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Release Notes for Cisco 7000 Family for Cisco IOS Releases 12.0(5)XE through 12.0(7)XE2

February 15, 2002

Note The most current Release 12.0(7)XE documentation is available on Cisco Connection Online. These online documents may contain updates and modifications made after the hard-copy documents were printed, including descriptions of new products and integrated features. Cisco Systems recommends that you consult the following URLs for the most up-to-date Release 12.0XE information.
The most recent 12.0(7)XE release notes are located at:
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/relnote/7000fam/12_0xe/rn120xe.htm

The most recent 12.0(7)XE feature descriptions are located at:
http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120limit/120xe/index.htm

These release notes for the Cisco 7000 family of routers support Cisco IOS Release 12.0(7)XE2. These release notes describe new features, memory requirements, hardware support, and changes to the microcode or modem code and related documents.

Cisco IOS Release 12.0(7)XE2 is the next release of Cisco IOS Release 12.0(5)XE8. All features and functionality, unless otherwise noted, introduced in Cisco IOS Release 12.0(5)XE are also in Release 12.0(7)XE2.

Release 12.0(5)XE is based on Cisco IOS Release 12.0(5)T. All functionality in Cisco IOS Release 12.0(5)T is also in Release 12.0(5)XE, and, subsequently, Cisco IOS Release 12.0(7)XE2.

Cisco IOS Release 12.0(7)XE was for the Catalyst 6000 platforms only. Cisco IOS Release 12.0(7)XE contains no functionality for Cisco 7000 family routers.

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA

For a list of the software caveats that apply to Release 12.0(7)XE2, see the "Caveats" section on page 48, the *Caveats for Cisco IOS Release 12.0 T* document, and the *Caveats for Cisco IOS Release 12.0* document that accompany these release notes. All caveats in Release 12.0(5)T are also in Releases 12.0(5)XE through 12.0(7)XE2. The caveats documents are updated for every maintenance release and are located on Cisco Connection Online (CCO) and the Documentation CD-ROM.

Use these release notes with the *Cross-Platform Release Notes for Cisco IOS Release 12.0* and the *Release Notes for Cisco 7000 Family for Cisco IOS Release 12.0 T* located on CCO and the Documentation CD-ROM.

Contents

These release notes describe the following topics:

Early Deployment Releases

Cisco IOS Release 12.0(7)XE2 will migrate to the following software releases: Cisco IOS Release 12.1(1)E, and Cisco IOS Release 12.1(3)T. All maintenance updates will be placed into Cisco IOS Release 12.1(3)T and future Cisco IOS Release 12.1 T maintenance releases. No maintenance updates will be placed into Release 12.0(7)XE2.

For more information about the Cisco IOS software release process, see the *Types of Cisco IOS Software Releases: Product Bulletin #537* located on CCO and on the Documentation CD-ROM.

Release 12.0(5)XE is based on Cisco IOS Release 12.0(5)T. All functionality in Cisco IOS Release 12.0(5)T is also in Release 12.0(5)XE, and, subsequently, Cisco IOS Release 12.0(7)XE2.

These release notes describe Release 12.0 XE for the Cisco 7000 family of routers and do not describe features that are available in Release 12.0, Release 12.0 T, or other Release 12.0 Early Deployment (ED) releases.

For information about features in Release 12.0, see the *Cross-Platform Release Notes for Cisco IOS Release 12.0* on CCO and the Documentation CD-ROM.

For information about features in Release 12.0 T, see the *Release Notes for Cisco 7000 Family for Cisco IOS Release 12.0 T* on CCO and the Documentation CD-ROM.

For information about features in other platforms, see the *Release Notes for Cisco IOS Release 12.0* index on CCO and the Documentation CD-ROM.

System Requirements

This section describes the system requirements for Release 12.0(7)XE2 and includes the following sections:

Memory Requirements

Table 1 describes the memory requirements for the feature sets supported by Cisco IOS Release 12.0 XE for the Cisco 7000 family of routers.

All feature sets for Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and the RSP7000CI include Versatile Interface Processor (VIP) support.

Note The images for the Cisco 7200 series routers for Cisco IOS Release 12.0(5)XE5 were deferred to Release 12.0(5)XE6.
The Cisco 7100 and Cisco 7500 software images are not available in Release 12.0(5)XE6. Cisco IOS Release 12.0(5)XE5 is for Cisco 7500 software images only. Cisco IOS Release 12.0(5)XE8 supports Cisco 7100 series software images only.

Table 1 Memory Requirements for Cisco 7000 Family of Routers

Platforms	Feature Sets	Image Name	Software Image	Flash Memory Required	DRAM Memory Required	Runs From
Cisco 7200 Series	IP Standard Feature Set	IP	c7200-is-mz	16 MB	64 MB	RAM
		IP IPSec 56	c7200-is56i-mz	16 MB	64 MB	RAM
		IP IPSec 3DES	c7200-ik2s-mz	16 MB	64 MB	RAM
	IP Firewall Standard Feature Set	IP/FW	c7200-io3s-mz	16 MB	64 MB	RAM
		IP/FW IPSec 56	c7200-io3s56i-mz	16 MB	64 MB	RAM
		IP/FW IPSec 3DES	c7200-ik2o3s-mz	16 MB	64 MB	RAM
	Enterprise Standard Feature Set	Enterprise	c7200-js-mz	16 MB	64 MB	RAM
		Enterprise IPSec 56	c7200-js56i-mz	16 MB	64 MB	RAM
		Enterprise IPSec 3DES	c7200-jk2s-mz	16 MB	64 MB	RAM
	Enterprise Firewall Standard Feature Set	Enterprise/FW	c7200-jo3s-mz	16 MB	64 MB	RAM
		Enterprise/FW IPSec 56	c7200-jo3s56i-mz	16 MB	64 MB	RAM
		Enterprise/FW IPSec 3DES	c7200-jk2o3s-mz	16 MB	64 MB	RAM
	Desktop/IBM Standard Feature Set	Desktop/IBM	c7200-ds-mz	16 MB	64 MB	RAM
		Desktop/IBM IPSec 56	c7200-ds56i-mz	16 MB	64 MB	RAM
	Desktop/IBM Firewall Standard Feature Set	Desktop/IBM FW	c7200-do3s-mz	16 MB	64 MB	RAM
		Desktop/IBM FW IPSec 56	c7200-do3s56i-mz	16 MB	64 MB	RAM
		Desktop/IBM FW IPSec 3DES	c7200-dk2o3s-mz	16 MB	64 MB	RAM
Cisco 7500 Series	IP Standard Feature Set	IP	rsp-isv-mz	16 MB	32 MB	RAM
		IP IPSec 56	rsp-isv56i-mz	16 MB	32 MB	RAM
		IP IPSec 3DES	rsp-ik2sv-mz	16 MB	32 MB	RAM
	Enterprise Standard Feature Set	Enterprise	rsp-jsv-mz	16 MB	32 MB	RAM
		Enterprise IPSec 56	rsp-jsv56i-mz	16 MB	32 MB	RAM
		Enterprise IPSec 3DES	rsp-jk2sv-mz	16 MB	32 MB	RAM
	Desktop/IBM Standard Feature Set	Desktop/IBM	rsp-dsv-mz	16 MB	32 MB	RAM
		Desktop/IBM IPSec 56	rsp-dsv56i-mz	16 MB	32 MB	RAM

Table 1 Memory Requirements for Cisco 7000 Family of Routers (continued)

Platforms	Feature Sets	Image Name	Software Image	Flash Memory Required	DRAM Memory Required	Runs From
Cisco 7100 Series	Enterprise Standard Feature Set	Enterprise	c7100-js-mz	16 MB	64 MB	RAM
		Enterprise IPSec 56	c7100-js56i-mz	16 MB	64 MB	RAM
		Enterprise IPSec 3DES	c7100-jk2s-mz	16 MB	64 MB	RAM
	Enterprise/FW Standard Feature Set	Enterprise/FW	c7100-jo3s-mz	16 MB	64 MB	RAM
		Enterprise/FW IPSec 56	c7100-jo3s56i-mz	16 MB	64 MB	RAM
		Enterprise/FW IPSec 3DES	c7100-jk2o3s-mz	16 MB	64 MB	RAM
	IP Standard Feature Set	IP	c7100-is-mz	16 MB	64 MB	RAM
		IP IPSec 56	c7100-is56i-mz	16 MB	64 MB	RAM
		IP IPSec 3DES	c7100-ik2s-mz	16 MB	64 MB	RAM
	IP/FW Standard Feature Set	IP/FW	c7100-io3s-mz	16 MB	64 MB	RAM
		IP/FW IPSec 56	c7100-io3s56i-mz	16 MB	64 MB	RAM
		IP/FW IPSec 3DES	c7100-ik2o3s-mz	16 MB	64 MB	RAM

Hardware Supported

Cisco IOS Release 12.0(7)XE2 supports the following Cisco 7000 family platforms:

- Cisco 7500 series routers (including the Cisco 7505, Cisco 7507, Cisco 7513, and Cisco 7576)
- Cisco 7000 series routers (including the Cisco 7000 and Cisco 7010) upgraded with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI)
- Cisco 7200 series routers (including the Cisco 7202, Cisco 7204, and Cisco 7206)
- Cisco 7200 VXR (including the Cisco 7204VXR and Cisco 7206VXR)
- Cisco 7100 series routers (including the Cisco 7120 and Cisco 7140)

Cisco IOS Release 12.0(5)XE8 supports the following platforms:

- Cisco 7100 series routers (including the Cisco 7120 and Cisco 7140)

Cisco IOS Release 12.0(5)XE6 supports the following platform:

- Cisco 7200 series routers (including the Cisco 7202, Cisco 7204, and Cisco 7206)
- Cisco 7200 VXR (including the Cisco 7204VXR and Cisco 7206VXR)

Cisco IOS Release 12.0(5)XE5 supports the following platforms:

- Cisco 7500 series routers (including the Cisco 7505, Cisco 7507, Cisco 7513, and Cisco 7576)
- Cisco 7000 series routers (including the Cisco 7000 and Cisco 7010) upgraded with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI)

Cisco IOS Releases 12.0(5)XE through 12.0(5)XE4 support the following platforms:

- Cisco 7500 series routers (including the Cisco 7505, Cisco 7507, Cisco 7513, and Cisco 7576)
- Cisco 7000 series routers (including the Cisco 7000 and Cisco 7010) upgraded with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI)
- Cisco 7200 series routers (including the Cisco 7202, Cisco 7204, and Cisco 7206)
- Cisco 7200 VXR (including the Cisco 7204VXR and Cisco 7206VXR)

Cisco 7100 series routers (including the Cisco 7120 and Cisco 7140)

For detailed descriptions of the new hardware features, see the "New and Changed Information" section on page 35.

Note In this document, the term Cisco 7500/RSP series represents both the Cisco 7500 series and the Cisco 7000 series equipped with the RSP7000 and the RSP7000CI.

Determining the Software Version

To determine the version of Cisco IOS software running on your Cisco 7000 family router, log in to the Cisco 7000 family router and enter the **show version** EXEC command. The following sample **show version** command output is from a router running a Cisco 7200 series software image with Release 12.0(7)XE2:

```
router>show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-MZ), Version 12.0(7)XE2, RELEASE SOFTWARE
```

Upgrading to a New Software Release

For information about upgrading to a new software release, see the product bulletin *Cisco IOS Software Release 12.0 Upgrade Paths and Packaging Simplification* located at:

http://www.cisco.com/kobayashi/library/12.0/120MigrPaths.pdf

If you do not have an account on CCO and want general information about upgrading to a new software release, see the product bulletin *Cisco IOS Software Release 11.3 Upgrade Paths and Packaging Simplification (#703: 12/97)* on CCO at:

Service & Support: **Software Center**: **Cisco IOS Software**: **Product Bulletins**

Under **Cisco IOS 11.3**, click **Cisco IOS Software Release 11.3 Upgrade Paths (#703: 12/97)**.

This product bulletin does not contain information specific to Cisco IOS Release 12.0 but provides generic upgrade information that may apply to Cisco IOS Release 12.0.

Microcode Software

Microcode software images are bundled with the system software image—with the exception of the Channel Interface Processor (CIP) microcode (all system software images). Bundling eliminates the need to store separate microcode images. When the router starts, the system software unpacks the microcode software bundle and loads the proper software on all the interface processor boards. Table 2 lists the current microcode versions for the Cisco 7000 family of routers.

Table 2 Current Microcode Versions for the Cisco 7000 Family

Processor or Module	Current Bundled RSP Microcode Version	Minimum Version Required
AIP (ATM Interface Processor)	20.18	20.13
EIP (Ethernet Interface Processor)	20.6	20.3
FEIP (Fast Ethernet Interface Processor)	20.8	20.7
FIP (FDDI Interface Processor)	20.4	20.4
FSIP (Fast Serial Interface Processor)	20.9	20.9
HIP (HSSI Interface Processor)	20.2	20.2
MIP (MultiChannel Interface Processor)	22.3	22.3
TRIP (Token Ring Interface Processor)	20.2	20.2
VIP2/VIP2C (Versatile Interface Processor)	22.20	22.20

Feature Set Tables

The Cisco IOS software is packaged in feature sets consisting of software images—depending on the platform. Each feature set contains a specific set of Cisco IOS features.

Release 12.0(5)XE is based on Cisco IOS Release 12.0(5)T. All functionality in Cisco IOS Release 12.0(5)T is also in Release 12.0(5)XE, and, subsequently, Cisco IOS Release 12.0(7)XE2.

Releases 12.0(5)XE through 12.0(7)XE2 support the same feature sets as Release 12.0(5)T, but Releases 12.0(5)XE through 12.0(7)XE2 can include new features supported by the Cisco 7000 family of routers.

Caution Cisco IOS images with strong encryption (including, but not limited to 168-bit [3DES] data encryption feature sets) are subject to United States government export controls and have limited distribution. Strong encryption images to be installed outside the United States may require an export license. Customer orders may be denied or subject to delay due to United States government regulations. When applicable, the purchaser or the user must obtain local import and use authorizations for all encryption strengths. Contact your sales representative or distributor for more information, or send an e-mail to export@cisco.com.

Note This feature set table contains only a selected list of features based on Release 12.0 and 12.0 T. This table is not a cumulative or complete list of all the features in each image. For a list of new features for Release 12.0 XE, see the "New and Changed Information" section later in this document.

Note In addition to the feature sets available for the Cisco 7000 family, some features are available through a special license. For example, NetFlow is only available if you purchase a NetFlow Switching license. For information on features that require a special license, refer to the Pricing Tool available on CCO at the following path: **Ordering**: **Ordering Information & Assistance**: **Pricing Tool**.

