CISCO SYSTEMS

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Release Notes for Cisco IOS Release 11.2(14)P Feature Packs for Cisco 4500 and Cisco 4700 Routers

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These release notes describe the Cisco IOS Release 11.2(14)P feature packs for Cisco 4500 and 4700 routers.

These release notes contain the following topics:

Introduction

This section explains how to use this document, describes feature pack components, and has tables that define the aspects of a feature pack.

How to Use These Release Notes

The tables in these release notes contain details about the Cisco feature packs. Use these tables to perform the following tasks before loading a software image onto a router:

1   Use Table 1, "Feature Pack Product Numbers Quick-Reference List," to identify the software image you want to load.

2   Use Table 2, "Cisco 4500/4700 Series Feature Packs," to identify your feature pack and the memory required for your feature set, based on the image you load.

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3 Use Table 3, "Cisco 4000 Series Software Feature Sets," to identify which features are supported in a feature set image.

4 Use Table 4, "Cisco 4500 and 4700 Default Memory and Upgrade Options," to check the memory required for your feature set, and determine the factory-default memory on the router and the available memory upgrades.

What Is a Feature Pack?

This section describes:

- Feature Pack Components

- Product Numbers Quick-Reference List

- Feature Pack Overview Table

- Feature Set Table

Feature Pack Components

A feature pack is a small box that contains the following items:

- CD-ROM with the following software:

    — Cisco IOS feature set software images that can include bundled modem firmware

    — Router Software Loader (RSL) program (a Windows 95 application)

    — Trivial File Transfer Protocol (TFTP) server application (for Windows 95 only)

- *Getting Started with the Router Software Loader* CD booklet.

- Release notes that include alternatives to using the RSL for loading software images onto a router

- Software license for using Cisco software in-object code form on a single access server or router

- Cisco Documentation CD-ROM that contains all Cisco documentation

The heart of a feature pack is the CD-ROM that contains software images and the Router Software Loader (RSL), which is a Windows 95 application that loads an image onto an access server or router. Each feature pack CD-ROM contains at least one Cisco IOS feature set. The CD booklet, *Getting Started with the Router Software Loader*, explains how to use the RSL to install the router image. If you cannot use the RSL to load images, you can follow the instructions in the "Alternatives to the RSL" section on page 13.

Before running the RSL, read the "Installing Software Images Using the RSL" section on page 11. If you are loading software on a preconfigured router, you should save the router configuration file on your PC before beginning the image download process, as described in *Getting Started with the Router Software Loader*.

Product Numbers Quick-Reference List

Table 1 lists the Cisco product numbers of the feature packs supported in this release.

Table 1   Feature Pack Product Numbers Quick-Reference List

Product Number	Feature Pack Description
CD45-C-11.2=	Cisco 4500/4700 IP Feature Pack
CD45-CP-11.2=	Cisco 4500/4700 IP Plus Feature Pack

Table 1   Feature Pack Product Numbers Quick-Reference List (continued)

Product Number	Feature Pack Description
CD45-CW-11.2=	Cisco 4500/4700 IP Plus 40 Feature Pack[1]
CD45-CY-11.2=	Cisco 4500/4700 IP Plus 56 Feature Pack[1]
CD45-B-11.2=	Cisco 4500/4700 IP/IPX/AT/DEC Feature Pack
CD45-BP-11.2=	Cisco 4500/4700 IP/IPX/AT/DEC Plus Feature Pack
CD45-BW-11.2=	Cisco 4500/4700 IP/IPX/AT/DEC Plus 40 Feature Pack[1]
CD45-BY-11.2=	Cisco 4500/4700 IP/IPX/AT/DEC Plus 56 Feature Pack[1]
CD45-A-11.2=	Cisco 4500/4700 Enterprise Feature Pack
CD45-AP-11.2=	Cisco 4500/4700 Enterprise Plus Feature Pack
CD45-AW-11.2=	Cisco 4500/4700 Enterprise Plus 40 Feature Pack[1]
CD45-AY-11.2=	Cisco 4500/4700 Enterprise Plus 56 Feature Pack[1]

1   This feature pack contains encryption images.

Feature Pack Overview Table

Table 2 identifies each feature pack as specified on the router software CD-ROM label, describes the feature sets in each feature pack, and lists the following: UNIX and DOS filenames of the images, memory requirements, and the RSL installer description.

Table 2   Cisco 4500/4700 Series Feature Packs

Product Number	CD-ROM Title	Image Name (UNIX)	Image Name (DOS)	Flash Memory Required	Main Memory Required	RSL Installer Description
CD45-C-11.2=	Cisco 4500/4700 IP Feature Pack Release 11.2(14)P RSL version 7.0	c4500-i-mz.112-14.P	80137013	4 MB	16 MB	Cisco 4500/4700 IP Feature Set 11.2(14)P
CD45-CP-11.2=	Cisco 4500/4700 IP Plus Feature Pack Release 11.2(14)P RSL version 7.0	c4500-is-mz.112-14.P	80137113	4 MB	16 MB	Cisco 4500/4700 IP Plus Feature Set 11.2(14)P
CD45-CW-11.2=	Cisco 4500/4700 IP Plus 40 Feature Pack Release 11.2(14)P RSL version 7.0	c4500-is40-mz.112-14.P	80137213	4 MB	16 MB	Cisco 4500/4700 IP Plus 40 Feature Set 11.2(14)P
CD45-CY-11.2=	Cisco 4500/4700 IP Plus 56 Feature Pack Release 11.2(14)P RSL version 7.0	c4500-is56-mz.112-14.P	80137313	4 MB	16 MB	Cisco 4500/4700 IP Plus 56 Feature Set 11.2(14)P
CD45-B-11.2=	Cisco 4500/4700 IP/IPX/AT/DEC Feature Pack Release 11.2(14)P RSL version 7.0	c4500-d-mz.112-14.P	80136613	4 MB	16 MB	Cisco 4500/4700 IP/IPX/AppleTalk/DECnet Feature Set 11.2(14)P

