



Text Part Number: 78-6269-01

Release Notes for Cisco 3600 Series for Cisco IOS Release 12.0(2)XD

December 7, 1998

These release notes describe new features for the Cisco 3600 series routers that support Cisco IOS Release 12.0(2)XD. Cisco IOS Release 12.0(2)XD is based on Cisco IOS Release 12.0(2)T.

Use these release notes in conjunction with the cross-platform *Release Notes for Cisco IOS Release 12.0 T* located on Cisco Connection Online (CCO) and the Documentation CD-ROM.

For a list of software caveats that apply to Release 12.0(2)XD, refer to the “Caveats” section on page 12.

Contents

These release notes discuss the following topics:

- Introduction, page 2
- System Requirements, page 2
- New and Changed Information, page 8
- Important Notes, page 12
- Caveats, page 12
- Related Documentation, page 17
- Service and Support, page 22
- Cisco Connection Online, page 23
- Documentation CD-ROM, page 24

Corporate Headquarters

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

Copyright © 1998
Cisco Systems, Inc.
All rights reserved.

Introduction

Cisco 3600 series includes the Cisco 3620 and Cisco 3640 routers. As modular solutions, the Cisco 3620 and Cisco 3640 enable corporations to increase dial-up intensity and take advantage of current and emerging WAN technologies and networking capabilities. The Cisco 3600 series routers are fully supported by Cisco IOS software, which includes dial-up connectivity, LAN-to-LAN routing, data and access security, WAN optimization, and multimedia features.

System Requirements

This section describes the system requirements for Release 12.0(2)XD and includes the following sections:

- Memory Requirements, page 2
- Hardware Supported, page 3
- Determining Your Cisco IOS Software Release, page 5
- Upgrading to a New Release, page 5
- Feature Set Tables, page 6

Memory Requirements

Table 1 describes the memory requirements of the Cisco IOS feature sets for the Cisco 3600 series routers for Release 12.0(2)XD.

Table 1 Memory Requirements for the Cisco 3600 Series

Feature Set by Platform	Image Name	Required Flash Memory	Required DRAM Memory	Runs from	
Cisco 3620	IP Plus	c3620-is-mz	8 MB Flash	32 MB DRAM	RAM
	IP Plus 40	c3620-is40-mz	8 MB Flash	32 MB DRAM	RAM
	IP Plus IPSec 56	c3620-is56i-mz	8 MB Flash	32 MB DRAM	RAM
	IP/FW Plus IPSec 56	c3620-ios56i-mz	8 MB Flash	32 MB DRAM	RAM
	IP/IPX/AT/DEC Plus	c3620-ds-mz	8 MB Flash	32 MB DRAM	RAM
	IP/IPX/AT/DEC/ FW Plus	c3620-dos-mz	8 MB Flash	32 MB DRAM	RAM
	Enterprise Plus	c3620-js-mz	8 MB Flash	32 MB DRAM	RAM
	Enterprise Plus 40	c3620-js40-mz	8 MB Flash	48 MB DRAM	RAM
	Enterprise Plus IPSec 56	c3620-js56i-mz	8 MB Flash	48 MB DRAM	RAM
	Enterprise/FW IPSec 56	c3620-jos56i-mz	8 MB Flash	32 MB DRAM	RAM
	Enterprise/APPN Plus	c3620-ajs-mz	8 MB Flash	48 MB DRAM	RAM
	Enterprise/APPN Plus 40	c3620-ajs40-mz	8 MB Flash	48 MB DRAM	RAM
	Enterprise/APPN Plus IPSec 56	c3620-ajs56i-mz	8 MB Flash	48 MB DRAM	RAM

Table 1 Memory Requirements for the Cisco 3600 Series (continued)