Note The images for the Cisco 7200 series routers for Cisco IOS Release 12.0(5)XE5 were deferred to Release 12.0(5)XE6.
The Cisco 7100 and Cisco 7500 software images are not available in Release 12.0(5)XE6. Cisco IOS Release 12.0(5)XE5 is for Cisco 7500 software images only. Cisco IOS Release 12.0(5)XE8 supports Cisco 7100 series software images only.

Table 3 Feature Sets Supported by the Cisco 7000 Family

Feature Sets	Image Name	Software Image	Platforms
IP Standard Feature Set	IP	c7200-is-mz	Cisco 7200 series
		rsp-isv-mz	Cisco 7500 series
		c7100-is-mz	Cisco 7100 series
	IP IPSec 56	c7200-is56i-mz	Cisco 7200 series
		rsp-isv56i-mz	Cisco 7500 series
		c7100-is56i-mz	Cisco 7100 series
	IP IPSec 3DES	c7200-ik2s-mz	Cisco 7200 series
		rsp-ik2sv-mz	Cisco 7500 series
		c7100-ik2s-mz	Cisco 7100 series
IP Firewall Standard Feature Set	IP/FW	c7200-io3s-mz	Cisco 7200 series
		c7100-io3s-mz	Cisco 7100 series
	IP/FW IPSec 56	c7200-io3s56i-mz	Cisco 7200 series
		c7100-io3s56i-mz	Cisco 7100 series
	IP/FW IPSec 3DES	c7200-ik2o3s-mz	Cisco 7200 series
		c7100-ik2o3s-mz	Cisco 7100 series
Enterprise Standard Feature Set	Enterprise	c7200-js-mz	Cisco 7200 series
		rsp-jsv-mz	Cisco 7500 series
		c7100-js-mz	Cisco 7100 series
	Enterprise IPSec 56	c7200-js56i-mz	Cisco 7200 series
		rsp-jsv56i-mz	Cisco 7500 series
		c7100-js56i-mz	Cisco 7100 series
	Enterprise IPSec 3DES	c7200-jk2s-mz	Cisco 7200 series
		rsp-jk2sv-mz	Cisco 7500 series
		c7100-jk2s-mz	Cisco 7100 series

Table 3 Feature Sets Supported by the Cisco 7000 Family (continued)

Feature Sets	Image Name	Software Image	Platforms
Enterprise Firewall Standard Feature Set	Enterprise/FW	c7200-jo3s-mz c7100-jo3s-mz	Cisco 7200 series Cisco 7100 series
	Enterprise/FW IPSec 56	c7200-jo3s56i-mz c7100-jo3s56i-mz	Cisco 7200 series Cisco 7100 series
	Enterprise/FW IPSec 3DES	c7200-jk2o3s-mz c7100-jk2o3s-mz	Cisco 7200 series Cisco 7100 series
Desktop/IBM Standard Feature Set	Desktop/IBM	c7200-ds-mz rsp-dsv-mz	Cisco 7200 series Cisco 7500 series
	Desktop/IBM IPSec 56	c7200-ds56i-mz rsp-dsv56i-mz	Cisco 7200 series Cisco 7500 series
Desktop/IBM Firewall Standard Feature Set	Desktop/IBM FW	c7200-do3s-mz	Cisco 7200 series
	Desktop/IBM FW IPSec 56	c7200-do3s56i-mz	Cisco 7200 series
	Desktop/IBM FW IPSec 3DES	c7200-dk2o3s-mz	Cisco 7200 series

Cisco IOS software is available in different feature sets depending on the platform. Table 4, Table 5, and Table 6 list the feature sets for Cisco 7200 series routers. Table 7 and Table 8 list the feature sets for Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and the RSP7000CI. Table 9 and Table 10 list the feature sets for Cisco 7100 series routers.

The tables use the following conventions to identify feature sets:

- Yes—The feature set is supported in the platform.
- No—The feature set is not supported in the platform.
- In—The number in the “In” column indicates the Cisco IOS release in which the feature was introduced. For example, (5) means a feature was introduced in Cisco IOS Release 12.0(5)T or 12.0(5)XE. If a cell in this column is empty, the feature was included in the initial base release.

Table 4 Feature List by Feature Set for the Cisco 7200 Series, Part 1

		Feature Set				
Features	**In**[1]	**Desktop/ IBM**	**Desktop/IBM IPSec 56**	**Desktop/ IBM FW**	**Desktop/IBM FW IPSec 56**	**Desktop/IBM FW IPSec 3DES**
Connectivity						
Layer 2 Tunnel Protocol	(1)	Yes	Yes	Yes	Yes	No
RIP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes
X.25 Load Balancing	(3)	Yes	Yes	Yes	Yes	Yes
IBM Support						
Bridging Code Rework		No	No	No	No	No
RIF Passthru in DLSw+		Yes	Yes	Yes	Yes	Yes
DLSw RSVP	(3)	Yes	Yes	Yes	Yes	No
Cisco Multipath Channel+ (CMPC+)	(3)	Yes	Yes	Yes	Yes	Yes
Internet						
WCCP		Yes	Yes	Yes	Yes	Yes
IP Routing						
Easy IP Phase 2–DHCP Server	(1)	Yes	Yes	Yes	Yes	Yes
Expanded IP Access Lists		Yes	Yes	Yes	Yes	Yes
MAC Address and Precedence Accounting		Yes	Yes	Yes	Yes	Yes
OSPF Packet Pacing	(1)	Yes	Yes	Yes	Yes	Yes
OSPF Point to Multipoint		Yes	Yes	Yes	Yes	Yes
Management						
Cisco IOS File System		Yes	Yes	Yes	Yes	Yes
Entity MIB		Yes	Yes	Yes	Yes	Yes
Expression MIB		Yes	Yes	Yes	Yes	Yes
ISDN MIB RFC 2127	(1)	Yes	Yes	Yes	Yes	Yes
NetFlow Switching Enhancements		Yes	Yes	Yes	Yes	Yes
Conditionally Triggered Debugging		Yes	Yes	Yes	Yes	Yes
SNMP Inform Request		No	No	No	No	No
SNMP Manager		Yes	Yes	Yes	Yes	Yes
SNMP Version 3	(3)	Yes	Yes	Yes	Yes	Yes
Process MIB	(3)	Yes	Yes	Yes	Yes	Yes
CNS Client for Cisco IOS Software	(4)	No	Yes	No	Yes	Yes

Table 4 Feature List by Feature Set for the Cisco 7200 Series, Part 1 (continued)

		Feature Set				
Features	**In**[1]	**Desktop/ IBM**	**Desktop/IBM IPSec 56**	**Desktop/ IBM FW**	**Desktop/IBM FW IPSec 56**	**Desktop/IBM FW IPSec 3DES**
Quality of Service						
CLI String Search	(1)	Yes	Yes	Yes	Yes	Yes
Committed Access Rate		Yes	Yes	Yes	Yes	Yes
Distributed Weighted Fair Queuing		Yes	Yes	Yes	Yes	Yes
Distributed Weighted Random Early Detection		Yes	Yes	Yes	Yes	Yes
Quality of Service Policy Propagation through BGP		Yes	Yes	Yes	Yes	Yes
Response Time Reporter (RTR) Enhancements	(3)	Yes	Yes	Yes	Yes	Yes
Flow Random Early Detection	(3)	Yes	Yes	Yes	Yes	Yes
Scalability						
IETF-Compliant PPP over ATM Scalability	(1)	Yes	Yes	Yes	Yes	Yes
Web Cache Communications Protocol v2 (WCCPv2)	(3)	Yes	Yes	Yes	Yes	Yes
Annex G	(1)	Yes	Yes	Yes	Yes	Yes
NetFlow Policy Routing	(3)	Yes	Yes	Yes	Yes	Yes
Inverse Multiplexing	(4)	Yes	Yes	Yes	Yes	Yes
Security						
Additional Vendor-Proprietary RADIUS Attributes		Yes	Yes	Yes	Yes	Yes
Automated Double Authentication		Yes	Yes	Yes	Yes	Yes
Certification Authority Interoperability		No	Yes	No	Yes	Yes
Internet Key Exchange Security Protocol		No	Yes	No	Yes	Yes
IPSec Network Security		No	Yes	No	Yes	Yes
MS-CHAP Support		No	No	No	No	No

Table 4 Feature List by Feature Set for the Cisco 7200 Series, Part 1 (continued)

		Feature Set				
Features	**In**[1]	**Desktop/ IBM**	**Desktop/IBM IPSec 56**	**Desktop/ IBM FW**	**Desktop/IBM FW IPSec 56**	**Desktop/IBM FW IPSec 3DES**
Named Method Lists for AAA Authentication & Accounting		Yes	Yes	Yes	Yes	Yes
Cisco IOS Firewall Feature Set	(3)	No	No	Yes	Yes	Yes
Cisco IOS IPSec 3DES Feature Sets	(3)	No	No	No	No	Yes
Switching						
Automatic Protection Switching of Packet-over-SONET Circuits		Yes	Yes	Yes	Yes	Yes
Cisco Express Forwarding (CEF)		Yes	Yes	Yes	Yes	Yes
Cisco IOS STP Enhancements	(1)	Yes	Yes	Yes	Yes	No
Multicast Distributed Switching		Yes	Yes	Yes	Yes	Yes
Tag Switching—Tag Switch Controller	(3)	No	No	No	No	No
WAN Services						
Always on/Dynamic ISDN		No	No	No	No	No
ATM E.164 Auto Conversion		Yes	Yes	Yes	Yes	Yes
ATM PVC Trap Support	(1)	Yes	Yes	Yes	Yes	Yes
IEEE 802.1Q VLAN	(1)	Yes	Yes	Yes	Yes	No
Mobile IP	(1)	Yes	Yes	Yes	Yes	No
MPPC—MS PPP Compression		Yes	Yes	Yes	Yes	Yes
Multiple ISDN Switch Types		Yes	Yes	Yes	Yes	Yes
Multiprotocol over ATM		Yes	Yes	Yes	Yes	Yes
National ISDN Switch Types		Yes	Yes	Yes	Yes	Yes
Stackable Home Gateway		Yes	Yes	Yes	Yes	Yes
Time-Based Access Lists	(1)	Yes	Yes	Yes	Yes	Yes
VPDN MIB Feature		Yes	Yes	Yes	Yes	Yes

Table 4 Feature List by Feature Set for the Cisco 7200 Series, Part 1 (continued)

		Feature Set				
Features	**In[1]**	**Desktop/ IBM**	**Desktop/IBM IPSec 56**	**Desktop/ IBM FW**	**Desktop/IBM FW IPSec 56**	**Desktop/IBM FW IPSec 3DES**
Dynamic Multiple Encapsulation for Dial-in over ISDN	(4)	Yes	Yes	Yes	Yes	Yes
Voice and Multimedia						
Voice over Frame Relay Enhancements	(4)	Yes	Yes	Yes	Yes	No

1 Indicates the maintenance release in which the feature was introduced.

Table 5 Feature List by Feature Set for the Cisco 7200 Series, Part 2

		Feature Set					
Features	**In[1]**	**Enterprise**	**Enterprise IPSec 56**	**Enterprise IPSec 3DES**	**Enterprise/ FW**	**Enterprise/ FW IPSec 56**	**Enterprise/ FW IPSec 3DES**
Connectivity							
Layer 2 Tunnel Protocol	(1)	Yes	Yes	Yes	Yes	Yes	Yes
RIP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes	Yes
X.25 Load Balancing	(3)	Yes	Yes	Yes	Yes	Yes	Yes
IBM Support							
Bridging Code Rework		No	No	No	No	No	No
RIF Passthru in DLSw+		Yes	Yes	Yes	Yes	Yes	Yes
DLSw RSVP	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Cisco Multipath Channel+ (CMPC+)	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Internet							
WCCP		Yes	Yes	Yes	Yes	Yes	Yes
IP Routing							
Easy IP Phase 2–DHCP Server	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Expanded IP Access Lists		Yes	Yes	Yes	Yes	Yes	Yes
MAC Address and Precedence Accounting		Yes	Yes	Yes	Yes	Yes	Yes
OSPF Packet Pacing	(1)	Yes	Yes	Yes	Yes	Yes	Yes
OSPF Point to Multipoint		Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Feature List by Feature Set for the Cisco 7200 Series, Part 2 (continued)

		Feature Set					
Features	**In**[1]	**Enterprise**	**Enterprise IPSec 56**	**Enterprise IPSec 3DES**	**Enterprise/ FW**	**Enterprise/ FW IPSec 56**	**Enterprise/ FW IPSec 3DES**
Management							
Cisco IOS File System		Yes	Yes	Yes	Yes	Yes	Yes
Entity MIB		Yes	Yes	Yes	Yes	Yes	Yes
Expression MIB		Yes	Yes	Yes	Yes	Yes	Yes
ISDN MIB RFC 2127	(1)	Yes	Yes	Yes	Yes	Yes	Yes
NetFlow Switching Enhancements		Yes	Yes	Yes	Yes	Yes	Yes
Conditionally Triggered Debugging		Yes	Yes	Yes	Yes	Yes	Yes
SNMP Inform Request		No	No	No	No	No	No
SNMP Manager		Yes	Yes	Yes	Yes	Yes	Yes
SNMP Version 3	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Process MIB	(3)	Yes	Yes	Yes	Yes	Yes	Yes
CNS Client for Cisco IOS Software	(4)	Yes	Yes	Yes	Yes	Yes	Yes
Quality of Service							
CLI String Search	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Committed Access Rate		Yes	Yes	Yes	Yes	Yes	Yes
Distributed Weighted Fair Queuing		Yes	Yes	Yes	Yes	Yes	Yes
Distributed Weighted Random Early Detection		Yes	Yes	Yes	Yes	Yes	Yes
Quality of Service Policy Propagation through BGP		Yes	Yes	Yes	Yes	Yes	Yes
Response Time Reporter (RTR) Enhancements	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Flow Random Early Detection	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Scalability							
IETF-Compliant PPP over ATM Scalability	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Web Cache Communications Protocol v2 (WCCPv2)	(3)	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Feature List by Feature Set for the Cisco 7200 Series, Part 2 (continued)