Table 2   Cisco 4500/4700 Series Feature Packs (continued)

Product Number	CD-ROM Title	Image Name (UNIX)	Image Name (DOS)	Flash Memory Required	Main Memory Required	RSL Installer Description
CD45-BP-11.2=	Cisco 4500/4700 IP/IPX/AT/DEC Plus Feature Pack Release 11.2(14)P RSL version 7.0	c4500-ds-mz.112-14.P	80136413	8 MB	16 MB	Cisco 4500/4700 IP/IPX/AppleTalk/DECnet Plus Feature Set 11.2(14)P
CD45-BW-11.2=	Cisco 4500/4700 IP/IPX/AT/DEC Plus 40 Feature Pack Release 11.2(14)P RSL version 7.0	c4500-ds40-mz.112-14.P	80136813	8 MB	16 MB	Cisco 4500/4700 IP/IPX/AppleTalk/DECnet Plus 40 Feature Set 11.2(14)P
CD45-BY-11.2=	Cisco 4500/4700 IP/IPX/AT/DEC Plus 56 Feature Pack Release 11.2(14)P RSL version 7.0	c4500-ds56-mz.112-14.P	80136913	8 MB	16 MB	Cisco 4500/4700 IP/IPX/AppleTalk/DECnet Plus 56 Feature Set 11.2(14)P
CD45-A-11.2=	Cisco 4500/4700 Enterprise Feature Pack Release 11.2(14)P RSL version 7.0	c4500-j-mz.112-14.P	80137413	8 MB	16 MB	Cisco 4500/4700 Enterprise Feature Set 11.2(14)P
CD45-AP-11.2=	Cisco 4500/4700 Enterprise Plus Feature Pack Release 11.2(14)P RSL version 7.0	c4500-js-mz.112-14.P	80137513	8 MB	16 MB	Cisco 4500/4700 Enterprise Plus Feature Set 11.2(14)P
CD45-AW-11.2=	Cisco 4500/4700 Enterprise Plus 40 Feature Pack Release 11.2(14)P RSL version 7.0	c4500-js40-mz.112-14.P	80137613	8 MB	16 MB	Cisco 4500/4700 Enterprise Plus 40 Feature Set 11.2(14)P
CD45-AY-11.2=	Cisco 4500/4700 Enterprise Plus 56 Feature Pack Release 11.2(14)P RSL version 7.0	c4500-js56-mz.112-14.P	80137713	8 MB	16 MB	Cisco 4500/4700 Enterprise Plus 56 Feature Set 11.2(14)P

Feature Set Table

The Cisco IOS software is packaged into "feature sets" (also called "images"). Many different feature sets are available, and each feature set contains a specific subset of Cisco IOS features. The following conventions are used to identify feature sets:

- Plus—Value-added feature set with additional features.

- Plus 40—Value-added feature set with additional features, including 40-bit data encryption.

- Plus 56—Value-added feature set with additional features, including 56-bit data encryption.

Cisco IOS images with strong encryption (including, but not limited to, 56-bit DES) are subject to U.S. government export controls and have a limited distribution. Images to be installed outside the U.S. require an export license. Customer orders might be denied or subject to delay due to U.S. government regulations. Contact your sales representative or distributor for more information, or send e-mail to export@cisco.com.

The following list shows which feature sets are supported on the Cisco 4500 and Cisco 4700 series routers and access servers. These feature sets only apply to Cisco IOS Release 11.2 P:

- IP
- IP Plus
- IP Plus 40
- IP Plus 56
- IP/IPX/AT/DEC
- IP/IPX/AT/DEC Plus 40
- IP/IPX/AT/DEC Plus 56
- Enterprise
- Enterprise Plus
- Enterprise Plus 40
- Enterprise Plus 56

To determine what features are available with each feature set (software image), see Table 3. The table summarizes the features you can use when running a specific feature set on the Cisco 4500 and Cisco 4700 routers for Cisco IOS Release 11.2 P. Table 3 uses these terms:

Feature Set Matrix Term	Description
Basic	This feature is offered in the basic feature set.
Plus	This feature is offered in the Plus feature set.
Encrypt	This feature is offered in the encryption feature sets, which consist of 40-bit (Plus 40) or 56-bit (Plus 56) data encryption feature sets.

Table 3   Cisco 4000 Series Software Feature Sets

Feature	Feature Set			
	IP Routing	IP/IPX/IBM/APPN[1]	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise[2]
LAN Support				
Apollo Domain	—	—	—	Basic
AppleTalk 1 and 2[3]	—	—	Basic	Basic
Banyan VINES	—	—	—	Basic
Concurrent routing and bridging (CRB)	Basic	Basic	Basic	Basic
DECnet IV	—	—	Basic	Basic
DECnet V	—	—	—	Basic

Table 3   Cisco 4000 Series Software Feature Sets (continued)