Feature Set by Platform	Image Name	Required Flash Memory	Required DRAM Memory	Runs from	
Cisco 3640	IP Plus	c3640-is-mz	8 MB Flash	32 MB DRAM	RAM
	IP Plus 40	c3640-is40-mz	8 MB Flash	32 MB DRAM	RAM
	IP Plus IPSec 56	c3640-is56i-mz	8 MB Flash	32 MB DRAM	RAM
	IP/FW Plus IPSec 56	c3640-ios56i-mz	8 MB Flash	32 MB DRAM	RAM
	IP/IPX/AT/DEC Plus	c3640-ds-mz	8 MB Flash	32 MB DRAM	RAM
	IP/IPX/AT/DEC/FW Plus	c3640-dos-mz	8 MB Flash	32 MB DRAM	RAM
	Enterprise Plus	c3640-js-mz	8 MB Flash	48 MB DRAM	RAM
	Enterprise Plus 40	c3640-js40-mz	8 MB Flash	48 MB DRAM	RAM
	Enterprise Plus IPSec 56	c3640-js56i-mz	8 MB Flash	48 MB DRAM	RAM
	Enterprise/FW IPSec 56	c3640-jos56i-mz	8 MB Flash	32 MB DRAM	RAM
	Enterprise/APPN Plus	c3640-ajs-mz	16 MB Flash	48 MB DRAM	RAM
	Enterprise/APPN Plus 40	c3640-ajs40-mz	16 MB Flash	48 MB DRAM	RAM
	Enterprise/APPN Plus IPSec 56	c3640-ajs56i-mz	16 MB Flash	48 MB DRAM	RAM

Hardware Supported

Cisco IOS Release 12.0(2)XD supports the Cisco 3600 series routers:

- Cisco 3620
- Cisco 3640

Table 2 Supported Interfaces on the Cisco 3600 Series

Interface, Network Module, or Data Rate	Platforms Supported	
Dial Access Network Modules	16- and 32-port Asynchronous network module	All Cisco 3600 series platforms
	6- to 30-port Integrated Digital Modems network module	All Cisco 3600 series platforms
	8- or 16-port Integrated Analog network module	All Cisco 3600 series platforms
LAN Interfaces	1- and 4-port Ethernet (AUI and 10BaseT)	All Cisco 3600 series platforms
	4/16 Mbps Token Ring	All Cisco 3600 series platforms
	Fast Ethernet (100BaseTX and 100BaseFX)	All Cisco 3600 series platforms

Table 2 Supported Interfaces on the Cisco 3600 Series (continued)

Interface, Network Module, or Data Rate	Platforms Supported	
Mixed Media Network Modules	Single port 10/100BaseTX with 1-port Channelized/PRI E1 balanced mode	All Cisco 3600 series platforms
	Single port 10/100BaseTX with 1-port Channelized/PRI E1 unbalanced mode	All Cisco 3600 series platforms
	Single port 10/100BaseTX with 1-port Channelized/PRI T1	All Cisco 3600 series platforms
	Single port 10/100BaseTX with 1-port Channelized/PRI T1 with CSU	All Cisco 3600 series platforms
	Single port 10/100BaseTX with 2-port Channelized/PRI E1 balanced mode	All Cisco 3600 series platforms
	Single port 10/100BaseTX with 2-port Channelized/PRI E1 unbalanced mode	All Cisco 3600 series platforms
	Single port 10/100BaseTX with 2-port Channelized/PRI T1	All Cisco 3600 series platforms
	Single port 10/100BaseTX with 2-port Channelized/PRI T1 with CSU	All Cisco 3600 series platforms
	1 Ethernet and 2 WAN Card Slot	All Cisco 3600 series platforms
	1 Ethernet, 1 Token Ring, and 2 WAN Card Slot	All Cisco 3600 series platforms
	2 Ethernet and 2 WAN Card Slot	All Cisco 3600 series platforms
Voice/Fax Interfaces and Network Modules¹	2-port ISDN BRI S/T TE Voice interface card	All Cisco 3600 series platforms
	1- and 2-port Voice/Fax network module	All Cisco 3600 series platforms with Voice/Fax network module
	2-port E&M Voice interface card	All Cisco 3600 series platforms
	2-port FXO Voice interface card	All Cisco 3600 series platforms with Voice/Fax network module
	2-port FXS Voice interface card	All Cisco 3600 series platforms with Voice/Fax network module
WAN Data Rates	48/56/64 kbps	All Cisco 3600 series platforms
	1.544/2.048 Mbps	All Cisco 3600 series platforms
	Up to 8 Mbps on 4-port Serial network module	All Cisco 3600 series platforms
	52 Mbps max using High Speed Serial Interface (HSSI) network module	All Cisco 3600 series platforms

Table 2 Supported Interfaces on the Cisco 3600 Series (continued)