		Feature Set					
Features	**In**[1]	**Enterprise**	**Enterprise IPSec 56**	**Enterprise IPSec 3DES**	**Enterprise/ FW**	**Enterprise/ FW IPSec 56**	**Enterprise/ FW IPSec 3DES**
Annex G	(1)	Yes	Yes	Yes	Yes	Yes	Yes
NetFlow Policy Routing	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Multiplexing	(4)	Yes	Yes	Yes	Yes	Yes	Yes
Security							
Additional Vendor-Proprietary RADIUS Attributes		Yes	Yes	Yes	Yes	Yes	Yes
Automated Double Authentication		Yes	Yes	Yes	Yes	Yes	Yes
Certification Authority Interoperability		No	Yes	Yes	No	Yes	Yes
Internet Key Exchange Security Protocol		No	Yes	Yes	No	Yes	Yes
IPSec Network Security		No	Yes	Yes	No	Yes	Yes
MS-CHAP Support		Yes	Yes	Yes	Yes	Yes	Yes
Named Method Lists for AAA Authentication & Accounting		Yes	Yes	Yes	Yes	Yes	Yes
Cisco IOS Firewall Feature Set	(3)	No	No	No	Yes	Yes	Yes
Cisco IOS IPSec 3DES Feature Sets	(3)	No	No	Yes	No	Yes	Yes
Switching							
Automatic Protection Switching of Packet-over-SONET Circuits		Yes	Yes	Yes	Yes	Yes	Yes
Cisco Express Forwarding (CEF)		Yes	Yes	Yes	Yes	Yes	Yes
Cisco IOS STP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Multicast Distributed Switching		Yes	Yes	Yes	Yes	Yes	Yes
Tag Switching—Tag Switch Controller	(3)	Yes	Yes	Yes	Yes	Yes	Yes
WAN Services							
Always on/Dynamic ISDN		Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Feature List by Feature Set for the Cisco 7200 Series, Part 2 (continued)

		Feature Set					
Features	**In[1]**	**Enterprise**	**Enterprise IPSec 56**	**Enterprise IPSec 3DES**	**Enterprise/ FW**	**Enterprise/ FW IPSec 56**	**Enterprise/ FW IPSec 3DES**
ATM E.164 Auto Conversion		Yes	Yes	Yes	Yes	Yes	Yes
ATM PVC Trap Support	(1)	Yes	Yes	Yes	Yes	Yes	Yes
IEEE 802.1Q VLAN	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Mobile IP	(1)	Yes	Yes	Yes	Yes	Yes	Yes
MPPC—MS PPP Compression		Yes	Yes	Yes	Yes	Yes	Yes
Multiple ISDN Switch Types		Yes	Yes	Yes	Yes	Yes	Yes
Multiprotocol over ATM		Yes	Yes	Yes	Yes	Yes	Yes
National ISDN Switch Types		Yes	Yes	Yes	Yes	Yes	Yes
Stackable Home Gateway		Yes	Yes	Yes	Yes	Yes	Yes
Time-Based Access Lists	(1)	Yes	Yes	Yes	Yes	Yes	Yes
VPDN MIB Feature		Yes	Yes	Yes	Yes	Yes	Yes
Dynamic Multiple Encapsulation for Dial-in over ISDN	(4)	Yes	Yes	Yes	Yes	Yes	Yes
Voice and Multimedia							
Voice over Frame Relay Enhancements	(4)	Yes	Yes	Yes	Yes	Yes	Yes

1 Indicates the maintenance release in which the feature was introduced.

Table 6 Feature List by Feature Set for the Cisco 7200 Series, Part 3

		Feature Set					
Features	**In[1]**	**IP**	**IP IPSec 56**	**IP IPSec 3DES**	**IP/FW**	**IP/FW IPSec 56**	**IP/FW IPSec 3DES**
Connectivity							
Layer 2 Tunnel Protocol	(1)	Yes	Yes	Yes	Yes	Yes	Yes
RIP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes	Yes
X.25 Load Balancing	(3)	Yes	Yes	Yes	Yes	Yes	Yes
IBM Support							
Bridging Code Rework		No	No	No	No	No	No

Table 6 Feature List by Feature Set for the Cisco 7200 Series, Part 3 (continued)

		Feature Set					
Features	**In**[1]	**IP**	**IP IPSec 56**	**IP IPSec 3DES**	**IP/FW**	**IP/FW IPSec 56**	**IP/FW IPSec 3DES**
RIF Passthru in DLSw+		Yes	Yes	Yes	Yes	Yes	Yes
DLSw RSVP	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Cisco Multipath Channel+ (CMPC+)	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Internet							
WCCP		Yes	Yes	Yes	Yes	Yes	Yes
IP Routing							
Easy IP Phase 2–DHCP Server	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Expanded IP Access Lists		Yes	Yes	Yes	Yes	Yes	Yes
MAC Address and Precedence Accounting		Yes	Yes	Yes	Yes	Yes	Yes
OSPF Packet Pacing	(1)	Yes	Yes	Yes	Yes	Yes	Yes
OSPF Point to Multipoint		Yes	Yes	Yes	Yes	Yes	Yes
Management							
Cisco IOS File System		Yes	Yes	Yes	Yes	Yes	Yes
Entity MIB		Yes	Yes	Yes	Yes	Yes	Yes
Expression MIB		Yes	Yes	Yes	Yes	Yes	Yes
ISDN MIB RFC 2127	(1)	Yes	Yes	Yes	Yes	Yes	Yes
NetFlow Switching Enhancements		Yes	Yes	Yes	Yes	Yes	Yes
Conditionally Triggered Debugging		Yes	Yes	Yes	Yes	Yes	Yes
SNMP Inform Request		No	No	No	No	No	No
SNMP Manager		Yes	Yes	Yes	Yes	Yes	Yes
SNMP Version 3	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Process MIB	(3)	Yes	Yes	Yes	Yes	Yes	Yes
CNS Client for Cisco IOS Software	(4)	No	Yes	Yes	No	Yes	Yes
Quality of Service							
CLI String Search	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Committed Access Rate		Yes	Yes	Yes	Yes	Yes	Yes
Distributed Weighted Fair Queuing		Yes	Yes	Yes	Yes	Yes	Yes
Distributed Weighted Random Early Detection		Yes	Yes	Yes	Yes	Yes	Yes
Quality of Service Policy Propagation through BGP		Yes	Yes	Yes	Yes	Yes	Yes
Response Time Reporter (RTR) Enhancements	(3)	Yes	Yes	Yes	Yes	Yes	Yes

Table 6 Feature List by Feature Set for the Cisco 7200 Series, Part 3 (continued)

		Feature Set					
Features	**In**[1]	**IP**	**IP IPSec 56**	**IP IPSec 3DES**	**IP/FW**	**IP/FW IPSec 56**	**IP/FW IPSec 3DES**
Flow Random Early Detection	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Scalability							
IETF-Compliant PPP over ATM Scalability	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Web Cache Communications Protocol v2 (WCCPv2)	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Annex G	(1)	Yes	Yes	Yes	Yes	Yes	Yes
NetFlow Policy Routing	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Multiplexing	(4)	Yes	Yes	Yes	Yes	Yes	Yes
Security							
Additional Vendor-Proprietary RADIUS Attributes		Yes	Yes	Yes	Yes	Yes	Yes
Automated Double Authentication		Yes	Yes	Yes	Yes	Yes	Yes
Certification Authority Interoperability		No	Yes	Yes	No	Yes	Yes
Internet Key Exchange Security Protocol		No	Yes	Yes	No	Yes	Yes
IPSec Network Security		No	Yes	Yes	No	Yes	Yes
MS-CHAP Support		No	No	No	No	No	No
Named Method Lists for AAA Authentication & Accounting		Yes	Yes	Yes	Yes	Yes	Yes
Cisco IOS Firewall Feature Set	(3)	No	No	No	Yes	Yes	Yes
Cisco IOS IPSec 3DES Feature Sets	(3)	No	No	Yes	No	No	No
Switching							
Automatic Protection Switching of Packet-over-SONET Circuits		Yes	Yes	Yes	Yes	Yes	Yes
Cisco Express Forwarding (CEF)		Yes	Yes	Yes	Yes	Yes	Yes
Cisco IOS STP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Multicast Distributed Switching		Yes	Yes	Yes	Yes	Yes	Yes
Tag Switching—Tag Switch Controller	(3)	No	No	No	No	No	No
WAN Services							
Always on/Dynamic ISDN		No	No	No	No	No	No
ATM E.164 Auto Conversion		Yes	Yes	Yes	Yes	Yes	Yes
ATM PVC Trap Support	(1)	Yes	Yes	Yes	Yes	Yes	Yes

Table 6 Feature List by Feature Set for the Cisco 7200 Series, Part 3 (continued)

		Feature Set					
Features	**In[1]**	**IP**	**IP IPSec 56**	**IP IPSec 3DES**	**IP/FW**	**IP/FW IPSec 56**	**IP/FW IPSec 3DES**
IEEE 802.1Q VLAN	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Mobile IP	(1)	Yes	Yes	Yes	Yes	Yes	Yes
MPPC—MS PPP Compression		Yes	Yes	Yes	Yes	Yes	Yes
Multiple ISDN Switch Types		Yes	Yes	Yes	Yes	Yes	Yes
Multiprotocol over ATM		Yes	Yes	Yes	Yes	Yes	Yes
National ISDN Switch Types		Yes	Yes	Yes	Yes	Yes	Yes
Stackable Home Gateway		Yes	Yes	Yes	Yes	Yes	Yes
Time-Based Access Lists	(1)	Yes	Yes	Yes	Yes	Yes	Yes
VPDN MIB Feature		Yes	Yes	Yes	Yes	Yes	Yes
Dynamic Multiple Encapsulation for Dial-in over ISDN	(4)	Yes	Yes	Yes	Yes	Yes	Yes
Voice and Multimedia							
Voice over Frame Relay Enhancements	(4)	Yes	Yes	Yes	Yes	Yes	Yes

1 Indicates the maintenance release in which the feature was introduced.

Table 7 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 1

		Feature Set		
Feature	**In[1]**	**Enterprise**	**Enterprise IPSec 56**	**Enterprise IPSec 3DES**
Connectivity				
Layer 2 Tunnel Protocol	(1)	Yes	Yes	Yes
RIP Enhancements	(1)	Yes	Yes	Yes
X.25 Load Balancing	(3)	Yes	Yes	Yes
IBM Support				
Bridging Code Rework		No	No	No
Cisco Database Connection		No	No	No
RIF Passthru in DLSw+		No	No	No
DLSw RSVP	(3)	Yes	Yes	Yes
Cisco Multipath Channel+ (CMPC+)	(3)	Yes	Yes	Yes
Internet				
WCCP		Yes	Yes	Yes
Easy IP Phase 2–DHCP Server	(1)	Yes	Yes	Yes

Table 7 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 1 (continued)

		Feature Set		
Feature	**In[1]**	**Enterprise**	**Enterprise IPSec 56**	**Enterprise IPSec 3DES**
IP Routing				
Expanded IP Access Lists		Yes	Yes	Yes
IP Type of Service and Precedence for GRE Tunnels		No	No	No
MAC Address and Precedence Accounting		Yes	Yes	Yes
OSPF Packet Pacing	(1)	Yes	Yes	Yes
OSPF Point to Multipoint		Yes	Yes	Yes
Token Ring MPOA	(3)	Yes	Yes	Yes
LAN Support				
Fast EtherChannel I and II		Yes	Yes	Yes
Management				
CIP Core Dump		Yes	Yes	Yes
Cisco IOS File System		Yes	Yes	Yes
Conditionally Triggered Debugging		Yes	Yes	Yes
Entity MIB		Yes	Yes	Yes
Expression MIB		Yes	Yes	Yes
ISDN MIB RFC 2127	(1)	Yes	Yes	Yes
NetFlow Switching Enhancements		Yes	Yes	Yes
SNMP Inform Request		No	No	No
SNMP Manager		Yes	Yes	Yes
SNMP Version 3	(3)	Yes	Yes	Yes
Process MIB	(3)	Yes	Yes	Yes
FUNI Support	(3)	Yes	Yes	Yes
Memory Scan	(4)	Yes	Yes	Yes
Multimedia				
Protocol-Independent Multicasts (PIM) Version 2		No	No	No
Protocols				
Token Ring ISL Feature		No	No	No
Quality of Service				
CLI String Search	(1)	Yes	Yes	Yes
Committed Access Rate		Yes	Yes	Yes
Distributed Weighted Fair Queuing		Yes	Yes	Yes
Distributed Weighted Random Early Detection		Yes	Yes	Yes

Table 7 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 1 (continued)

		Feature Set		
Feature	**In**[1]	**Enterprise**	**Enterprise IPSec 56**	**Enterprise IPSec 3DES**
Quality of Service Policy Propagation through BGP		Yes	Yes	Yes
Response Time Reporter (RTR) Enhancements	(3)	Yes	Yes	Yes
IP-ATM CoS SW Phase II	(3)	Yes	Yes	Yes
Flow Random Early Detection	(3)	Yes	Yes	Yes
QoS Mapping of RSVP to ATM SVC Mapping	(3)	Yes	Yes	Yes
Distributed Traffic Shaping	(5)	Yes	Yes	Yes
Scalability				
Airline Product Set (ALPS)		Yes	Yes	Yes
IETF-Compliant PPP over ATM Scalability	(1)	Yes	Yes	Yes
Web Cache Communications Protocol v2 (WCCPv2)	(3)	Yes	Yes	Yes
Multilink Inverse Multiplexer Enhancements	(3)	Yes	Yes	Yes
Annex G	(1)	Yes	Yes	Yes
NetFlow Policy Routing	(3)	Yes	Yes	Yes
Inverse Multiplexing	(4)	Yes	Yes	Yes
Security				
AAA Support for MS-CHAP		No	No	No
Additional Vendor-Proprietary RADIUS Attributes		No	No	No
Authenticating ACLs		No	No	No
Automated Double Authentication		Yes	Yes	Yes
Certification Authority Interoperability		No	No	No
Encryption SA		Yes	Yes	Yes
Internet Key Exchange Security Protocol		No	No	No
IPSec Network Security		No	No	No
Named Method Lists for AAA Authentication & Accounting		No	No	No
Subblock Phase 1		No	No	No
Cisco IOS Firewall Feature Set	(3)	No	No	No
Cisco IOS IPSec 3DES Feature Sets	(3)	No	No	Yes

Table 7 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 1 (continued)