Feature	IP Routing	IP/IPX/IBM/APPN[1]	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise[2]
GRE	Basic	Basic	Basic	Basic
Integrated routing and bridging (IRB)[4]	Basic	Basic	Basic	Basic
IP	Basic	Basic	Basic	Basic
LAN extension host	Basic	Basic	Basic	Basic
Multiring	Basic	Basic	Basic	Basic
Novell IPX[5]	—	Basic	Basic	Basic
OSI	—	—	—	Basic
Source-route bridging[6]	—	—	—	—
Transparent and translational bridging	Basic	Basic	Basic	Basic
VLANs (ISL[7] and IEEE 802.10) (Cisco 4500 only)	Plus	—	Plus	Plus
XNS	—	—	—	Basic
WAN Services				
ATM LAN emulation: DECnet routing, XNS routing, and Banyan VINES support (Cisco 4500 and 4700 only)[8]	—	—	Plus	Plus
ATM LAN emulation: Hot Standby Router Protocol (HSRP) and Simple Server Redundancy Protocol (SSRP) (Cisco 4500 and 4700 only)	Plus	—	Plus	Plus
ATM: Rate queues for SVC per subinterface (Cisco 4000, 4500, and 4700 only)	Plus	—	Plus	Plus
ATM: UNI 3.1 signaling for ATM (Cisco 4500 and 4700 only)	Plus	—	Plus	Plus
Combinet Packet Protocol (CPP)	Basic	Basic	Basic	Basic
Dialer profiles	Basic	Basic	Basic	Basic
Frame Relay	Basic	Basic	Basic	Basic
Frame Relay SVC Support (DTE)	—	—	—	Basic
Frame Relay traffic shaping	Basic	Basic	Basic	Basic
Half bridge/half router for CPP and PPP	Basic	Basic	Basic	Basic
HDLC	Basic	Basic	Basic	Basic
IPXWAN 2.0	—	Basic	Basic	Basic
ISDN[9]	Basic	Basic	Basic	Basic
Multichassis Multilink PPP (MMP)	—	—	—	Basic
NetBEUI over PPP	—	—	—	Basic
PPP[10]	Basic	Basic	Basic	Basic
SMDS	Basic	Basic	Basic	Basic
Switched 56	Basic	Basic	Basic	Basic

Table 3   Cisco 4000 Series Software Feature Sets (continued)

Feature	IP Routing	IP/IPX/IBM/APPN[1]	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise[2]
			Feature Set	
Virtual Private Dial-up Network (VPDN)	Plus	—	Plus	Basic
X.25[11]	Basic	Basic	Basic	Basic
WAN Optimization				
Bandwidth-on-demand	Basic	Basic	Basic	Basic
Custom and priority queuing	Basic	Basic	Basic	Basic
Dial backup	Basic	Basic	Basic	Basic
Dial-on-demand	Basic	Basic	Basic	Basic
Header[12], link and payload compression	Basic	Basic	Basic	Basic
Snapshot routing	Basic	Basic	Basic	Basic
Weighted fair queuing	Basic	Basic	Basic	Basic
IP Routing				
BGP	Basic	Basic	Basic	Basic
BGP4[13]	Basic	Basic	Basic	Basic
EGP	Basic	Basic	Basic	Basic
Enhanced IGRP	Basic	Basic	Basic	Basic
Enhanced IGRP Optimizations	Basic	Basic	Basic	Basic
ES-IS	—	—	—	Basic
IGRP	Basic	Basic	Basic	Basic
IS-IS	—	—	—	Basic
Named IP Access Control List	Basic	Basic	Basic	Basic
Network Address Translation (NAT)	Plus	—	Plus	Plus
NHRP	Basic	Basic	Basic	Basic
On Demand Routing (ODR)	Basic	Basic	Basic	Basic
OSPF	Basic	Basic	Basic	Basic
OSPF Not-So-Stubby-Areas (NSSA)	Basic	Basic	Basic	Basic
OSPF On Demand Circuit (RFC 1793)	Basic	Basic	Basic	Basic
PIM	Basic	Basic	Basic	Basic
Policy-based routing	Basic	Basic	Basic	Basic
RIP	Basic	Basic	Basic	Basic
RIP Version 2	Basic	Basic	Basic	Basic
Other Routing				
AURP	—	—	Basic	Basic
IPX RIP	—	Basic	Basic	Basic
NLSP	—	Basic	Basic	Basic
RTMP	—	—	Basic	Basic
SMRP	—	—	Basic	Basic
SRTP	—	—	—	Basic

Table 3   Cisco 4000 Series Software Feature Sets (continued)

	Feature Set			
Feature	**IP Routing**	**IP/IPX/IBM/APPN[1]**	**Desktop (IP/IPX/AppleTalk/DEC)**	**Enterprise[2]**
Multimedia and Quality of Service				
Generic traffic shaping	Basic	Basic	Basic	Basic
Random Early Detection (RED)[14]	Basic	Basic	Basic	Basic
Resource Reservation Protocol (RSVP)[14]	Basic	Basic	Basic	Basic
Management				
AutoInstall	Basic	Basic	Basic	Basic
Automatic modem configuration	Basic	Basic	Basic	Basic
HTTP Server	Basic	Basic	Basic	Basic
RMON events and alarms[15]	Basic	Basic	Basic	Basic
RMON full (Cisco 2500 series only)	Plus	Plus	Plus	Plus
SNMP	Basic	Basic	Basic	Basic
Telnet	Basic	Basic	Basic	Basic
Security				
Access lists	Basic	Basic	Basic	Basic
Access security	Basic	Basic	Basic	Basic
Extended access lists	Basic	Basic	Basic	Basic
Kerberized login	—	—	—	Basic
Kerberos V client support	—	—	—	Basic
Lock and key	Basic	Basic	Basic	Basic
MAC security for hubs[16]	Basic	Basic	Basic	Basic
MD5 routing authentication	Basic	Basic	Basic	Basic
Router authentication and network layer encryption (40-bit or export controlled 56-bit DES)[17]	Encrypt	—	Encrypt	Encrypt
RADIUS	Basic	Basic	Basic	Basic
TACACS+[18]	Basic	Basic	Basic	Basic
IBM Support (Optional)				
APPN (optional)[2]	—	Basic	—	Basic
BAN for SNA Frame Relay support	Plus	Basic	Plus	Basic
Bisync	Plus	Basic	Plus	Basic
Caching and filtering	Plus	Basic	Plus	Basic
DLSw+ [19]	Plus	Basic	Plus	Basic
Downstream PU concentration (DSPU)	Plus	Basic	Plus	Basic
Frame Relay SNA support (RFC 1490)	Plus	Basic	Plus	Basic
Native Client Interface Architecture (NCIA) Server	Plus	Basic	Plus	Basic
NetView Native Service Point	Plus	Basic	Plus	Basic
QLLC	Plus	Basic	Plus	Basic