Interface, Network Module, or Data Rate	Platforms Supported
WAN Interfaces and Network Modules²	
1- and 2-port Channelized T1 and E1 network module	All Cisco 3600 series platforms
1-port ATM-25 network modules for the Cisco 3600 series	All Cisco 3600 series platforms
1-port BRI with NT or S/T WAN interface card	All Cisco 3600 series platforms
1-Port High Speed Serial Interface network module (HSSI)	All Cisco 3600 series platforms
4- and 8-port BRI network module with NT1	All Cisco 3600 series platforms
4- and 8-port BRI network module with S/T interface	All Cisco 3600 series platforms
4- and 8-port Synchronous/Asynchronous	All Cisco 3600 series platforms
4-port Serial	All Cisco 3600 series platforms
56/64 kbps DSU/CSU	All Cisco 3600 series platforms
T1 WAN interface card for Cisco 3600, Cisco 2600, and Cisco 1600 series	All Cisco 3600 series platforms
T1 with Integrated DSU/CSU for the Cisco 3600, Cisco 2600, and Cisco 1600 series	All Cisco 3600 series platforms

1 The Voice/Fax network modules require Cisco IOS Plus feature sets.

2 The ATM-25 network modules require Cisco IOS Plus feature sets.

Determining Your Cisco IOS Software Release

To determine the version of Cisco IOS software currently running on a Cisco 3600 series router, log into the router and use the **show version EXEC** command. The following is sample output from the **show version** command. The version number is indicated on the second line as shown below:

```
Cisco Internetwork Operating System Software
IOS (tm) 3620 Software (C3620-JS-MZ), Version 12.0(2)XD, RELEASE SOFTWARE
```

Additional command output lines include more information, such as processor revision numbers, memory amounts, hardware IDs, and partition information.

Upgrading to a New Release

For generic information on upgrading to a new software release, refer to the *Cisco IOS Software Release Upgrade Paths and Packaging Simplification product bulletin* located on CCO. On CCO, follow this path:

Products & Ordering: More Information: Product Bulletins. Scroll to Software. Under Cisco IOS 11.3, click the Upgrade Paths bulletin.

The *Cisco IOS Software Release Upgrade Paths and Packaging Simplification product bulletin* does not contain information specific to Cisco IOS Release 12.0(2)XD, but provides generic upgrade information that might apply to Cisco IOS Release 12.0(2)XD.

Feature Set Tables

To determine what features are available with each feature set, see Table 3 and Table 4. The tables summarize what features you can use when running a specific feature set on a Cisco 3600 series router for Cisco IOS Release 12.0(2)XD.

Both tables use the following conventions to identify features:

- Yes—The feature is supported in the feature set.
- No—The feature is not supported in the feature set.

Note This feature set table contains only a selected list of features. This table is not a cumulative or complete list of all the features in each image.

Table 3 Feature Lists by Feature Sets for the Cisco 3600 Series, Part 1 of 2

Features	Feature Set					
	IP Plus	IP Plus 40	IP Plus IPsec 56	IP/FW Plus IPsec 56	IP/IPX/AT/DEC Plus	IP/IPX/AT/DEC/FW Plus
Connectivity						
Layer 2 Tunnel Protocol (L2TP)	Yes	Yes	Yes	Yes	Yes	Yes
RIP Enhancements	Yes	Yes	Yes	Yes	Yes	Yes
IP Routing						
Easy IP Phase 2-DHCP Server	Yes	Yes	Yes	Yes	Yes	Yes
OSPF Packet Pacing	Yes	Yes	Yes	Yes	Yes	Yes
Management						
ISDN MIB RFC 2127	Yes	Yes	Yes	Yes	Yes	Yes
Smart-init (Mars FE2P)	Yes	Yes	Yes	Yes	Yes	Yes
Quality of Service						
CLI String Search	Yes	Yes	Yes	Yes	Yes	Yes
Security						
Cisco IOS Firewall Feature Set Platform Support	No	No	No	Yes	No	Yes
Switching						
Cisco IOS STP Enhancements	Yes	Yes	Yes	Yes	Yes	Yes
Voice/Multimedia						
Voice over IP	Yes	Yes	Yes	Yes	Yes	Yes
WAN Services						
Cisco IOS IEEE 802.1Q	Yes	Yes	Yes	Yes	Yes	Yes
Mobile IP	Yes	Yes	Yes	Yes	Yes	Yes