		Feature Set		
Feature	**In[1]**	**Enterprise**	**Enterprise IPSec 56**	**Enterprise IPSec 3DES**
Switching				
Automatic Protection Switching of Packet-over-SONET Circuits		Yes	Yes	Yes
Cisco Express Forwarding (CEF)		Yes	Yes	Yes
Cisco IOS STP Enhancements	(1)	Yes	Yes	Yes
Enhanced ATM VC Configuration and Management		No	No	No
Multicast Distributed Switching		Yes	Yes	Yes
Tag Switching		Yes	Yes	Yes
Token Ring over RFC 1483	(3)	Yes	Yes	Yes
Tag Switching—Tag Switch Controller	(3)	Yes	Yes	Yes
WAN Optimization				
DRP Server Agent Enhancements		No	No	No
WAN Services				
Always on/Dynamic ISDN		No	No	No
ATM E.164 Auto Conversion		Yes	Yes	Yes
ATM PVC Trap Support	(1)	Yes	Yes	Yes
IEEE 802.1Q VLAN	(1)	Yes	Yes	Yes
Dialer Watch		No	No	No
Mobile IP	(1)	Yes	Yes	Yes
MPPC—MS PPP Compression		Yes	Yes	Yes
MS Callback		No	No	No
Multiple ISDN Switch Types		No	No	No
Multiprotocol over ATM		Yes	Yes	Yes
National ISDN Switch Types		No	No	Yes
PPP over Frame Relay		No	No	No
Stackable Home Gateway		No	No	No
Time-Based Access Lists	(1)	Yes	Yes	Yes
VPDN MIB and Syslog Facility		No	No	No
Dynamic Multiple Encapsulation for Dial-in over ISDN	(4)	Yes	Yes	Yes

1 Indicates the maintenance release in which the feature was introduced.

Table 8 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 2

		Feature Set				
Feature	**In**[1]	**Desktop/ IBM**	**Desktop/ IBM IPSec 56**	**IP**	**IP IPSec 56**	**IP IPSec 3DES**
Connectivity						
Layer 2 Tunnel Protocol	(1)	Yes	Yes	Yes	Yes	Yes
RIP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes
X.25 Load Balancing	(3)	No	No	No	No	No
IBM Support						
Bridging Code Rework		Yes	No	No	No	No
Cisco Database Connection		No	No	No	No	No
RIF Passthru in DLSw+		Yes	No	No	No	No
DLSw RSVP	(3)	Yes	Yes	Yes	Yes	Yes
Cisco Multipath Channel+ (CMPC+)	(3)	Yes	Yes	Yes	Yes	Yes
Internet						
WCCP		Yes	Yes	Yes	Yes	Yes
IP Routing						
Easy IP Phase 2–DHCP Server	(1)	Yes	Yes	Yes	Yes	Yes
Expanded IP Access Lists		Yes	Yes	Yes	Yes	Yes
IP Type of Service and Precedence for GRE Tunnels		Yes	Yes	No	No	No
MAC Address and Precedence Accounting		Yes	Yes	Yes	Yes	Yes
OSPF Packet Pacing	(1)	Yes	Yes	Yes	Yes	Yes
OSPF Point to Multipoint		Yes	Yes	Yes	Yes	Yes
Token Ring MPOA	(3)	Yes	Yes	Yes	Yes	Yes
LAN Support						
Fast EtherChannel I and II		Yes	Yes	Yes	Yes	Yes
Management						
CIP Core Dump		Yes	Yes	Yes	Yes	Yes
Cisco IOS File System		Yes	Yes	Yes	Yes	Yes
Entity MIB		Yes	Yes	Yes	Yes	Yes

Table 8 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 2 (continued)

		Feature Set				
Feature	**In[1]**	**Desktop/ IBM**	**Desktop/ IBM IPSec 56**	**IP**	**IP IPSec 56**	**IP IPSec 3DES**
Conditionally Triggered Debugging		Yes	Yes	Yes	Yes	Yes
Expression MIB		Yes	Yes	Yes	Yes	Yes
ISDN MIB RFC 2127	(1)	Yes	Yes	Yes	Yes	Yes
NetFlow Switching Enhancements		Yes	Yes	Yes	Yes	Yes
SNMP Inform Request		Yes	No	No	No	No
SNMP Manager		Yes	Yes	Yes	Yes	Yes
SNMP Version 3	(3)	Yes	Yes	Yes	Yes	Yes
Process MIB	(3)	Yes	Yes	Yes	Yes	Yes
FUNI Support	(3)	Yes	Yes	Yes	Yes	Yes
Memory Scan	(4)	Yes	Yes	Yes	Yes	Yes
Multimedia						
Protocol- Independent Multicasts (PIM) Version 2		Yes	Yes	No	No	No
Protocols						
Token Ring ISL Feature		Yes	No	No	No	No
Quality of Service						
CLI String Search	(1)	Yes	Yes	Yes	Yes	Yes
Committed Access Rate		Yes	Yes	Yes	Yes	Yes
Distributed Weighted Fair Queuing		Yes	Yes	Yes	Yes	Yes
Distributed Weighted Random Early Detection		Yes	Yes	Yes	Yes	Yes
Quality of Service Policy Propagation through BGP		Yes	Yes	Yes	Yes	Yes
Response Time Reporter (RTR) Enhancements	(3)	Yes	Yes	Yes	Yes	Yes
IP-ATM CoS SW Phase II	(3)	Yes	Yes	Yes	Yes	Yes
Flow Random Early Detection	(3)	Yes	Yes	Yes	Yes	Yes
QoS Mapping of RSVP to ATM SVC Mapping	(3)	Yes	Yes	Yes	Yes	Yes

Table 8 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 2 (continued)

		Feature Set				
Feature	**In[1]**	**Desktop/ IBM**	**Desktop/ IBM IPSec 56**	**IP**	**IP IPSec 56**	**IP IPSec 3DES**
Distributed Traffic Shaping	(5)	Yes	Yes	Yes	Yes	Yes
Scalability						
Airline Product Set (ALPS)		Yes	Yes	Yes	Yes	Yes
IETF-Compliant PPP over ATM Scalability	(1)	Yes	Yes	Yes	Yes	Yes
Web Cache Communications Protocol v2 (WCCPv2)	(3)	Yes	Yes	Yes	Yes	Yes
Multilink Inverse Multiplexer Enhancements	(3)	Yes	Yes	Yes	Yes	Yes
Annex G	(1)	Yes	Yes	Yes	Yes	Yes
NetFlow Policy Routing	(3)	Yes	Yes	Yes	Yes	Yes
Inverse Multiplexing	(4)	Yes	Yes	Yes	Yes	Yes
Security						
AAA Support for MS-CHAP		Yes	No	No	No	No
Additional Vendor-Proprietary RADIUS Attributes		Yes	Yes	No	No	No
Authenticating ACLs		Yes	Yes	No	No	No
Automated Double Authentication		Yes	Yes	Yes	Yes	Yes
Certification Authority Interoperability		Yes	No	No	No	No
Encryption SA		Yes	Yes	Yes	Yes	Yes
Internet Key Exchange Security Protocol		Yes	No	No	No	No
IPSec Network Security		Yes	No	No	No	No
Named Method Lists for AAA Authentication & Accounting		Yes	Yes	No	No	No
Subblock Phase 1		Yes	Yes	No	No	No
Cisco IOS Firewall Feature Set	(3)	No	No	No	No	No

Table 8 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 2 (continued)

		Feature Set				
Feature	**In[1]**	**Desktop/ IBM**	**Desktop/ IBM IPSec 56**	**IP**	**IP IPSec 56**	**IP IPSec 3DES**
Cisco IOS IPSec 3DES Feature Sets	(3)	Yes	No	No	No	Yes
Switching						
Automatic Protection Switching of Packet-over-SONET Circuits		Yes	Yes	Yes	Yes	Yes
Cisco Express Forwarding (CEF)		Yes	Yes	Yes	Yes	Yes
Cisco IOS STP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes
Enhanced ATM VC Configuration and Management		Yes	Yes	No	No	No
Multicast Distributed Switching		Yes	Yes	Yes	Yes	Yes
Tag Switching		Yes	Yes	Yes	Yes	Yes
Token Ring over RFC 1483	(3)	Yes	Yes	Yes	Yes	Yes
Tag Switching— Tag Switch Controller	(3)	No	No	No	No	No
WAN Optimization						
DRP Server Agent Enhancements		Yes	Yes	No	No	No
WAN Services						
Always on/Dynamic ISDN		Yes	No	No	No	No
ATM E.164 Auto Conversion		Yes	Yes	Yes	Yes	Yes
ATM PVC Trap Support	(1)	Yes	Yes	Yes	Yes	Yes
IEEE 802.1Q VLAN	(1)	Yes	Yes	Yes	Yes	Yes
Dialer Watch		Yes	Yes	No	No	No
Mobile IP	(1)	Yes	Yes	Yes	Yes	Yes
MPPC— MS PPP Compression		Yes	Yes	Yes	Yes	Yes
MS Callback		Yes	Yes	No	No	No
Multiple ISDN Switch Types		Yes	Yes	No	No	No
Multiprotocol over ATM		No	No	Yes	Yes	Yes

Table 8 Feature List by Feature Set for the Cisco 7500/RSP Series, Part 2 (continued)

		Feature Set				
Feature	**In[1]**	**Desktop/ IBM**	**Desktop/ IBM IPSec 56**	**IP**	**IP IPSec 56**	**IP IPSec 3DES**
National ISDN Switch Types		Yes	Yes	No	No	No
PPP over Frame Relay		Yes	Yes	No	No	No
Stackable Home Gateway		Yes	No	No	No	No
Time-Based Access Lists	(1)	Yes	Yes	Yes	Yes	Yes
VPDN MIB and Syslog Facility		Yes	No	No	No	No
Dynamic Multiple Encapsulation for Dial-in over ISDN	(4)	Yes	Yes	Yes	Yes	Yes

1 Indicates the maintenance release in which the feature was introduced.

Table 9 Feature List by Feature Set for the Cisco 7100 Series, Part 1

		Feature Set					
Features	**In[1]**	**Enterprise**	**Enterprise IPSec 56**	**Enter-prise IPSec 3DES**	**Enter-prise/ FW**	**Enter-prise/ FW IPSec 56**	**Enterprise/FW IPSec 3DES**
Connectivity							
Layer 2 Tunnel Protocol	(1)	Yes	Yes	Yes	Yes	Yes	Yes
RIP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes	Yes
X.25 Load Balancing	(3)	Yes	Yes	Yes	Yes	Yes	Yes
IBM Support							
Bridging Code Rework		No	No	No	No	No	No
RIF Passthru in DLSw+		Yes	Yes	Yes	Yes	Yes	Yes
DLSw RSVP	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Cisco Multipath Channel+ (CMPC+)	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Internet							
WCCP		Yes	Yes	Yes	Yes	Yes	Yes
IP Routing							
Easy IP Phase 2–DHCP Server	(1)	Yes	Yes	Yes	Yes	Yes	Yes

Table 9 Feature List by Feature Set for the Cisco 7100 Series, Part 1 (continued)

		Feature Set					
Features	**In**[1]	**Enterprise**	**Enterprise IPSec 56**	**Enter-prise IPSec 3DES**	**Enter-prise/ FW**	**Enter-prise/ FW IPSec 56**	**Enterprise/FW IPSec 3DES**
Expanded IP Access Lists		Yes	Yes	Yes	Yes	Yes	Yes
MAC Address and Precedence Accounting		Yes	Yes	Yes	Yes	Yes	Yes
OSPF Packet Pacing	(1)	Yes	Yes	Yes	Yes	Yes	Yes
OSPF Point to Multipoint		Yes	Yes	Yes	Yes	Yes	Yes
LAN Support							
Fast EtherChannel I and II		Yes	Yes	Yes	Yes	Yes	Yes
Management							
Cisco IOS File System		Yes	Yes	Yes	Yes	Yes	Yes
Entity MIB		Yes	Yes	Yes	Yes	Yes	Yes
Expression MIB		Yes	Yes	Yes	Yes	Yes	Yes
ISDN MIB RFC 2127	(1)	Yes	Yes	Yes	Yes	Yes	Yes
NetFlow Switching Enhancements		Yes	Yes	Yes	Yes	Yes	Yes
Conditionally Triggered Debugging		Yes	Yes	Yes	Yes	Yes	Yes
SNMP Inform Request		No	No	No	No	No	No
SNMP Manager		Yes	Yes	Yes	Yes	Yes	Yes
SNMP Version 3	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Process MIB	(3)	Yes	Yes	Yes	Yes	Yes	Yes
CNS Client for Cisco IOS Software	(4)	Yes	Yes	Yes	Yes	Yes	Yes
Quality of Service							
CLI String Search	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Committed Access Rate		Yes	Yes	Yes	Yes	Yes	Yes
Distributed Weighted Fair Queuing		Yes	Yes	Yes	Yes	Yes	Yes
Distributed Weighted Random Early Detection		Yes	Yes	Yes	Yes	Yes	Yes

Table 9 Feature List by Feature Set for the Cisco 7100 Series, Part 1 (continued)

		Feature Set					
Features	**In**[1]	**Enterprise**	**Enterprise IPSec 56**	**Enter-prise IPSec 3DES**	**Enter-prise/ FW**	**Enter-prise/ FW IPSec 56**	**Enterprise/FW IPSec 3DES**
Quality of Service Policy Propagation through BGP		Yes	Yes	Yes	Yes	Yes	Yes
Response Time Reporter (RTR) Enhancements	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Flow Random Early Detection	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Scalability							
IETF-Compliant PPP over ATM Scalability	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Web Cache Communications Protocol v2 (WCCPv2)	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Annex G	(1)	Yes	Yes	Yes	Yes	Yes	Yes
NetFlow Policy Routing	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Security							
Additional Vendor-Proprietary RADIUS Attributes		Yes	Yes	Yes	Yes	Yes	Yes
Automated Double Authentication		Yes	Yes	Yes	Yes	Yes	Yes
Certification Authority Interoperability		No	Yes	Yes	No	Yes	Yes
Internet Key Exchange Security Protocol		No	Yes	Yes	No	Yes	Yes
IPSec Network Security		No	Yes	Yes	No	Yes	Yes
MS-CHAP Support		Yes	Yes	Yes	Yes	Yes	Yes
Named Method Lists for AAA Authentication & Accounting		Yes	Yes	Yes	Yes	Yes	Yes
Cisco IOS Firewall Feature Set	(3)	No	No	No	Yes	Yes	Yes
Cisco IOS IPSec 3DES Feature Sets	(3)	No	No	Yes	No	Yes	Yes

Table 9 Feature List by Feature Set for the Cisco 7100 Series, Part 1 (continued)