Table 3   Cisco 4000 Series Software Feature Sets (continued)

Feature	IP Routing	IP/IPX/IBM/APPN[1]	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise[2]
			Feature Set	
Response Time Reporter (RTR)	Plus	Basic	Plus	Basic
SDLC integration	Plus	Basic	Plus	Basic
SDLC transport (STUN)	Plus	Basic	Plus	Basic
SDLC-to-LAN conversion (SDLLC)	Plus	Basic	Plus	Basic
SNA and NetBIOS WAN optimization via local acknowledgment	Plus	Basic	Plus	Basic
SRB/RSRB[20]	Plus	Basic	Plus	Basic
SRT	Plus	Basic	Plus	Basic
TG/COS	—	—	—	Basic
TN3270	—	—	—	Basic
Protocol Translation				
LAT	—	—	—	Basic
Rlogin	—	—	—	Basic
Remote Node[21]				
ARAP 1.0/2.0[22]	—	—	Basic	Basic
Asynchronous master interfaces	Basic	Basic	Basic	Basic
ATCP	—	—	Basic	Basic
CPPP	Basic	Basic	Basic	Basic
CSLIP	Basic	Basic	Basic	Basic
DHCP	Basic	Basic	Basic	Basic
IP pooling	Basic	Basic	Basic	Basic
IPX and ARAP on virtual async interfaces	—	—	—	Basic
IPXCP[12]	—	Basic	Basic	Basic
MacIP	—	—	Basic	Basic
NASI	—	Basic	Basic	Basic
PPP	Basic	Basic	Basic	Basic
SLIP	Basic	Basic	Basic	Basic
Terminal Services[21]				
LAT[23]	—	—	—	Basic
Rlogin	Basic	Basic	Basic	Basic
Telnet	Basic	Basic	Basic	Basic
TN3270	—	—	—	Basic
X.25 PAD	Basic	Basic	Basic	Basic
Xremote	—	—	—	Basic

1   This feature set has no additional options. It offers a low-end APPN solution for this set of hardware platforms. This feature set is not available for AccessPro PC cards.

2   Enterprise is available with APPN in a separate feature set. APPN includes APPN Central Registration (CRR) and APPN over DLSw+. APPN is not available on the AccessPro PC Card.

3 This feature includes AppleTalk load balancing.

4 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; and IRB and concurrent routing and bridging (CRB) cannot operate at the same time.

5 The Novell IPX feature includes display SAP by name, IPX Access Control List violation logging, and plain-English IPX access lists.

6 Translational bridging is fast switched by default but can be disabled.

7 Note that the only IPX encapsulation supported in ISL is 802.3.

8 ATM LAN emulation for Banyan VINES is only supported in Enterprise. The Desktop feature set supports DECnet only.

9 ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization features.

10 PPP includes support for LAN protocols supported by the feature set, address negotiation, PAP and CHAP authentication, Multilink PPP, and PPP compression.

11 X.25 includes X.25 switching.

12 IPX header compression (RFC 1553) is available in the feature sets that support IPX.

13 BGP4 includes soft configuration, multipath support, and prefix filtering with inbound route maps.

14 RED and RSVP are supported in IP/IPX/IBM/APPN for the Cisco 4000, 4500, and 4700 only.

15 The RMON events and alarms groups are supported on all interfaces. Full RMON support is available with the Plus feature sets.

16 MAC security for hubs is applicable to the following Cisco 2500 series Ethernet hub models: Cisco 2505, 2507, 2516, and 2518.

17 For more details, see the description of the new data encryption options in the section "Cisco IOS Packaging" in the *Release Notes for Cisco IOS Release 11.2*. (See the "Related Documentation" section on page 18 for information on accessing the related release notes.)

18 TACACS+ Single Connection and TACACS+ SENDAUTH enhancements are supported.

19 Cisco IOS Release 11.2 introduces several DLSw+ enhancements available in the Plus, Plus 40, and Plus 56 feature sets.

20 SRB/RSRB is fast switched. This enhancement is on by default, but can be disabled.

21 This feature is supported on access servers (with limited support on router auxiliary ports).

22 The Cisco 4000, 4500, and 4700 products do not support ARAP 1.0/2.0.

23 Use of LAT requires terminal license (FR-L8-10.X= for an 8-user license or FR-L16-10.X= for a 16-user license).

System Requirements

This section describes the following:

- Memory Requirements
- Hardware Supported
- Software Compatibility
- Determining Your Software Release

Memory Requirements

Table 4 lists the memory delivered by default and the available memory upgrades.