Table 3 Feature Lists by Feature Sets for the Cisco 3600 Series, Part 1 of 2 (continued)

Features	Feature Set					
	IP Plus	IP Plus 40	IP Plus IPsec 56	IP/FW Plus IPsec 56	IP/IPX/AT/DEC Plus	IP/IPX/AT/DEC/FW Plus
PPP Over Frame Relay	Yes	Yes	Yes	Yes	Yes	Yes
Time-Based Access Lists	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 Feature Lists by Feature Sets for the Cisco 3600 Series, Part 2 of 2

Features	Feature Set						
	Enterprise Plus	Enterprise Plus 40	Enterprise Plus IPsec 56	Enterprise Plus/FW IPsec 56	Enterprise Plus APPN	Enterprise Plus APPN 40	Enterprise Plus APPN IPsec 56
Connectivity							
Layer 2 Tunnel Protocol (L2TP)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIP Enhancements	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IP Routing							
Easy IP Phase 2-DHCP Server	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OSPF Packet Pacing	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Management							
ISDN MIB RFC 2127	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Smart-init (Mars FE2P)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quality of Service							
CLI String Search	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Security							
Cisco IOS Firewall Feature Set Platform Support	No	No	No	Yes	No	No	No
Switching							
Cisco IOS STP Enhancements	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Voice/Multimedia							
Voice over IP	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WAN Services							
Cisco IOS IEEE 802.1Q	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mobile IP	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 Feature Lists by Feature Sets for the Cisco 3600 Series, Part 2 of 2 (continued)

Features	Feature Set						Enterprise/ APPN Plus IPSec 56
	Enterprise Plus	Enterprise Plus 40	Enterprise Plus IPSec 56	Enterprise/ FW IPSec 56	Enterprise/ APPN Plus	Enterprise/ APPN Plus 40	
PPP Over Frame Relay	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-Based Access Lists	Yes	Yes	Yes	Yes	Yes	Yes	Yes

New and Changed Information

This section lists new features introduced for the Cisco 3600 in Cisco IOS Release 12.0(2)XD and Cisco IOS Release 12.0(1)T. For more information about these features, refer to the cross-platform *Release Notes for Cisco IOS Release 12.0 T* located on Cisco Connection Online (CCO) and the Documentation CD-ROM, and the “Cisco IOS Software Document Set” section on page 20.

New Features in Release 12.0(2)XD

The following new features are supported by the Cisco 3600 in Cisco IOS Release 12.0(2)XD.

ISDN BRI VIC

The ISDN BRI VIC (Voice Interface Card) provides narrowband digital voice connectivity in Cisco’s VoIP (and soon, VoFR) environments. It provides a client-side (TE) ISDN S/T physical interface for connection to an NT1 terminating an ISDN telephone network. Each of its two ports can carry two voice calls (one over each ISDN B channel) for a total of four calls per ISDN BRI card.

It is another VIC which supplements the current array of VICs, but is the first digital VIC available.

New Features in Release 12.0(1)T

Cisco IOS IEEE 802.1Q Support

Cisco IOS IEEE 802.1Q provides support for IEEE 802.1Q encapsulation for Virtual LANs (VLANs). Use this feature for VLANs consisting of IEEE 802.1Q compliant switches.

Mobile IP

Mobile IP provides users the freedom to roam beyond their home subnet while consistently maintaining their home IP address. This enables transparent routing of IP datagrams to mobile users during their movement, so that data sessions can be initiated to them while they roam; it also enables sessions to be maintained in spite of physical movement between points of attachment to the Internet or other networks. Cisco’s implementation of Mobile IP is fully compliant with the Internet Engineering Task Force’s (IETF’s) proposed standard defined in Request for Comments (RFC) 2002.

Easy IP Phase 2-DHCP Server

With the introduction of Easy IP Phase 2, Cisco IOS software supports Intelligent DHCP Relay functionality. A DHCP Relay Agent is any host that forwards DHCP packets between clients and servers. A DHCP Relay Agent enables the client and server to reside on separate subnets. If the Cisco IOS DHCP server cannot satisfy a DHCP request from its own database, it can forward the DHCP request to one or more secondary DHCP servers defined by the network administrator using standard Cisco IOS IP helper-address functionality.