		Feature Set					
Features	**In**[1]	**Enterprise**	**Enterprise IPSec 56**	**Enter-prise IPSec 3DES**	**Enter-prise/ FW**	**Enter-prise/ FW IPSec 56**	**Enterprise/FW IPSec 3DES**
Switching							
Automatic Protection Switching of Packet-over-SONET Circuits		Yes	Yes	Yes	Yes	Yes	Yes
Cisco Express Forwarding (CEF)		Yes	Yes	Yes	Yes	Yes	Yes
Cisco IOS STP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Multicast Distributed Switching		Yes	Yes	Yes	Yes	Yes	Yes
WAN Services							
Always on/ Dynamic ISDN		Yes	Yes	Yes	Yes	Yes	Yes
ATM E.164 Auto Conversion		Yes	Yes	Yes	Yes	Yes	Yes
ATM PVC Trap Support	(1)	Yes	Yes	Yes	Yes	Yes	Yes
IEEE 802.1Q VLAN	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Mobile IP	(1)	Yes	Yes	Yes	Yes	Yes	Yes
MPPC—MS PPP Compression		Yes	Yes	Yes	Yes	Yes	Yes
Multiple ISDN Switch Types		Yes	Yes	Yes	Yes	Yes	Yes
Multiprotocol over ATM		Yes	Yes	Yes	Yes	Yes	Yes
National ISDN Switch Types		Yes	Yes	Yes	Yes	Yes	Yes
Stackable Home Gateway		Yes	Yes	Yes	Yes	Yes	Yes
Time-Based Access Lists	(1)	Yes	Yes	Yes	Yes	Yes	Yes
VPDN MIB Feature		Yes	Yes	Yes	Yes	Yes	Yes
Dynamic Multiple Encapsulation for Dial-in over ISDN	(4)	Yes	Yes	Yes	Yes	Yes	Yes

Table 9 Feature List by Feature Set for the Cisco 7100 Series, Part 1 (continued)

		Feature Set					
Features	**In[1]**	**Enterprise**	**Enterprise IPSec 56**	**Enter-prise IPSec 3DES**	**Enter-prise/ FW**	**Enter-prise/ FW IPSec 56**	**Enterprise/FW IPSec 3DES**
Voice and Multimedia							
Voice over Frame Relay Enhancements	(4)	Yes	Yes	Yes	Yes	Yes	Yes

1 Indicates the maintenance release in which the feature was introduced.

Table 10 Feature List by Feature Set for the Cisco 7100 Series, Part 2

		Feature Set					
Features	**In[1]**	**IP**	**IP IPSec 56**	**IP IPSec 3DES**	**IP/FW**	**IP/FW IPSec 56**	**IP/FW IPSec 3DES**
Connectivity							
Layer 2 Tunnel Protocol	(1)	Yes	Yes	Yes	Yes	Yes	Yes
RIP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes	Yes
X.25 Load Balancing	(3)	Yes	Yes	Yes	Yes	Yes	Yes
IBM Support							
Bridging Code Rework		No	No	No	No	No	No
RIF Passthru in DLSw+		Yes	Yes	Yes	Yes	Yes	Yes
DLSw RSVP	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Cisco Multipath Channel+ (CMPC+)	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Internet							
WCCP		Yes	Yes	Yes	Yes	Yes	Yes
IP Routing							
Easy IP Phase 2–DHCP Server	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Expanded IP Access Lists		Yes	Yes	Yes	Yes	Yes	Yes
MAC Address and Precedence Accounting		Yes	Yes	Yes	Yes	Yes	Yes
OSPF Packet Pacing	(1)	Yes	Yes	Yes	Yes	Yes	Yes
OSPF Point to Multipoint		Yes	Yes	Yes	Yes	Yes	Yes

Table 10 Feature List by Feature Set for the Cisco 7100 Series, Part 2 (continued)

		Feature Set					
Features	**In**[1]	**IP**	**IP IPSec 56**	**IP IPSec 3DES**	**IP/FW**	**IP/FW IPSec 56**	**IP/FW IPSec 3DES**
LAN Support							
Fast EtherChannel I and II		Yes	Yes	Yes	Yes	Yes	Yes
Management							
Cisco IOS File System		Yes	Yes	Yes	Yes	Yes	Yes
Entity MIB		Yes	Yes	Yes	Yes	Yes	Yes
Expression MIB		Yes	Yes	Yes	Yes	Yes	Yes
ISDN MIB RFC 2127	(1)	Yes	Yes	Yes	Yes	Yes	Yes
NetFlow Switching Enhancements		Yes	Yes	Yes	Yes	Yes	Yes
Conditionally Triggered Debugging		Yes	Yes	Yes	Yes	Yes	Yes
SNMP Inform Request		No	No	No	No	No	No
SNMP Manager		Yes	Yes	Yes	Yes	Yes	Yes
SNMP Version 3	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Process MIB	(3)	Yes	Yes	Yes	Yes	Yes	Yes
CNS Client for Cisco IOS Software	(4)	No	Yes	Yes	No	Yes	Yes
Quality of Service							
CLI String Search	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Committed Access Rate		Yes	Yes	Yes	Yes	Yes	Yes
Distributed Weighted Fair Queuing		Yes	Yes	Yes	Yes	Yes	Yes
Distributed Weighted Random Early Detection		Yes	Yes	Yes	Yes	Yes	Yes
Quality of Service Policy Propagation through BGP		Yes	Yes	Yes	Yes	Yes	Yes
Response Time Reporter (RTR) Enhancements	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Flow Random Early Detection	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Scalability							
IETF-Compliant PPP over ATM Scalability	(1)	Yes	Yes	Yes	Yes	Yes	Yes

Table 10 Feature List by Feature Set for the Cisco 7100 Series, Part 2 (continued)

		Feature Set					
Features	**In**[1]	**IP**	**IP IPSec 56**	**IP IPSec 3DES**	**IP/FW**	**IP/FW IPSec 56**	**IP/FW IPSec 3DES**
Web Cache Communications Protocol v2 (WCCPv2)	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Annex G	(1)	Yes	Yes	Yes	Yes	Yes	Yes
NetFlow Policy Routing	(3)	Yes	Yes	Yes	Yes	Yes	Yes
Security							
Additional Vendor-Proprietary RADIUS Attributes		Yes	Yes	Yes	Yes	Yes	Yes
Automated Double Authentication		Yes	Yes	Yes	Yes	Yes	Yes
Certification Authority Interoperability		No	Yes	Yes	No	Yes	Yes
Internet Key Exchange Security Protocol		No	Yes	Yes	No	Yes	Yes
IPSec Network Security		No	Yes	Yes	No	Yes	Yes
MS-CHAP Support		No	No	No	No	No	No
Named Method Lists for AAA Authentication & Accounting		Yes	Yes	Yes	Yes	Yes	Yes
Cisco IOS Firewall Feature Set	(3)	No	No	No	Yes	Yes	Yes
Cisco IOS IPSec 3DES Feature Sets	(3)	No	No	Yes	No	No	No
Switching							
Automatic Protection Switching of Packet-over-SONET Circuits		Yes	Yes	Yes	Yes	Yes	Yes
Cisco Express Forwarding (CEF)		Yes	Yes	Yes	Yes	Yes	Yes
Cisco IOS STP Enhancements	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Multicast Distributed Switching		Yes	Yes	Yes	Yes	Yes	Yes
WAN Services							
Always on/Dynamic ISDN		No	No	No	No	No	No

Table 10 Feature List by Feature Set for the Cisco 7100 Series, Part 2 (continued)

		Feature Set					
Features	**In**[1]	**IP**	**IP IPSec 56**	**IP IPSec 3DES**	**IP/FW**	**IP/FW IPSec 56**	**IP/FW IPSec 3DES**
ATM E.164 Auto Conversion		Yes	Yes	Yes	Yes	Yes	Yes
ATM PVC Trap Support	(1)	Yes	Yes	Yes	Yes	Yes	Yes
IEEE 802.1Q VLAN	(1)	Yes	Yes	Yes	Yes	Yes	Yes
Mobile IP	(1)	Yes	Yes	Yes	Yes	Yes	Yes
MPPC—MS PPP Compression		Yes	Yes	Yes	Yes	Yes	Yes
Multiple ISDN Switch Types		Yes	Yes	Yes	Yes	Yes	Yes
Multiprotocol over ATM		Yes	Yes	Yes	Yes	Yes	Yes
National ISDN Switch Types		Yes	Yes	Yes	Yes	Yes	Yes
Stackable Home Gateway		Yes	Yes	Yes	Yes	Yes	Yes
Time-Based Access Lists	(1)	Yes	Yes	Yes	Yes	Yes	Yes
VPDN MIB Feature		Yes	Yes	Yes	Yes	Yes	Yes
Dynamic Multiple Encapsulation for Dial-in over ISDN	(4)	Yes	Yes	Yes	Yes	Yes	Yes
Voice and Multimedia							
Voice over Frame Relay Enhancements	(4)	Yes	Yes	Yes	Yes	Yes	Yes

1 Indicates the maintenance release in which the feature was introduced.

New and Changed Information

The following sections list the new hardware and software features supported by the Cisco 7000 family of routers for Release 12.0(7)XE2.

All features in Release 12.0(5)T are also in Releases 12.0(5)XE through 12.0(7)XE2. For a list of features for Release 12.0(5)T, see the *Release Notes for Cisco 7000 Family for Cisco IOS Release 12.0T*, the *New Features in Release 12.0(5)T* index, or *Cisco IOS Software Release 12.0T - No. 815* product bulletin on Cisco Connection Online or the Documentation CD-ROM. The information in the *New Features in Release 12.0(5)T* index and the *Cisco IOS Software Release 12.0T - No. 815* product bulletin contain information on all platforms for Release 12.0 T, not just the 7000 family platforms.

New Hardware Features in Release 12.0(7)XE2

There are no new hardware features for Cisco IOS Release 12.0(7)XE2.

New Software Features in Release 12.0(7)XE2

There are no new software features for Cisco IOS Release 12.0(7)XE2.

New Hardware Features in Release 12.0(7)XE1

The following new hardware features are supported by the Cisco 7000 family of routers for Release 12.0(7)XE1.

OC-12c Dynamic Packet Transport Interface Processor (DPTIP) for Cisco 7200 and 7500 Series Routers

The dual-width OC-12c Dynamic Packet Transport (DPT) port adapter is available on Cisco 7200 series routers and Cisco 7200 VXR series routers. The DPT is an OC-12c interface used in Cisco 7200 series and Cisco 7200 VXR routers to provide a shared IP over SONET capability.

The OC-12c Dynamic Packet Transport (DPT) Interface Processor (DPTIP) is available on Cisco 7500 series routers. The DPT is an OC-12c interface that uses second-generation Versatile Interface Processor (VIP2) technology to provide a shared IP-over-SONET capability and it complies with IEEE 802.3 specifications. The DPTIP assembly consists of a VIP2 with a dual-width DPT port adapter permanently attached to it.

Inverse Multiplexing over ATM on Cisco 7100 series routers

The PA-A3-8T1IMA and PA-A3-8E1IMA port adapters are now available for Cisco 7100 series routers.

PA-MC-2T3+ Port Adapter

The PA-MC-2T3+ has been added to the 12.0XE train in Release 12.0(7)XE1.

Two-Port Multichannel DS1/PRI and Multichannel E1/PRI port adapters:

Two-port versions of the Multichannel DS1/PRI and Multichannel E1/PRI port adapters are now available for Cisco IOS Release 12.0(7)T.

Gigabit Ethernet (PA-GE Support)

The PA-GE is a single-port port adapter that, when combined with the appropriate fiber-optic cable and a Gigabit Interface Converter (GBIC), provides one Gigabit Ethernet (GE) interface that is compliant with the IEEE.

802.3z specification. The GE interface on a PA-GE operates in full-duplex mode. The PA-GE is supported by the Cisco 7200 VXR routers. Please note that this port adapter is not currently supported by the fourth-generation Versatile Interface Processor (VIP4). See the following document for further information:

http://www.cisco.com/univercd/cc/td/doc/product/core/7200vx/72vxpa/7188page/index.htm

New Software Features in Release 12.0(7)XE1

The following new hardware features are supported by the Cisco 7000 family of routers for Release 12.0(7)XE1.

dWFQ for RSVP

In earlier software releases, Resource Reservation Protocol (RSVP) on Cisco 7500 series routers would leverage RSP-based weighted fair-queuing to guarantee bandwidth to RSVP flows. In Release 12.0(7)XE1, RSVP now interoperates with distributed weighted fair-queuing (dWFQ), thus offloading the RSP of the overhead of the queueing function and improving RSVP scalability. RSVP support of dWFQ is transparent to the user.

RSVP-based Voice over IP (VoIP) will be available in a future software release.

Cisco IOS Firewall Feature Set for Cisco 7500 Series Routers

The Cisco IOS Firewall feature set, available for a wide range of Cisco router platforms, adds more depth and flexibility to existing Cisco IOS software security capabilities, enriching features such as authentication, encryption, and failover with robust firewall functionality and intrusion detection. A Cisco IOS software-based, integrated firewall solution scales to meet the bandwidth and performance requirements of any network. It also maximizes a Cisco router investment by combining multiprotocol routing functionality with sophisticated security policy enforcement throughout the network.

The Cisco IOS Firewall feature set delivers cost-effective perimeter security packaged with advanced features like stateful, application-based filtering, dynamic per-user authentication and authorization, defense against network attacks, Java blocking, and real-time alerts. Because it is completely interoperable with Cisco IOS software features including NAT, VPN tunneling protocols, Cisco Express Forwarding (CEF), AAA extensions, Cisco encryption technology, and Cisco IOS IPSec, it is a complete, integrated VPN solution.

Fast EtherChannel Enhancements for Cisco 7200 Routers

Fast EtherChannel provides higher bidirectional bandwidth, redundancy, and load sharing. Up to four Fast Ethernet interfaces can be bundled in a port-channel, and the router or switch can support up to four port-channels. The Fast EtherChannel feature is capable of load balancing traffic across the Fast Ethernet links. Unicast, broadcast, and multicast traffic is distributed across the links providing higher performance and redundant parallel paths. In the event of a link failure, traffic is redirected to remaining links within the Fast EtherChannel without user intervention.

In this release of the Fast EtherChannel feature, IP traffic is distributed over the port-channel interface while traffic from other routing protocols is sent over a single link. Bridged traffic is distributed based on the Layer 3 information in the packet. If the Layer 3 information does not exist in the packet, the traffic is sent over the first link.

Fast EtherChannel supports all features currently supported on the Fast Ethernet interface. You must configure these features on the port-channel interface rather than on the individual Fast Ethernet interfaces. Fast EtherChannel connections are fully compatible with Cisco IOS virtual LAN (VLAN) and routing technologies. The Inter-Switch Link (ISL) VLAN trunking protocol can carry multiple VLANs across a Fast EtherChannel, and routers attached to Fast EtherChannel links can provide full multiprotocol routing with support for host standby using Host Standby Router Protocol (HSRP).

The port-channel (consisting of up to four Fast Ethernet interfaces) is treated as a single interface. The port-channel interfaces is used in the Cisco IOS software to maintain compatibility with existing commands on the Catalyst 5000 switch. You create the Fast EtherChannel by using the **interface port-channel interface** configuration command. You can assign up to four Fast Ethernet interfaces to a port-channel by using the channel-group interface configuration command.