Table 4   Cisco 4500 and 4700 Default Memory and Upgrade Options

Memory Type	Default	Upgrade Options
Cisco 4500 Router		
Flash	4 MB	4-MB upgrade: MEM-4500-4F= 16-MB upgrade: MEM-4500-16F=
Main	16 MB	32-MB upgrade: MEM-4500-32D=
Shared	8 MB	16-MB upgrade: MEM-4500-16S=
Cisco 4700 Router		
Flash	4 MB	8-MB upgrade: MEM-4700-8F= 16-MB upgrade: MEM-4700-16F=
Main	16 MB	32-MB upgrade: MEM-4700-32D=
Shared	8 MB	8-MB upgrade: MEM-4700-8S= 16-MB upgrade: MEM-4700-16S=

Hardware Supported

The Router Software Loader (RSL) version 7.0 supports many Cisco routers. Specific to the Cisco 4000 series routers, RSL 7.0 supports:

- CiscoPro CPA4500 and CPA4700

- Cisco 4500 and 4700

Software Compatibility

The feature packs described in these release notes contain Cisco IOS Release 11.2(14)P software images, some earlier images, and the Router Software Loader (RSL) Version 7.0. Before running the RSL, read the "Installing Software Images Using the RSL" section on page 11.

Determining Your Software Release

To view the version of Cisco IOS software that is running on your Cisco 4000 series router, log in to the router, and enter the **show version** user EXEC command:

```
router> show version
```

An output begins similar to the following. The Cisco IOS version appears in the second line.

```
Cisco Internetwork Operating System Software
IOS (tm) 4000 Software (C4000-BNR2SY-L), Version 11.2(14)P, RELEASE SOFTWARE
```

The output includes more information including processor revision numbers, memory amounts, hardware IDs, and partition information.

Installation Notes

This section provides solutions to problems you might encounter when using the RSL to load Cisco IOS software on a router. It also describes special cases that might require you to load Cisco IOS software on a CiscoPro router or to use an alternative to the RSL.

Installing Software Images Using the RSL

This section describes some solutions to problems you might encounter when using the RSL. These solutions are additions to the RSL online help.

Recovering from a Connection Error

This installation tip provides a possible recovery solution if you are unable to connect to your access server or 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 access server:

```
"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, which is set to 25 seconds, in the Options dialog box, especially if one of the following situations applies:

Note Increasing the Short Timeout value might increase the time it takes for the RSL to connect to the target access server or router.

- You are connecting to an access server that has a large configuration file.

- You are connecting to a Cisco AS5200 access server. A Cisco AS5200 requires up to 45 seconds to write a configuration to nonvolatile random-access memory (NVRAM), due to the amount of interfaces that must be checked during this process. Increase the Short Timeout value to 60 seconds.

Restoring the Startup Configuration

In some cases, the RSL is unable to restore the startup configuration. If this happens, take the following steps:

Step 1 Ensure that all cables are properly attached to both the router and the PC.

Step 2 Restart the RSL, and connect by using the **Preconfigured router** option.

Step 3 When asked if you want to overwrite the existing startup configuration file, choose **no**.

Step 4 When asked if you want to continue, choose **yes**.

Step 5 When the router is connected, select **Download Router Configuration** in the Router Software Loader dialog box.

Step 6 Select the appropriate file, and click the radio button beside **Copy configuration to the router nonvolatile memory**.

The router should now contain the startup configuration it had before the initial RSL connection. You can now exit the RSL.

Note In the previous situation, the router configuration register (**config-register 0x***nnnn*) is not restored.

Note If you press **Ctrl-Alt-Delete** to terminate the RSL, the router configuration and configuration register are not restored. However, in this case the configuration file is not deleted from the PC, so you can restore it using the previous steps, beginning with Step 2.

Helpful Hints

The following information about RSL operations can help you with the installation process:

- If you have added any static entries to the PC Address Resolution Protocol (ARP) table, one or more of them might be deleted by the RSL. You need to manually re-enter any deleted entries in the PC ARP table.

- If the router's running configuration at connection time is not the same as its startup configuration, the exact configuration is not restored. Any changes that you have made since the last time a **copy running-config startup-config** or **write memory** command was entered are lost.

- The RSL restores the router's startup configuration, but some running configuration commands are not restored. To restore the exact running configuration, reboot the router. The following interface configuration commands are not restored to the running configuration: **no shutdown**, **no ringspeed**, and **media-type aui**.

Loading Cisco IOS Release 11.2 Software on CiscoPro Routers

The RSL has an upgrade utility to permanently modify a CiscoPro router so that it accepts Cisco IOS Release 11.2 software images. The utility changes the router SysObjectID Simple Network Management Protocol (SNMP) MIB value (used for network management) to that of a Cisco router. The software banner also changes and no longer identifies the router as a CiscoPro product.

Note   After this upgrade, CiscoVision cannot recognize your router. If you choose the permanent upgrade, CiscoWorks for Windows is a recommended replacement for network management purposes. To upgrade your CiscoVision software to CiscoWorks Windows 2.1, order 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). For general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

If you select a Cisco IOS Release 11.2 image from the image list and are connected to a CiscoPro CPA 4000 series router, a message box tells you that the router requires a permanent upgrade to load this image. You can either select **yes** to have the RSL upgrade the router and continue loading the selected image or select **no** to cancel the load operation.

After you select **yes**, the RSL utility downloads, performs the upgrade, reboots the router, and issues a message to confirm the upgrade. Confirm this message. The RSL then downloads the selected image.

The upgrade utility must be located in the Images directory. If it is not, the upgrade utility informs you that the image is not present.

Alternatives to the RSL

The RSL is designed to work with a PC running Microsoft Windows 95 and is the recommended method for downloading software to the router. The booklet included with the CD-ROM explains how to perform this simple install process. However, two alternatives are available for installing router software:

- Using the console or auxiliary port
- Using a TFTP server application

Installing the Router Software Using the Console or Auxiliary Port

This section explains how to use the **copy xmodem flash** command to install the router software from the CD-ROM onto the router.

Note   The transfer takes place only on the port at which you issue the command. If you download via the console, all console output is discarded for the duration of the transfer. You can only download files to the router; you cannot copy files from the router. Cisco recommends using the auxiliary port for this type of software download. The auxiliary port has hardware flow control and full modem control. In addition, the transfer does not occupy the system console so it is free for other uses.

The following example shows how to use the **copy xmodem flash** command on a Cisco 4000 series router:

```
Router# copy xmodem flash
                       **** WARNING ****
      x/ymodem is a slow transfer protocol limited to the current speed
      settings of the auxiliary/console ports. The use of the auxilary
      port for this download is strongly recommended.
      During the course of the download no exec input/output will be
      available.
                       ---- ******* ----
      Proceed? [confirm] yes
      Use crc block checksumming? [confirm] yes
      Max Retry Count [10]:
      Perform image validation checks? [confirm] yes
      Xmodem download using crc checksumming with image validation
      Continue? [confirm] yes
      Partition   Size    Used     Free      Bank-Size  State        Copy Mode
        1         4096K   3259K     836K     4096K      Read/Write   Direct
        2         4096K      0K    4095K     4096K      Read/Write   Direct

      [Type ?<no> for partition directory; ? for full directory; q to abort]
      Which partition? [default = 1] 2

      System flash directory, partition 2:
      File  Length   Name/status
        1   68       TESTFILE
      [132 bytes used, 4194172 available, 4194304 total]
      Destination file name? c3620-i-mz.0918
      Erase flash device before writing? [confirm] yes
      Flash contains files. Are you sure you want to erase? [confirm] yes

      Copy '' from server
        as 'c3620-i-mz.0918' into Flash WITH erase? [yes/no] yes
      Erasing device... eeeeeeeeeeeeeee ...erased
      Ready to receive file...........C
      Verifying checksum...  OK (0x5DE8)
      Flash device copy took 00:12:06 [hh:mm:ss]
```

Installing the Router Software Using a TFTP Server Application

Use this TFTP server application method as an alternative to using the RSL to install the router software from the CD-ROM. You can perform this procedure using a PC (running Microsoft Windows 95 or Microsoft Windows 3.1), a Macintosh, or a UNIX system. You can use either the **copy tftp flash** or **copy rcp flash** command to download the router software to the router.

First obtain a TFTP application or a remote copy protocol (rcp) application to set up your computer as a TFTP server or an rcp server. Use the RSL or the TFTP server included on the feature pack CD-ROM to install the router software only if you are using a PC running Windows 95. For other operating systems, a number of TFTP or rcp applications are available from independent software vendors or available as shareware from public sources on the World Wide Web.

Note To use an rcp application, follow the same procedure, and substitute rcp for TFTP in the instructions. Use the **copy rcp flash** command instead of the **copy tftp flash** command.

Step 1 Install any TFTP server application on the PC. (A PC application is included on the feature pack CD-ROM for Microsoft Windows 95 only.)

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

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

Most TFTP server applications include 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 check box beside the word Server. To configure the local PC as a server, select this check box.

The TFTP server also allows the selection of a "root" directory. You must select the directory in which the Cisco IOS files reside, for example, d:\cpswinst\images.

Caution Make sure you set up your local C as a TFTP server. If you overlook this step, you cannot perform the copy procedure. This reminder also applies if you are using rcp instead of TFTP.

Step 4 Establish a console session from your local PC (which is now configured as a TFTP server) to the Cisco router by using one of these methods:

- Connect the PC com port to the router console port.

  This is the recommended method. When you reload the router with the new image in Step 24, you remain connected to the router. (If you use Telnet, you lose connection to the router.)

- Establish a Telnet session from the PC to the router.

Caution Make sure your PC is set up to communicate with the 10BaseT Ethernet port on the router.

Step 5 Connect your PC Ethernet port to the corresponding router LAN port. Use the 10BaseT crossover cable to connect to an Ethernet port. Use straight-through cables if you are connecting via a 10BaseT hub or a 100BaseT hub.

Note We recommend that you back up the router configuration before upgrading the router software.

Step 6   Enter the following commands to set the configuration register to 0x2101 and reload to the bootstrap image:

```
Router# configure terminal
Router(config)# config-reg 0x2101
Router(config)# end
Router# reload
```

Step 7   Enter **yes** in response to the prompt asking if the system configuration has been modified:

```
# System configuration has been modified. Save? yes
```

Step 8   If the password prompt appears, enter the password.

```
Password: <password>
```

Step 9   At the router prompt, enter **enable** and then the password:

```
Router(boot)> enable
Password: <password>
```

Step 10   At the router prompt, enter the following command to copy the router upgrade utility from the PC CD-ROM drive to the router:

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

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

Step 11   When prompted, enter the IP address of your 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. (Note that you can obtain your PC IP address from the DOS prompt in the windows directory by entering **winipcfg**, as follows: C:\WINDOWS> **winipcfg**.)

Step 12   When prompted, enter the filename of the image to be copied to the router as in the following example:

```
Source file name? cpa4500-i-mz.112-14.P
```

Note   The upgrade image file on the Feature Pack CD has a long filename (cpa4500-i-mz.112-14.P); note that DOS displays it in 8.3 format as cpa4500~1.P. The upgrade utility is a special file, not a Cisco IOS run-time image.

Step 13   In response to the following prompt, enter the destination filename, and press **Enter**.