Smart-init (Mars FE2P)

The smart-init feature is an extension to the existing memory split program of the Cisco IOS software running on Cisco 3600 series routers. It computes iomem size by looking at the network modules installed in the system and uses this iomem for carrying out the memory split. Also, compatibility with older Cisco IOS configurations is maintained by retaining support for the **memory-size** configuration command. The user can disable smart-init and set iomem percentage to the required value by entering the **memory-size** configuration command.

OSPF Packet Pacing

The former OSPF implementation for sending update packets needed to be more efficient. Some update packets were getting lost in cases when a link was slow, a neighbor could not receive the updates fast enough, or the router was out of buffer space. For example, packets might be dropped if either of these topologies existed:

- A fast router was connected to a slower router over a point-to-point link.
- During flooding, several neighbors dumped updates to a single router at the same time.

OSPF update packets are now automatically paced by a delay of 33 milliseconds. Pacing is also added between retransmissions to increase efficiency and minimize lost retransmissions.

OSPF update and retransmission packets are sent more efficiently. Also, you can display the LSAs waiting to be sent out an interface.

Time-Based Access Lists

It is now possible to implement access lists based on the time of day. To do so, you create a time range that defines specific times of the day and week. The time range is identified by a name, and then referenced by a function, so that those time restrictions are imposed on the function itself.

Currently, IP and IPX extended access lists are the only functions that can use time ranges. The time range allows the network administrator to define when the permit or deny statements in the access list are in effect. Prior to this feature, access list statements were always in effect once they were applied. Both named or numbered access lists can reference a time range.

RIP Enhancements

Triggered extensions to IP RIP increase efficiency of RIP on point-to-point, serial interfaces.

Routers are used on connection-oriented networks to allow potential connectivity to many remote destinations. Circuits on the WAN are established on demand and are relinquished when the traffic subsides. Depending on the application, the connection between any two sites for user data could be short and relatively infrequent.

Previously, there were two problems using RIP to connect to a WAN:

- Periodic broadcasting by RIP generally prevented WAN circuits from being closed.
- Even on fixed, point-to-point links, the overhead of periodic RIP transmissions could seriously interrupt normal data transfer because of the quantity of information that hits the line every 30 seconds.

To overcome these limitations, triggered extensions to RIP cause RIP to send information on the WAN only when there has been an update to the routing database. Periodic update packets are suppressed over the interface on which this feature is enabled.

Cisco IOS Firewall Feature Set Platform Support

The Cisco IOS Firewall feature set is now available on Cisco 2600 and Cisco 3600 series products.

The Cisco IOS Firewall feature set extends the security technology currently available in Cisco IOS software to provide firewall specific capabilities:

- Context-based Access Control (CBAC)
- Java blocking
- Denial-of-service detection and prevention
- Real-time alerts and audit trails

The Cisco IOS Firewall feature set adds advanced filtering capabilities to existing security functionality in Cisco routers. Some existing Cisco IOS security features include packet filtering via access control lists (ACLs), Network Address Translation (NAT), network-layer encryption, and TACACS+ authentication.

ISDN MIB RFC2127

The new Integrated Services Digital Network (ISDN) Management Information Base (MIB) RFC2127 has been designed to provide useful information in accordance with the IETF's new standard for the management of ISDN interfaces. RFC2127 provides information on the physical Basic Rate interfaces, control and statistical information for B (bearer) and D (signaling) channels, terminal endpoints, and directory numbers.

The ISDN MIB RFC2127 controls all aspects of ISDN interfaces. It consists of five groups:

- ISDN Physical Interface Group
- B (Bearer) Channel Group
- D (Signaling) Channel Group
- Terminal Endpoint Group
- Directory Number Group (optional)

The ISDN MIB RFC2127 enables you to use any commercial SNMP network management application to support ISDN call processing in Cisco IOS software. You can integrate management of dial access products using ISDN with your existing network management systems.