Inverse Multiplexing over ATM Enhancements

The PA-A3-IMA port adapter has added the following functionalities:

- virtual path shaping
- IP-ATM class of service mapping on Cisco 7100 and 7200 series routers
- the available bit rate (ABR) Quality of Service class

Low Latency Queueing for the Versatile Interface Processor Enhancement

The **tx-ring-limit** command has been added as am option on the 12.0XE train. This command allows users to limit the number of particles on a transmission ring for the PA-A3 port adapter. For additional information on this command, see the Low Latency Queuing feature module.

PA-MC-T3 Multi-Channel T3 Synchronous Serial Port Adapter Enhancement

The addition of the **equipment {customer | network} loopback** command enables you to configure the PA-T3-MC as network equipment or customer equipment so it can operate based on the ANSI T1.403 standard. When a PA-MC-T3 is configured as Customer Equipment, all loopback requests are honored. When configured as network equipment the PA-MC-T3 ignores the following DS-3 and DS-1 loopback requests:

- Far-end alarm control (FEAC) code requests for the DS-3 line
- 1-28 DS-1 line loop-up or loop-down
- Payload loop-up or loop-down
- Line loopback full rate patterns of 0001 and 001 loop-up or loop-down
- Extended Superframe data link (ESF-DL) line loop-up or loop-down
- ESF-DL payload loop-up or loop-down
- ESF-DL SX.25 payload loop-up or loop-down

When configured as network equipment, the PA-MC-T3 recognizes router network loop commands as line loopback commands.

Simple Network Management Protocol (SNMP) requests for loopbacks are always honored, whether the PA-MC-T3 is configured as customer equipment or network equipment.

MPLS Class of Service Classification using MPLS Experimental Bits

The MPLS experimental bits can now be used as classification criteria within a QoS policy on the VIP platform. Using the Modular QoS CLI, a class map can be defined wherein one of the available match criteria is the MPLS experimental bits. A policy map can then be defined to enable VIP-based CBWFQ or Low Latency Queueing for the MPLS class.

New Hardware Features in Release 12.0(5)XE8

There are no new hardware features supported by the Cisco 7000 family of routers for Release 12.0(5)XE8.

New Software Features in Release 12.0(5)XE8

There are no new software features supported by the Cisco 7000 family of routers for Release 12.0(5)XE8.

New Hardware Features in Release 12.0(5)XE7

There are no new hardware features supported by the Cisco 7000 family of routers for Release 12.0(5)XE7.

New Software Features in Release 12.0(5)XE7

There are no new software features supported by the Cisco 7000 family of routers for Release 12.0(5)XE7.

New Hardware Features in Release 12.0(5)XE6

There are no new hardware features supported by the Cisco 7000 family of routers for Release 12.0(5)XE6.

New Software Features in Release 12.0(5)XE6

There are no new software features supported by the Cisco 7000 family of routers for Release 12.0(5)XE6:

Support Added for New Revision of System Controller Chip

CSCdp57908—This caveat adds support for a new revision of a hardware component that fixes a previous error. For the benefit of users that have not upgraded to the new hardware, it will also exhibit a warning error message that indicates the old hardware revision.

Cisco 7200 series routers with NPE-175 or NPE-225 network processing engines must upgrade to Cisco IOS releases that incorporate this change (for example, Cisco IOS Release 12.0(9) and later releases or Cisco IOS Release 12.0(9)S and later releases). Use of older Cisco IOS releases might result in unpredictable malfunctions. Please see the following document for further information:

http://www.cisco.com/warp/customer/770/fn8611.shtml

New Hardware Features in Release 12.0(5)XE5

The following new hardware features are supported by the Cisco 7000 family of routers for Release 12.0(5)XE5.

Integrated Service Module

The Integrated Service Module (ISM) is a Layer 3 encryption service module that supports IP Security Protocol (IPSec) protection of IP datagrams on Cisco 7100 series routers. The ISM provides hardware-based encryption, thus freeing resources on the network processor [NP].

The ISM provides hardware-accelerated support for the following encryption functions:

- 56-bit Data Encryption Standard (DES) standard mode: Cipher Block Chaining (CBC)
- 3-Key Triple DES (168-bit)
- Secure Hash Algorithm (SHA)-1 and Message Digest 5 (MD5) hash algorithms
- Rivest, Shamir, Adelman (RSA) public-key algorithm
- Diffie-Hellman key exchange RC4-40

For Release 12.0(5)XE5, ISM has the following restrictions:

- Keepalives are not supported on ISM if more than 200 tunnels are created. If you need to create more than 200 tunnels, turn off keepalives.
- Flow switching is not supported.

New Software Features in Release 12.0(5)XE5

The following new software features are supported by the Cisco 7000 family of routers for Release 12.0(5)XE5.

PPTP with MPPE

Enterprises are increasingly looking to the Internet as a means of enabling new, lower-cost services for their users. The ubiquity of the Internet makes it very easy for remote and mobile users to connect anywhere on the planet, all that's required is an ISP to provide Internet access. At the same time, Enterprises are hesitant to trust the Internet as a transport for private company data and are looking for means to use the Internet in a secure way.

Point-to-Point Tunneling Protocol with Microsoft's Point-to-Point Encryption (PPTP/MPPE) provides a solution to this need. The PPTP protocol (Point-to-Point Tunneling Protocol) provides a mechanism to tunnel user's data across the Internet to the edge of the enterprise network, so that users can use any ISP account and any Internet-routable IP address to access the edge of the enterprise network. At the edge, the IP packet is detunneled and the enterprise IP address space is used for traversing the internal network. MPPE (Microsoft Point to Point Encryption) protocol provides an encryption service that protects the datastream as it traverses the Internet. MPPE is available in 2 forms: 40-bit encryption, which is widely available throughout the world, and 128-bit encryption which may be subject to certain export controls when used outside the United States.

Service providers also have an opportunity to leverage PPTP/MPPE when deploying managed services for enterprise customers. In this model, the Service Provider deploys and manages the enterprise's PPTP/MPPE tunnel server or PNS (PPTP Network Server) and manages this service on behalf of the enterprise. The tunnel server may be hosted at the Service Providers POP, or may be located at the enterprise edge, but managed by the Service Provider.

Using Cisco IOS Technology, PPTP/MPPE PNS service may be provided by the Cisco 7100 and 7200 platforms.

Low Latency Queueing for the VIP

The Low Latency Queueing for the Versatile Interface Processor (VIP) feature brings priority queueing to Class-Based Weighted Fair Queueing (CBWFQ). Priority queueing allows delay-sensitive data such as voice to be dequeued and sent first (before packets in other queues are dequeued), giving delay-sensitive data preferential treatment over other traffic.

Without Low Latency Queueing, CBWFQ provides weighted fair queueing based on defined classes with no priority queue available for real-time traffic. CBWFQ allows you to define traffic classes and then assign characteristics to that class. For example, you can designate the minimum bandwidth delivered to the class during congestion.

For CBWFQ, the weight for a packet belonging to a specific class is derived from the bandwidth you assigned to the class when you configured it. Therefore, the bandwidth assigned to the packets of a class determines the order in which packets are sent. All packets are serviced fairly based on weight; no class of packets may be granted priority. This approach can pose problems for voice traffic on low bandwidth links that are largely intolerant of delay, especially variation in delay. For voice traffic, variations in delay might introduce irregularities of transmission manifesting as jitter in the heard conversation.

The Low Latency Queueing feature provides priority queueing for CBWFQ, reducing jitter in voice conversations. Configured by the **priority** command, Low Latency Queueing enables use of a single priority queue within CBWFQ at the class level, allowing you to direct traffic belonging to a class to the CBWFQ priority queue. To enqueue class traffic to the priority queue, you configure the **priority** command for the class after you specify the named class within a policy map. (Classes to which the **priority** command is applied are considered priority classes.) Within a policy map, you can give one or more classes priority status. When multiple classes within a single policy map are configured as priority classes, all traffic from these classes is enqueued to the same, single, priority queue.

New Hardware Features in Release 12.0(5)XE4

There are no new hardware features supported by the Cisco 7000 family of routers for Release 12.0(5)XE4.

New Software Features in Release 12.0(5)XE4

There are no new software features supported by the Cisco 7000 family of routers for Release 12.0(5)XE4.

New Hardware Features in Release 12.0(5)XE3

There are no new hardware features supported by the Cisco 7000 family of routers for Release 12.0(5)XE3.

New Software Features in Release 12.0(5)XE3

The following new software features are supported by the Cisco 7000 family of routers for Release 12.0(5)XE3.

Quality of Service for Virtual Private Networks

When packets are encapsulated by tunnel or encryption headers, Quality of Service (QoS) features are unable to examine the original packet headers and correctly classify the packets. Packets traveling across the same tunnel have the same tunnel headers, so the packets are treated identically if the physical interface is congested.

With the growing popularity of Virtual Private Networks (VPNs), the need to classify traffic within a traffic tunnel is gaining importance. QoS features have historically been unable to classify traffic within a tunnel. With the introduction of the Quality of Service for Virtual Private Networks (QoS for VPNs) feature, packets can now be classified before tunneling and encryption occur. The process of classifying features before tunneling and encryption is called preclassification.

The QoS for VPNs feature is designed for tunnel interfaces. When the new feature is enabled, the QoS features on the output interface classify packets before encryption, allowing traffic flows to be adjusted in congested environments. The end result is more effective packet tunneling.

New Hardware Features in Release 12.0(5)XE2

The following new hardware features are supported by the Cisco 7000 family of routers for Release 12.0(5)XE2.

E1 Support for Two-Port T1/E1 High-Capacity Digital Voice Port Adapter for Cisco 7200 Series Routers

E1 applications, which were unavailable for the two-port T1/E1 high-capacity digital voice port adapter for Cisco 7200 series routers on Cisco IOS Release 12.0(5)XE, have been enabled for Cisco IOS Release 12.0(5)XE2.

For additional information on the two-port T1/E1 high-capacity digital voice port adapter for Cisco 7200 series routers, see the *Two-Port T1/E1 High-Capacity Digital Voice Port Adapter for Cisco 7200 Series Routers* installation and configuration note.

New Software Features in Release 12.0(5)XE2

The following new software feature is supported by the Cisco 7000 family of routers for Release 12.0(5)XE2.

Network-Based Application Recognition (NBAR)

As IP Quality of Service (QoS) technology matures and customers begin QoS deployment in production networks, new requirements for packet classification have emerged. Today's applications require high performance to ensure competitiveness in an increasingly fast-paced business environment. Networks provide a variety of services to ensure that mission-critical applications receive the required bandwidth for high performance. Today's Internet-based client-server applications make it difficult for networks to identify and provide the proper level of control.

The Network-Based Application Recognition (NBAR) engine solves this problem by adding intelligent network classification to network infrastructures. NBAR is a new classification engine that recognizes a wide variety of applications, including web-based and other difficult-to-classify protocols that utilize dynamic port assignments. When an application is recognized by NBAR, a network can invoke services for that specific application. NBAR ensures that network bandwidth is used efficiently by working with Quality of Service features such as:

- Guaranteed bandwidth for critical applications
- Bandwidth limits for noncritical applications
- Traffic shaping
- Packet identification

NBAR introduces several new classification features:

- Classification of applications that dynamically assign Transport Control Protocol/User Datagram Protocol (TCP/UDP) port numbers
- Classification of HTTP traffic by URL or Multipurpose Internet Mail Extension (MIME) type
- Classification of application traffic using subport information
- Classification of traffic that uses static TCP/UDP port numbers

NBAR provides classification of static port traffic for easier configurations. Access lists also provide the same classification ability for static port protocols.

NBAR provides a special Protocol Discovery feature that determines which application protocols are traversing a network at any given time. The Protocol Discovery feature captures key statistics associated with each protocol in a network. These statistics can be used to define traffic classes and QoS policies for each traffic class.

New Hardware Features in Release 12.0(5)XE

The following new hardware features are supported by the Cisco 7000 family of routers for Release 12.0(5)XE.

Two-Port T1/E1 High-Capacity Digital Voice Port Adapter for Cisco 7200 Series Routers

The T1/E1 VXC port adapter (PA-VXC-2TE1) is a multichannel packet voice port adapter that allows a Cisco 7200 series or Cisco 7200 VXR router to become a dedicated packet voice hub or packet voice gateway that connects to both private branch exchanges (PBXs) and the Public Switched Telephone Network (PSTN). These connections allow packet voice and fax calls to be placed over the WAN and sent through the gateway into the traditional circuit-switched voice infrastructure.

Note In Cisco IOS Release 12.0(5)XE, E1 applications using this card are not supported. Although the PA-VXC-2TE1 port adapter can be configured for both T1 and E1 environments, Cisco IOS Release 12.0(5)XE only supports channel associated signaling (CAS) for T1 environments. Although CAS for T1 applications is widely deployed and standardized, CAS is not a standardized solution for E1 environments. Ongoing efforts to qualify E1 CAS with third-party products should enable E1 applications to be supported in the next Cisco IOS 12.0 XE release.

In Voice over IP, the digital signal processor (DSP) segments the voice signal into frames, which are then coupled in groups of two and stored in voice packets. These voice packets are transported using IP in compliance with ITU-T specification H.323. Because Voice over IP is a delay-sensitive application, a well-engineered end-to-end network is required to use it successfully. Fine-tuning your network to adequately support Voice over IP involves a series of protocols and features geared toward quality of service (QoS). Traffic shaping considerations must be taken into account to ensure the reliability of the voice connection.

Inverse Multiplexing over ATM Port Adapter

The Inverse Multiplexing over ATM (IMA) port adapter is a single-width port adapter that allows Cisco 7200 series and Cisco 7500 series routers to support inverse multiplexing over ATM. The port adapter allows WAN uplinks at speeds ranging from 1.544 Mbps to 12.288 Mbps for T1 or E1 environments.

Cisco's scalable ATM IMA solution means that network designers and managers can deploy only the bandwidth they need, using multiple T1 or E1 connections instead of more expensive T3 or OC-3 lines to bridge between LANs and ATM WAN applications. Enterprises and branch offices can aggregate traffic from multiple lower-bandwidth physical transmission media, such as T1 or E1 pipes, to transmit voice and data at high-bandwidth connection speeds.

New Software Features in Release 12.0(5)XE

The following new software feature is supported by the Cisco 7000 family of routers for Release 12.0(5)XE.

Distributed Traffic Shaping

Many enterprise and service provider customers need to shape traffic in their networks and sometimes need to shape IP traffic independently of the underlying interface. In other cases, the goal is to perform traffic shaping to ensure adherence to committed information rates on Frame Relay links.

