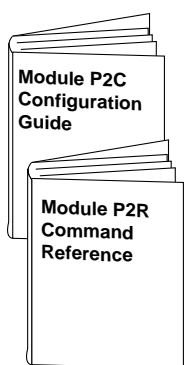
Module P2C/P2R:
**Network Protocols,
Part 2**
• AppleTalk
• Novell IPX
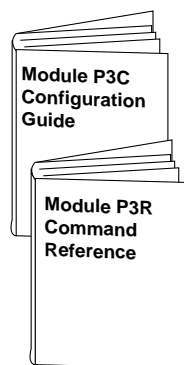
Module P3C/P3R:
**Network Protocols,
Part 3**
• Apollo Domain
• Banyan VINES
• DECnet
• ISO CLNS
• XNS
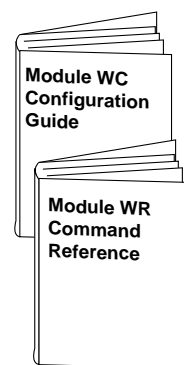
Module WC/WR:
**Wide-Area
Networking**
• ATM
• Frame Relay
• SMDS
• X.25 and LAPB

Module SC
Configuration
Guide

Module SR
Command
Reference

Module DC
Configuration
Guide

Module DR
Command
Reference

Module XC
Configuration
Guide

Module XR
Command
Reference

Module BC
Configuration
Guide

Module BR
Command
Reference

Configuration
Guide Master
Index

Command
Reference
Master Index
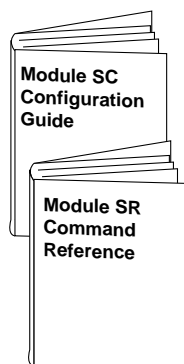
Module SC/SR:
Security
• Terminal Access Security
• Network Access Security
• Accounting and Billing
• Filtering Traffic
• Preventing Fraudulent
 Route Updates
• Network Data Encryption
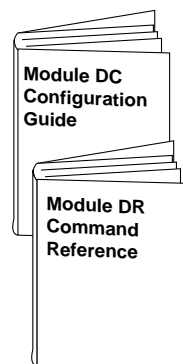
Module DC/DR:
Dial Solutions
• Dial Business
  Solutions and
  Examples
• Dial-In Port Setup
• DDR and Dial Backup
• Remote Node and
  Terminal Service
• Cost-Control and
  Large-Scale Dial
 Solutions
• VPDN
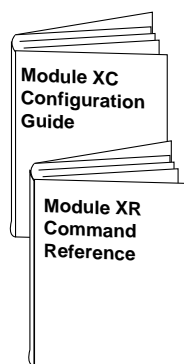
Module XC/XR:
**Cisco IOS Switching
Services**
• Switching Paths for IP
  Networks
  - Fast Switching
  - Autonomous Switching
  - NetFlow Switching
  - Optimum Switching
• Virtual LAN (VLAN)
  Switching and Routing
  - Inter-Switch Link Protocol
    Encapsulation
  - IEEE 802.10
    Encapsulation
  - LAN Emulation
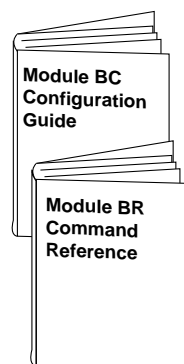
Module BC/BR:
**Bridging and IBM
Networking**
• Transparent Bridging
• Source-Route Bridging
• Remote Source-Route
  Bridging
• DLSw+
• STUN and BSTUN
• LLC2 and SDLC
• IBM Network Media Translation
• DSPU and SNA Service Point
• SNA Frame Relay Access Support
• APPN
• NCIA Client/Server Topologies
• IBM Channel Attach
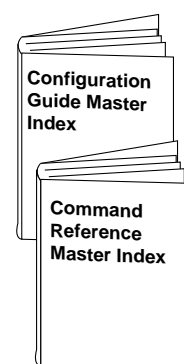
**Configuration
Guide Master
Index**

**Command
Reference
Master Index**

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Cisco IOS configuration guides describe system configuration and maintenance tasks and provide comprehensive configuration examples. The configuration guides do not include command syntax for every command, so you should use them in conjunction with the command references. The Cisco configuration guides give in-depth descriptions of configuration tasks.

Cisco IOS command references describe the commands necessary for configuring and maintaining your system. If you are new to Cisco software, you should use the Cisco command references in conjunction with the configuration guides to reference commands and detailed information pertaining to their use. If you are an experienced network administrator, you might want to use the Cisco command references as standalone manuals.

Cisco Connection Online

Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, product documentation, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

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You can access CCO in the following ways:

- WWW: http://www.cisco.com
- WWW: http://www-europe.cisco.com
- WWW: http://www-china.cisco.com
- Telnet: cco.cisco.com
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

This document is to be used in conjunction with the Cisco IOS configuration guides and command reference publications.