```
Destination file name [cpa1600-upgrade-l.112-3.P]?
cpa4500-i-mz.112-14.P
```

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

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

If the file is not found, check the following:

- The filename is correct.

- The TFTP server is enabled.

- The correct root directory is selected.

- There is IP connectivity between the router and TFTP server.

If the file is still not found, create a temporary directory called C:\temp and copy the CiscoPro upgrade file into the directory. Select the C:\temp directory as the root directory.

Step 14 Enter **yes** in response to the prompt asking if you want to erase the existing image in the router Flash memory before copying the new one:

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

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. If you see three or more periods (...), the transfer might fail. If the transfer fails, use the **ping** command to check IP connectivity between the router and TFTP server.

Step 15 Enter the **reload** command to reload the router:

```
Router(boot)# reload
```

Do not save the configuration.

After reload is complete, your CiscoPro router has been upgraded to a Cisco Enterprise router. Because the original Cisco IOS image that resided in Flash memory was erased during the upgrade process, the router is now running in bootstrap mode.

Step 16 If the password prompt appears, enter the password.

```
Password: <password>
```

Step 17 At the router prompt, enter **enable** and then the password:

```
Router(boot)# enable
Password: <password>
```

Step 18 At the router prompt, enter the following command to copy the new software image from the PC CD-ROM drive to the router:

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

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

Step 19 When prompted, enter the IP address of your 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 20 When prompted, enter the filename of the Cisco IOS Release 11.2 image to be copied to the router, as in the following example:

```
Source file name? 80137013.bin
```

This example specifies the DOS image name of the IP feature set for Cisco 4000 or 4500 series routers (as shown in Table 2 in the "Feature Pack Overview Table" section on page 3).

Step 21 In response to the prompt, enter the destination UNIX image filename, and press **Enter**.

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. Refer to Table 2 in the "Feature Pack Overview Table" section on page 3 for the UNIX image filename.

```
Destination file name [80137013.bin]? c4500-i-mz.112-14.P
```

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

Step 22 Enter **yes** in response to the prompt asking if you want to erase the existing image copy resident in the router Flash memory before copying the new one.

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

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 checksum verification of the image occurs after the image is written to Flash memory.

Step 23 Enter the following commands to reset the configuration register to 0x2102.

```
Router(boot)(config)# configure terminal
Router(boot)(config)# config-reg 0x2102
Router(boot)(config)# end
```

Step 24 Enter the **reload** command to reload the router:

```
Router# reload
```

After reload is complete, the router should be running the required Cisco IOS image. Use the **show version** command to verify.

Documentation Updates

Due to a production problem, many source-route bridging commands were omitted from the printed version of the *Cisco IOS Software Command Summary* (78-4746-xx, DOC-CIOSCS11.2=). For complete documentation of all source-route bridging commands, refer to the *Bridging and IBM Networking Command Reference* (78-4743-xx). You can also obtain the most current documentation on the Documentation CD-ROM or Cisco Connection Online (CCO).

Related Documentation

These release notes should be used in conjunction with the documents listed in this section:

- Cisco 4000 Series-Specific Documentation

- New Feature Documentation

- Cisco IOS Documentation Set

- Other Supporting Documents

- Online Navigation

The documents listed in this section are available in printed or electronic format. See the "Online Navigation" section on page 22 for more information on accessing electronic documentation.

Cisco 4000 Series-Specific Documentation

The following documents are specific to the Cisco 4000 series routers:

- *Cisco 4000 Hardware Installation and Maintenance*
- *Cisco 4000 Series Hardware Installation and Maintenance*
- *Cisco 4000 Series Installation Guide*
- Cisco 4000 Series Configuration Notes
- Cisco 4000 Series Router Configuration Notes
- *Regulatory Compliance and Safety Information*

New Feature Documentation

New feature documentation is first published online only, and is eventually added to the books in the Cisco IOS documentation set. New feature documentation includes configuration tasks and new and changed command reference information; it supplements the Cisco IOS Release 11.2 configuration guide and command reference books. The new feature documentation for Release 11.2 P is available online on CCO and on the Documentation CD-ROM. Refer to the "Online Navigation" section on page 22 for details.

Cisco IOS Documentation Set

The Cisco IOS software documentation is divided into nine modules and two master indexes. There are also four supporting documents.

Note   The most current Cisco IOS documentation can be found on the latest Documentation CD-ROM and on the Web. These electronic documents contain updates and modifications made after the paper documents were printed. See the "Online Navigation" section on page 22 for details.

Documentation Modules

Each module consists of two books: a configuration guide and a corresponding command reference. Chapters in a configuration guide describe protocols, configuration tasks, and Cisco IOS software functionality and contain comprehensive configuration examples. Chapters in a command reference provide complete command syntax information. Each configuration guide can be used in conjunction with its corresponding command reference.

Master Indexes

Two master indexes provide indexing information for the Cisco IOS software documentation set: an index for the configuration guides and an index for the command references. In addition, individual books contain a book-specific index.

The Cisco IOS documentation set consists of the following books and chapter topics:

Books	Chapter Topics
• *Configuration Fundamentals Configuration Guide*	Configuration Fundamentals Overview
• *Configuration Fundamentals Command Reference*	Cisco IOS User Interfaces
	File Management
	Interface Configuration
	System Management
• *Network Protocols Configuration Guide, Part 1*	IP Addressing
• *Network Protocols Command Reference, Part 1*	IP Services
	IP Routing Protocols
• *Network Protocols Configuration Guide, Part 2*	AppleTalk
• *Network Protocols Command Reference, Part 2*	Novell IPX
• *Network Protocols Configuration Guide, Part 3*	Apollo Domain
• *Network Protocols Command Reference, Part 3*	Banyan VINES
	DECnet
	ISO CLNS
	XNS
• *Wide-Area Networking Configuration Guide*	ATM
• *Wide-Area Networking Command Reference*	Frame Relay
	SMDS
	X.25 and LAPB
• *Security Configuration Guide*	AAA Security Services
• *Security Command Reference*	Security Server Protocols
	Traffic Filtering
	Network Data Encryption
	Passwords and Privileges
	Neighbor Router Authentication
	IP Security Options
• *Dial Solutions Configuration Guide*	Dial Business Solutions and Examples
• *Dial Solutions Command Reference*	Dial-In Port Setup
	DDR and Dial Backup
	Remote Node and Terminal Service
	Cost-Control and Large-Scale Dial Solutions
	VPDN

Books	Chapter Topics
• *Cisco IOS Switching Services Configuration Guide*	Switching Paths for IP Networks
• *Cisco IOS Switching Services Command Reference*	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
• *Bridging and IBM Networking Configuration Guide*	Transparent Bridging
• *Bridging and IBM Networking Command Reference*	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
• *Cisco IOS Software Command Summary*	
• *Dial Solutions Quick Configuration Guide*	
• *System Error Messages*	
• *Debug Command Reference*	

Note The *Cisco Management Information Base (MIB) User Quick Reference* publication is no longer being published. For the latest list of MIBs supported by Cisco, see the *Cisco Network Management Toolkit* on Cisco Connection Online. On CCO, go to **Software and Support**: **Software Center**: **Network Management Products**: **Cisco Network Management Toolkit**: **Cisco MIBs**.

Other Supporting Documents

The following documents also relate to the Cisco 4000 series routers:

- *Release Notes for Cisco IOS Release 11.2*
- Product-specific Cisco IOS release notes for the Cisco 4000 series routers
- *Access Services Quick Configuration Guide*
- *Cisco IOS Software Release 11.2 and 11.2 P Caveats*

- *CIP Microcode Release Note and Upgrade Instructions*

Online Navigation

The Cisco IOS software documentation set is available as printed manuals or electronic documents. You can access Cisco documentation at Cisco Connection Online (CCO) on the World Wide Web and on the Cisco Documentation CD-ROM:

- Cisco 1600 series manuals and configuration notes:

  — Using a web browser, go to **http://www.cisco.com/**, click **Products & Ordering**, select **Cisco Documentation**, go to **Access Servers and Access Routers**, select **Modular Access Routers**, and click **Cisco 4000 Series (4000/4500/4700/4000-M/4500-M/4700-M)**.

  — On the Documentation CD-ROM, go to **Cisco Product Documentation**, select **Access Servers and Access Routers**, go to **Modular Access Routers**, and click **Cisco 4000 Series (4000/4500/4700/4000-M/4500-M/4700-M)**.

- Cisco IOS documentation set and supporting documents:

  — On Cisco Connection Online (CCO), the path is **Products and Ordering**: **Documentation**: **Cisco Documentation**: **Cisco Product Documentation**: **Cisco IOS Software Configuration**: **Cisco IOS Release 11.2**.

  — On the Documentation CD, the path is **Cisco Product Documentation**: **Cisco IOS Software Configuration**: **Cisco IOS Release 11.2**.

- New feature documentation for Cisco IOS 11.2 P features:

  — On Cisco Connection Online (CCO), the path is **Products and Ordering**: **Documentation**: **Cisco Documentation**: **Cisco Product Documentation**: **Cisco IOS Software Configuration**: **Cisco IOS Release 11.2**: **Release Notes for Cisco IOS Release 11.2**.

  — On the Documentation CD, the path is **Cisco Product Documentation**: **Cisco IOS Software Configuration**: **Cisco IOS Release 11.2**: **Release Notes for Cisco IOS Release 11.2**.

For additional information about the Documentation CD-ROM and CCO, refer to the sections "Cisco Connection Online" and "Documentation CD-ROM" at the end of these release notes.

Service and Support

The following URL contains links to access helpful tips on configuring your Cisco products:

```
http://www.cisco.com/kobayashi/serv_tips.shtml
```

This URL is subject to change without notice. If it changes, point your web browser to **http://www.cisco.com/,** and follow this path: **Software & Support: Technical Tips** (button on left margin).

"Hot Tips" are popular tips and hints gathered from the Cisco Technical Assistance Center (TAC). Most of these documents are available from the TAC FAX-on-demand service. To access FAX-on-demand and receive documents at your FAX machine, from the USA, call 888-50-CISCO (888-502-4726). From other areas, call 415-596-4408.

The following sections are provided from the Technical Tips page:

- Access Dial Cookbook—Offers easy-to-follow "recipes" for sample router configurations. The first cookbook contains network diagrams, sample configurations, and troubleshooting commands for helping you set up and use dial technologies on Cisco access routers.

- Field Notices—Designed to provide notification of any critical issues regarding Cisco products. These include problem descriptions, safety or security issues, and hardware defects.

- Hardware—Technical Tips related to specific hardware platforms.

- Internetworking Features—Tips on using and deploying Cisco IOS software features and services.

- Sample Configurations—Actual configuration examples complete with topology and annotations.

- Software Products—MultiNet & Cisco Suite 100, Network Management, Cisco IOS Software Bulletins, and CiscoPro Configurations.

- Special Collections—Other Helpful Documents, Frequently Asked Questions, Security Advisories, References & RFCs, Case Studies, and the CiscoPro Documentation CD-ROM.

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.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously: a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and it is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

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.

Note 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.

Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM, a member of the Cisco Connection Family, is updated monthly. Therefore, it might be more current than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription. You can also access Cisco documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

If you are reading Cisco product documentation on the World Wide Web, you can submit comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco. We appreciate your comments.