The distributed Traffic Shaping (dTS) feature is one element used to manage the bandwidth of an interface to avoid congestion, meet remote site requirements, and conform to a service rate that is provided on that interface.

The distributed Traffic Shaping (dTS) feature uses queues to buffer traffic surges that can congest a network. Data is buffered and then sent into the network at a regulated rate. This ensures that traffic will behave in accordance with the configured descriptor, as defined by CIR (mean rate), Bc (burst size), and Be (excess burst size). With the defined average bit rate and burst size that are acceptable on that shaped entity, you can derive a time interval value.

The excess burst size (Be) allows more than the burst size (Bc) to be sent during a time interval under certain conditions. Therefore, dTS provides two types of **shape** commands: **average** and **peak**. When **shape average** is configured, the interface sends no more than the burst size (Bc) for each interval, achieving an average rate no higher than the mean rate (CIR). When **shape peak** is configured, the interface sends Bc plus Be bits in each interval.

In a link layer network such as Frame Relay, the network sends messages with the forward explicit congestion notification (FECN) or backward explicit congestion notification (BECN) if there is congestion. With the dTS feature, the traffic shaping adaptive mode takes advantage of these signals and adjusts the traffic descriptors. This approximates the rate to the available bandwidth along the path.

Important Notes

The following sections contain important notes that apply to the Cisco 7000 family of routers.

Image Deferral, Cisco 7200 Boot Images

Cisco IOS Release 12.0(5)XE, Cisco IOS Release 12.0(7)XE and Cisco IOS Release 12.0(7)XE1 bootimages for Cisco 7200 series routers have been deferred due to the following caveat:

CSCdm85656—Reduce size of boothelper image c7200-boot-mz

Cisco IOS Release 12.0(5)XE, Cisco IOS Release 12.0(7)XE and Cisco IOS Release 12.0(7)XE1 for the 7200 bootimages (c7200-boot-mz-*) have outgrown the FLASH SIMM used to store the bootimage on the Input/Output Controllers used in the Cisco 7200 series routers. Although the present released images are below 4MB, the available space after formatting the 4MB FLASH SIMM is 3.25MB. Cisco utilizes the FLASH SIMM to not only store the bootimage but also to store crashinfo files. After providing 300KB for up to two crashinfo files, only 2.96MB is available for the bootimage. Using an oversized bootimage would not allow space for crashinfo files into the FLASH SIMM. In some cases, the bootimage itself may not fit in the FLASH SIMM.

For more information about this deferral refer to the Field Notice located at the following URL:

http://www.cisco.com/warp/customer/770/fn7771.shtml

or on CCO at:

Service & Support: **Technical Assistance Center**: **Documents**: **Field Notices**

Image Replacement, Cisco IOS Release 12.0(5)XE7

Cisco IOS Release 12.0(5)XE5 7100 images have been replaced by Cisco IOS Release 12.0(5)XE7 images because of the following caveats:

- CSCdm53425—Authentication proxy won't prompt the login page to the clients. Instead the clients will see "TCP connection reset/network error" messages.
- CSCdp63977—PCMCIA may corrupt data read or written for C7100

For more information about Cisco IOS Release 12.0(5)XE including product support, migration paths, product numbers and descriptions refer to the *Cisco IOS Software Release 12.0(5)XE Product Bulletin* located at:

http://www.cisco.com/warp/customer/cc/cisco/mkt/gen/bulletin/soft/ios_120/index.shtml

Image Replacement, Cisco IOS Release 12.0(5)XE6

All Cisco 7200 series routers on Cisco IOS Release 12.0(5)XE4 through 12.0(5)XE5 are not recommended and are no longer supported for Cisco NPE-175 or NPE-225 products. Customers using this software should migrate to Cisco IOS Release 12.0(5)XE6.

For information on this caveat, refer to the *NPE-175 and NPE-225 Recall Due To Anomalous Packet Handling Behavior* field notice on CCO.

Image Replacement, Cisco IOS Release 12.0(5)XE5

Cisco IOS Release 12.0(5)XE5 7200 images have been replaced by Cisco IOS Release 12.0(5)XE6 images because of the following caveats:

- CSCdm53425 - Authentication proxy won't prompt the login page to the clients. Instead the clients will see "TCP connection reset/network error
- CSCdp63977 - PCMCIA may corrupt data read or written for C7100

For more information about Cisco IOS Release 12.0(5)XE including product support, migration paths, product numbers and descriptions refer to the *Cisco IOS Software Release 12.0(5)XE Product Bulletin* located at:

http://www.cisco.com/warp/customer/cc/cisco/mkt/gen/bulletin/soft/ios_120/index.shtml

Image Replacement, Cisco IOS Release 12.0(5)XE4

Note Any order using the 12.0(5)XE product numbers will be issue the latest rebuild. Earlier rebuilds (12.0(5)XE4) are available on CCO IOS Planner. CCO registration is required for the CCO IOS Planner. If you are not a CCO registered customer, and require an earlier rebuild, you will need to contact TAC.

Cisco IOS Release 12.0(5)XE4 images have been replaced by 12.0(5)XE5 images because of the following caveats:

- CSCdm36742— 2EWAN:ISA:7200 formatting bootflash, disabled access to bootflash.
- CSCdm53878 —3Tracebacks during SNMP walk of ATM interface MIB
- CSCdm78669 —2ISAKMP rsa-encr authnetication stopped working after IOS upgrade
- CSCdp13899 —2 modCLI:VIP-slot gets bus error exception on atm-lite sub-int
- CSCdp22263—2 INTC:Crash due to Malloc Failure in Intercooler *B*
- CSCdp31686— 2 EWAN:ISA:EGR Ping failure and Main mode processing failure
- CSCdp36634—2 llq:Cannot enable random through a policy with priority configured
- CSCdp37696—3 low latency queueing support
- CSCdp37787—2 llq:unable to enable a policy with multiple priority classes
- CSCdp39800—2 EWAN:ISA:EGR Spurious mem access made at 0x60EB5E38 reading 0x18
- CSCdp41211—3 HAYDN:%DSPRM-5-DSPFAIL:during 7200 VXR (NPE-200) bootup
- CSCdp42918—3 PPTP/MPPE:pptp_int merge to conn_4xe
- CSCdp44498—2 EWAN:ISA:EGR Ping fails on back to back UUT routers
- CSCdp44669—2 Disallow MPPE at parser level for non-crypto images
- CSCdp44719—2 RSP build issues on conn_4xe
- CSCdp45848—3 llq:problem with non-priority class drops
- CSCdp47930—2 EWAN:ISA:IKE keepalive memory leak

- CSCdp48550—2 ping doesn't work if a pol has just shape/police/wred/fair on a class
- CSCdp49097—2 MPPE:Memory corruption around mppe_flowid_bits

Image Deferral, Cisco IOS Release 12.0(5)XE3

Cisco IOS Release 12.0(5)XE3 was deferred on all Cisco 7200 platforms. For information on this deferral, see the *Field Notice for Cisco IOS Release 12.0(5)XE3* on CCO.

Image Deferral, Cisco IOS Release 12.0XE1

Cisco IOS Release 12.0(5)XE2 was deferred because of the following caveats:

- CSCdp03404—2 Haydn Spurious memory access during VoFR voice/data integration test
- CSCdp06492—2 WFQ Rcvd incorrectly initialized packet during voice/data stress.
- CSCdp09045—2 Frame-relay+frf9-compression+dwfq does not work
- CSCdp09920—2 Haydn dsp19 dies in stress test

Release 12.0(5)XE1 images have been replaced with Release 12.0(5)XE2 images.

For additional information on Release 12.0 deferrals, including the Release 12.0 XE deferral, see the *What's Hot for Cisco IOS Software Release 12.0* document on CCO. To reach the *What's Hot for Cisco IOS Software Release 12.0* document, log in to CCO and click this path:

Service & Support: **Software Center**: **Cisco IOS Software**: **Cisco IOS 12.0**: **What's Hot for Cisco IOS Software Release 12.0**

Image Deferral, Cisco IOS Release 12.0XE

Cisco IOS Release 12.0(5)XE1 was deferred because of the following caveats:

- CSCdp02927—VHS card halts the command addcon 1 1 1 1 1, afterwards failed cc 2 command
- CSCdm73855—Images won't boot on NPE-300 with default memory configuration

Release 12.0(5)XE images have been replaced with Release 12.0(5)XE1 images.

For additional information on Release 12.0 deferrals, including the Release 12.0 XE deferral, see the *What's Hot for Cisco IOS Software Release 12.0* document on CCO. To reach the *What's Hot for Cisco IOS Software Release 12.0* document, log in to CCO and click this path:

Service & Support: **Software Center**: **Cisco IOS Software**: **Cisco IOS 12.0**: **What's Hot for Cisco IOS Software Release 12.0**

Caveats

Caveats describe unexpected behavior in Cisco IOS software releases. Severity 1 caveats are the most serious caveats; severity 2 caveats are less serious.

This section contains the open caveats for the current Cisco IOS maintenance release only. The *Caveats for Cisco IOS Release 12.0* and *Caveats for Cisco IOS Release 12.0 T* documents are located on CCO and the Documentation CD-ROM.

All caveats Release 12.0(5)T are also in Release 12.0(5)XE and, subsequently, Release 12.0(7)XE2.

For information on caveats in Cisco IOS Release 12.0 T, see the *Caveats for Cisco IOS Release 12.0 T* document on CCO and the Documentation CD-ROM.

For information on caveats in Cisco IOS Release 12.0, see *Caveats for Cisco IOS Release 12.0* document on CCO and the Documentation CD-ROM.

If you have an account with CCO, you can use Bug Navigator II to find caveats of any severity for any release. Bug Navigator II is at http://www.cisco.com/support/bugtools, or from CCO, select **Software & Support**: **Technical Tools**: **Bug Toolkit II**

Caveats for Release 12.0(7)XE2

This section describes possibly unexpected behavior by Release 12.0(7)XE2. All of the caveats that remain open from Releases 12.0(5)XE thru 12.0(5)XE8 are also in Release 12.0(7)XE2.

- CSCdw65903

  An error can occur with management protocol processing. Please use the following URL for further information:

  http://www.cisco.com/cgi-bin/bugtool/onebug.pl?bugid=CSCdw65903

Caveats for Release 12.0(7)XE1

This section describes possibly unexpected behavior by Release 12.0(7)XE1. All of the caveats that remain open from Releases 12.0(5)XE thru 12.0(5)XE8 are also in Release 12.0(7)XE1.

Basic System Services

- CSCdp73630

  In certain configurations, a Cisco 7120 router with an Integrated Service Module (ISM) might receive the following error message:

  ```
  00:42:22: isa_rx_error: B208, id 59, pool offset 0
  00:42:25: IP: s=204.64.105.25 (local), d=4.4.140.98 (FastEthernet0/0), len 112,
  encapsulation failed, proto=50
  ```

  This error message seems to indicate that packets are getting encrypted and decrypted based on the IPSec SA counters, but the router isn't placing these packets onto the interface.

  There are no known workarounds.

Interfaces and Bridging

- CSCdp43270

  If a configuration change is applied to an ATM subinterface before shuting down the subinterface, the main ATM interface goes to a down/down state. A reload is required to restore the interface to it's normal state.

  Workaround: Shutdown the subinterface before applying changes.

- CSCdp51752

  In Cisco 7100 and 7200 series routers, transparent bridging using the PA-DTR Token Ring Port Adapter does not operate properly. The **show bridge** command fails to indicate any of the end-stations in the bridge table.

  Workaround: On the Cisco 7200 series routers, use alternative token ring port adapters. There are no known workarounds for the Cisco 7100 series routers.

Miscellaneous

- CSCdm64207

  The following problem occurs on serial interfaces after the default value of the clock-rate or bandwidth has been changed.

  When Class Based Weighted Fair Queuing (CBWFQ) for the Versatile Interface Processor is enabled on the interface, the CBWFQ weights are chosed based on the default bandwidth, not the modified bandwidth, of the interface.

  There are no known workarounds.

- CSCdp52184

  Fast-switching on an ATM IMA interface might cause RTP packets from a Cisco 7200 series router to be dropped. Although the call is placed, the audio stream from the 7200 is dropped off the interface. The result is a one-way audio path.

  Please note that this problem does not appear to affect calls switched thru a Cisco 7200 series router, only calls generated by a Cisco 7200 series router.

  Workaround: Disable fast-switching.

- CSCdp37300

  When using EIGRP and two ipsec tunnels, only one ipsec tunnel pings successfully, the other ipsec tunnel fails to ping.

  Workaround: Use the **crypto map local-address** command to create a single address as the identity of the router by using one local-address for both crypto maps.

- CSCdp55136

  The write memory command sometimes fails and produces the following error message:

  ```
  private-config file open failed
  ```

  Workaround: Use the **write erase** command before using the **write memory** command.

- CSCdp59073

  In certain configurations, a Cisco 7100 series router with ATM interfaces might experience a software forced reload. This reload indicate that the pak_pool_maximum_size is responsible for the reload.

  There are currently no known workarounds.

- CSCdp49786

  Keepalives are not supported on ISM if more than 200 tunnels are created.

  Workaround: If you need to create more than 200 tunnels, turn off keepalives.

- CSCdp33570

  When two Inverse Multiplexing port adapters attempt to connect to one another in certain configurations, one of the Versatile Interface Processors (VIPs) on one of the Inverse Multiplexing over ATM (IMA) port adapters might not be recognized.

  There is no known workaround.

- CSCdp23736

  In certain configurations, a Cisco 7200 series router running the IP software image (c7200-is-mz) might cause the software to experience memory corruption.

  There is no known workaround.

- CSCdm94030

  As the number of IPSec sessions increases on an ISA port adapter, the impact of checking an extended access control list (ACL) might cause the throughput (NDR or no_drop_rate) rate to decrease.

  There is no known workaround.

- CSCdp27437

  In certain environments, Cisco 7140 router continuously exchanging heavy traffic loads might unexpectedly reload. There is no known workaround.

- CSCdp30856

  On RSP8 platforms, an Extended On-line Insertion and Removal (EOIR) attempt might fail if a VIP receives a bus error while accessing MEMD above the 2 MB boundary due to a CyBus stall, which is a normal portion of the installation.

  There is no known workaround.

- CSCdp13899

  While attaching service-policies to atm-lite sub-interfaces, a Versatile Interface Processor (VIP) reloads while attaching a policy map configured with traffic shaping or bandwidth to an interface.

  Workaround: Avoid attaching service-policies to atm-lite subinterfaces when using a VIP.

- CSCdp07943

  A GEIP running Cisco IOS Release 12.0(5)XE1 with local switching might drop a large number of packets.

  There is no known workaround.

- CSCdp19300

  This problem occurs with a Versatile Interface Processor (VIP) with 32MB of DRAM. When using Quality of Service (QoS) features on all interfaces of a channelized T3 port adapter, the VIP might reload while configuring certain features.

  Workaround: Upgrade the VIP to 64mb of DRAM for this environment.

- CSCdm91628

  A Cisco 7100 VPN series router running the IP/FW IPSec 56 image on Cisco IOS Release 12.0(5)XE rejects commands for authentication proxy on the command line interface (CLI).

  There is no known workaround.

- CSCdm87976

  A Cisco 7500 series router running a Cisco IOS Release 12.0(5) crypto image is unable to ping another router.

  There is no known workaround.

- CSCdm88083

  A Cisco 7500 series router running a Cisco IOS Release 12.0(5) crypto image fails to display an EIGRP routing table to other routers.

  There is no known workaround.

- CSCdm64860

  When online insertion and removal (OIR) is used to access the Sandisk, the **dir disk** command might pause the Route Switch Processor (RSP).

  There is no known workaround.

- CSCdm70188

  A Cisco 7100 series router running the Enterprise/FW IPSec 56 (c7100-jos56I-mz) software image might experience spurious access errors.

  There is no known workaround.

- CSCdm30802

  When Cisco Express Forwarding (CEF) is configured for a packet size larger than 1948, the **ping** command might be unsuccessful.

  There is no known workaround.

- CSCdm62147

  On Cisco 7500 series routers, the **copying startup-configuration** command has difficulties working consistently with configurations larger than 13396 bytes.There is no known workaround.

- CSCdm79460

  When two Cisco 7500 series routers with connections to Internet Service Providers (ISPs) are connected, the Cisco 7500 series routers might have trouble pinging each other.

  Workaround: Reload the router.

- CSCdm27064

  A Cisco 7200 series router supporting the NPE-300 might reload during IPX routing.

  There are no known workarounds.

- CSCdm27625

  A Cisco 7200 series router running pagent traffic on a CT3 port adapter might reload.

  There are no known workarounds.

- CSCdm60868

  An RSP 8 (Route Switch Processor 8) with 64 MB of memory might utilize too much memory and subsequently fail to receive output from a **dir disk1** output command.

- CSCdm25439

  A Cisco 7200 series router configured with the IMA port adapter might run slowly after configuring a large number of subinterfaces and virtual circuits.

  There is no known workaround.

NBAR

- CSCdm73634

  If the router has a configured class map or an interface has an attached service policy when loading a new Packet Description Language Module (PDLM) from flash memory, NBAR configuration information could be lost.

  Workaround: When loading a PDLM from Flash memory, remember to detach service policies and remove class map configurations.

- CSCdm94155

  The byte counts from the **show ip nbar protocol-discovery** command output might differ from the byte count statistics from the **show interface stat** command. This mismatch occurs when the packet counts match.

  There is no known workaround.

- CSCdp06970

  The **ip nbar port-map ?** command displays incorrect options when non-UDP/TCP protocols are running. The incorrect options indicate that certain UDP/TCP applications are allowed with the IP NBAR port map. These indications are incorrect.

- CSCdp08054

  The **ip nbar port-map** command does not allow 15 additional port numbers. The other 16 port numbers that are available with the router are unaffected.

- CSCdp14158

  Attaching service policies to tunnel interfaces is not currently supported in Release 12.0(5)XE2. Attempting to attach a service-policy to a tunnel interface will not generate an error message.

- CSCdm89973

  Disabling Cisco Express Forwarding (CEF) switching after applying and attempting to disable a service policy might produce an error message indicating that CEF switching needs to be enabled. This message is unimportant because the service policy has already been removed.

Caveats for Release 12.0(5)XE8

This section describes possibly unexpected behavior by Release 12.0(5)XE8.

- CSCdw65903

  An error can occur with management protocol processing. Please use the following URL for further information:

  http://www.cisco.com/cgi-bin/bugtool/onebug.pl?bugid=CSCdw65903

Related Documentation

The following sections describe the documentation available for the Cisco 7000 family of routers. These documents consist of hardware and software installation guides, Cisco IOS configuration and command references, system error messages, feature modules, and other documents.

Documentation is available as printed manuals or electronic documents, except for feature modules, which are available online on CCO and the Documentation CD-ROM.

Use these release notes with these documents:

- Release-Specific Documents, page 53
- Platform-Specific Documents, page 54
- Feature Modules, page 55
- Cisco IOS Software Documentation Set, page 55

Release-Specific Documents

The following documents are specific to Release 12.0 and are located on CCO and the Documentation CD-ROM:

- *Cross-Platform Release Notes for Cisco IOS Release 12.0*

  On CCO at:

  Technical Documents: Documentation Home Page: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**: **Release Notes**: **Cross-Platform Release Notes**

  On the Documentation CD-ROM at:

  Cisco Product Documentation: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**: **Release Notes**: **Cross-Platform Release Notes**

- Product bulletins, field notices, and other release-specific documents

  On CCO at:

  Technical Documents

- Product Bulletins for Cisco IOS Release 12.0

  On CCO at:

  Technical Documents: Product Bulletins: Software: Cisco IOS 12.0

- Caveats documents

  As a supplement to the caveats listed in the "Caveats" section of these release notes, see the *Caveats for Cisco IOS Release 12.0* and *Caveats for Cisco IOS Release 12.0 T* documents, which contain caveats applicable to all platforms for all maintenance releases of Release 12.0 XE.

  On CCO at:

  Technical Documents: **Documentation Home Page**: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**: **Caveats**

  On the Documentation CD-ROM at:

  Cisco Product Documentation: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**: **Caveats**

- For information relating to deferrals on Cisco IOS Release 12.0, log in to CCO and refer to the *What's Hot for Cisco IOS Software Release 12.0* document.

  On CCO at*:*

  Service and Support: **Software Center**: **Cisco IOS Software**: **Cisco IOS 12.0**: **What's Hot for Cisco IOS Software Release 12.0**

Note To access *What's Hot for Cisco IOS Software Release 12.0* on CCO, you must have a CCO login account name and password. For information on obtaining a CCO account, or on accessing CCO as a guest, refer to the Service and Support section of this document.

Note If you have an account with CCO, you can use Bug Navigator II to find caveats of any severity for any release. You can reach Bug Navigator II on CCO at: **Service & Support**: **Online Technical Support**: **Software Bug Toolkit**. You can also find Bug Navigator II at http://www.cisco.com/support/bugtools.

Platform-Specific Documents

These documents are available for the Cisco 7000 family on CCO and the Documentation CD-ROM:

- *Cisco 7500 Series Installation and Configuration Guide*
- *Cisco 7200 VXR Installation and Configuration Guide*
- *Cisco 7206 Installation and Configuration Guide*
- *Cisco 7204 Installation and Configuration Guide*
- *Cisco 7202 Installation and Configuration Guide*
- *Cisco 7100 Series VPN Router Installation and Configuration Guide*
- *Cisco 7010 Users Guide*

On CCO at:

Technical Documents: Documentation Home Page: Core/High-End Routers

On the Documentation CD-ROM at:

Cisco Product Documentation: Core/High-End Routers

Feature Modules

Feature modules describe new features supported by Release 12.0 XE and are updates to the Cisco IOS documentation set. A feature module consists of a brief overview of the feature, benefits, configuration tasks, and a command reference. As updates, the feature modules are available online only. Feature module information is incorporated in the next printing of the Cisco IOS documentation set.

On CCO at:

Service and Support: **Technical Documents**: **Documentation Home Page**: **Cisco Product Documentation**: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**: **New Feature Documentation**: **New Features in 12.0-Based Limited Lifetime Releases**: **New Features in Release 12.0 XE**

On the Documentation CD-ROM at:

Cisco Product Documentation: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**: **New Feature Documentation**: **New Features in 12.0-Based Limited Lifetime Releases**: **New Features in Release 12.0 XE**

Cisco IOS Software Documentation Set

The Cisco IOS software documentation set consists of the Cisco IOS configuration guides, Cisco IOS command references, and several other supporting documents, which are shipped with your order in electronic form on the Documentation CD-ROM—unless you specifically ordered the printed versions.

Documentation Modules

Each module in the Cisco IOS documentation set consists of two books: a configuration guide and a corresponding command reference. Chapters in a configuration guide describe protocols, configuration tasks, Cisco IOS software functionality, and contain comprehensive configuration examples. Chapters in a command reference provide complete command syntax information. Use each configuration guide with its corresponding command reference.

On CCO and the Documentation CD-ROM, two master hot-linked documents provide information for the Cisco IOS software documentation set.

On CCO at:

Technical Documents: Documentation Home Page: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**: **Configuration Guides and Command References**

On the Documentation CD-ROM at:

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

Release 12.0 Documentation Set

Table 11 describes the contents of the Cisco IOS Release 12.0 software documentation set, which is available in electronic form and in printed form upon request.

Note You can find the most current Cisco IOS documentation on CCO and the Documentation CD-ROM. These electronic documents may contain updates and modifications made after the hard-copy documents were printed.

On CCO at:

Technical Documents: **Documentation Home Page**: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**

On the Documentation CD-ROM at:

Cisco Product Documentation: **Cisco IOS Software Configuration**: **Cisco IOS Release 12.0**

Table 11 Cisco IOS Software Release 12.0 Documentation Set

Books	Chapter Topics
• *Configuration Fundamentals Configuration Guide* • *Configuration Fundamentals Command Reference*	Configuration Fundamentals Overview Cisco IOS User Interfaces File Management System Management
• *Bridging and IBM Networking Configuration Guide* • *Bridging and IBM Networking Command Reference*	Transparent Bridging Source-Route Bridging Token Ring Inter-Switch Link 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 Cisco Database Connection NCIA Client/Server Topologies Cisco Mainframe Channel Connection Airline Product Set

Table 11 Cisco IOS Software Release 12.0 Documentation Set (continued)

Books	Chapter Topics
• *Dial Solutions Configuration Guide* • *Dial Solutions Command Reference*	X.25 over ISDN AppleTalk Remote Access Asynchronous Callback, DDR, PPP, SLIP Bandwidth Allocation Control Protocol ISDN Basic Rate Service ISDN Caller ID Callback PPP Callback for DDR Channelized E1 & T1 Dial Backup for Dialer Profiles Dial Backup Using Dialer Watch Dial Backup for Serial Lines Peer-to-Peer DDR with Dialer Profiles DialOut Dial-In Terminal Services Dial-on-Demand Routing (DDR) Dial Backup Dial-Out Modem Pooling Large-Scale Dial Solutions Cost-Control Solutions Virtual Private Dialup Networks Dial Business Solutions and Examples
• *Cisco IOS Interface Configuration Guide* • *Cisco IOS Interface Command Reference*	Interface Configuration Overview LAN Interfaces Logical Interfaces Serial Interfaces
• *Network Protocols Configuration Guide, Part 1* • *Network Protocols Command Reference, Part 1*	IP Overview IP Addressing and Services IP Routing Protocols
• *Network Protocols Configuration Guide, Part 2* • *Network Protocols Command Reference, Part 2*	AppleTalk Novell IPX
• *Network Protocols Configuration Guide, Part 3* • *Network Protocols Command Reference, Part 3*	Network Protocols Overview Apollo Domain Banyan VINES DECnet ISO CLNS XNS
• *Security Configuration Guide* • *Security Command Reference*	AAA Security Services Security Server Protocols Traffic Filtering and Firewalls IP Security and Encryption Passwords and Privileges Neighbor Router Authentication IP Security Options
• *Cisco IOS Switching Services Configuration Guide* • *Cisco IOS Switching Services Command Reference*	Switching Services Switching Paths for IP Networks Virtual LAN (VLAN) Switching and Routing
• *Wide-Area Networking Configuration Guide* • *Wide-Area Networking Command Reference*	Wide-Area Network Overview ATM Frame Relay SMDS X.25 and LAPB

Table 11 Cisco IOS Software Release 12.0 Documentation Set (continued)

Books	Chapter Topics
• *Voice, Video, and Home Applications Configuration Guide* • *Voice, Video, and Home Applications Command Reference*	Voice over IP Voice over Frame Relay Voice over ATM Voice over HDLC Frame Relay-ATM Internetworking Synchronized Clocks Video Support Universal Broadband Features
• *Quality of Service Solutions Configuration Guide* • *Quality of Service Solutions Command Reference*	Policy-Based Routing QoS Policy Propagation via BGP Committed Access Rate Weighted Fair Queueing Custom Queueing Priority Queueing Weighted Random Early Detection Scheduling Signaling RSVP Packet Drop Frame Relay Traffic Shaping Link Fragmentation RTP Header Compression
• *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 published. For the latest list of MIBs supported by Cisco, see *Cisco Network Management Toolkit* on Cisco Connection Online. From CCO, click on the following path: **Service & Support**: **Software Center**: **Network Mgmt Products**: **Cisco Network Management Toolkit**: **Cisco MIB**.

Service and Support

For service and support for a product purchased from a reseller, contact the reseller, who offers a wide variety of Cisco service and support programs described in the "Service and Support" section of the *Cisco Information Packet* shipped with your product.

Note If you purchased your product from a reseller, you can access CCO as a guest. CCO is Cisco Systems' primary real-time support channel. Your reseller offers programs that include direct access to CCO services.

For service and support for a product purchased directly from Cisco, use CCO.

Software Configuration Tips on the Cisco Technical Assistance Center Home Page

If you have a CCO login account, you can access the following URL, which contains links and 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 CCO and click on this path: **Products & Technologies**: **Products**: **Technical Tips.**

The following sections are provided from the Technical Tips page:

- Configuration Cookbooks—Contains common configurations or recipes for configuring various access routes and dial technologies.
- Field Notices—Notifies you of any critical issues regarding Cisco products and includes problem descriptions, safety or security issues, and hardware defects.
- Frequently Asked Questions—Describes the most frequently asked technical questions about Cisco hardware and software.
- Hardware—Provides technical tips related to specific hardware platforms.
- Hot Tips—Describes 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 reach Fax-on-demand and receive documents at your fax machine from the United States, call 888-50-CISCO (888-502-4726). From international areas, call 415-596-4408.
- Internetworking Features—Lists tips on using and deploying Cisco IOS software features and services.
- Sample Configurations—Provides actual configuration examples that are complete with topology and annotations.
- Software Products—Contains Cisco IOS Software Bulletins, Cisco TCP/IP Suite 100, General Cisco IOS, Internet/Intranet Applications and Software, Network Management, Network Protection Software Tips, and WAN Switching Products and Software.
- Special Collections—Lists other helpful documents, including Case Studies, References & Request for Comments (RFCs), and Security Advisories.

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 reach 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 package that 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.

This document is to be used in conjunction with the documents listed in the "Related Documentation" section.