Layer Two Tunneling Protocol (L2TP)

Layer Two Tunneling Protocol (L2TP) is an emerging Internet Engineering Task Force (IETF) standard that combines the best features of two existing tunneling protocols: Cisco's Layer Two Forwarding (L2F) and Microsoft's Point-to-Point Tunneling Protocol (PPTP). L2TP is an extension to the Point-to-Point Protocol (PPP), which is an important component for Access Virtual Private Networks (VPNs). Access VPNs allow mobile users to connect to their corporate intranets or extranets, thus improving flexibility and reducing costs.

Previously, traditional dial-up networking services only supported registered IP address, which limited the types of applications that could be implemented over Virtual Private Networks (VPNs). L2TP supports multiple protocols and unregistered and privately administered IP addresses over the Internet. This allows the existing access infrastructure, such as the Internet, modems, access servers, and ISDN terminal adaptors (TAs), to be used.

L2TP can be initiated wherever PPTP or L2F is currently deployed and can be operated as a client initiated tunnel, such as PPTP, or a network access server (NAS) initiated tunnel, such as L2F.

PPP Over Frame Relay

The PPP over Frame Relay feature allows a router to establish end-to-end Point-to-Point Protocol (PPP) sessions over Frame Relay. IP datagrams are transported over the PPP link using RFC 1973 compliant Frame Relay framing. This feature is useful for remote users running PPP to access their Frame Relay corporate networks.

PPP over Frame Relay provides the following benefits:

- Allows end-to-end PPP sessions over Frame Relay.
- Supports the 90i IDSL Channel Unit that supports both Frame Relay and Point-to-Point Protocol (PPP) on an ISDN DSL.

CLI String Search

The Command Line Interface (CLI) String Search feature allows you to search or filter any **show** or **more** command's output. This is useful when you need to sort through large amounts of output, or if you want to exclude output that you do not need to see. CLI String Search also allows for searching and filtering at paging prompts.

With the search function, you can begin unfiltered output at the first line that contains a regular expression you specify. You can specify a maximum of one filter per command to either include or exclude output lines that contain the specified regular expression.

A regular expression is any word, phrase, number, and so forth that appears in **show** or **more** command output.

Cisco IOS STP Enhancements

Cisco IOS Spanning Tree Protocol enhancements broaden the original Cisco IOS STP implementation with increased port identification capability, improved path cost determination, and support for a new VLAN bridge spanning-tree protocol.

Important Notes

This section contains important information about use of your Cisco IOS Release 12.0(2)XD software.

Deprecated MIBs

Older Cisco Management Information Bases (MIBs) will be replaced in a future release. OLD-CISCO-* MIBs are currently being migrated into more scalable MIBs, without affecting existing Cisco IOS products or NMS applications. Application developers should update from deprecated MIBs to the replacement MIBs as shown in the table below.

Table 5 **Deprecated MIBs**

Deprecated MIB	Replacement
OLD-CISCO-APPLETALK-MIB	RFC1243-MIB
OLD-CISCO-CHASSIS-MIB	ENTITY-MIB
OLD-CISCO-CPUK-MIB	In Development
OLD-CISCO-DECNET-MIB	
OLD-CISCO-ENV-MIB	CISCO-ENVMON-MIB
OLD-CISCO-FLASH-MIB	CISCO-FLASH-MIB
OLD-CISCO-INTERFACES-MIB	IF-MIB CISCO-QUEUE-MIB
OLD-CISCO-IP-MIB	
OLD-CISCO-MEMORY-MIB	CISCO-MEMORY-POOL-MIB
OLD-CISCO-NOVELL-MIB	NOVELL-IPX-MIB
OLD-CISCO-SYS-MIB	(Compilation of other OLD* MIBS)
OLD-CISCO-SYSTEM-MIB	CISCO-CONFIG-COPY-MIB
OLD-CISCO-TCP-MIB	CISCO-TCP-MIB
OLD-CISCO-TS-MIB	
OLD-CISCO-VINES-MIB	CISCO-VINES-MIB
OLD-CISCO-XNS-MIB	

Caveats

This section contains the open caveats for the current Cisco IOS maintenance release only. The software caveats are also located in the *Caveats for Cisco IOS Release 12.0 T* document that accompanies these release notes. The caveats document is located on CCO and the Documentation CD-ROM.

Note 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**

Open Caveats – Release 12.0(2)XD

This section describes possibly unexpected behavior by Release 12.0(2)XD. Unless otherwise noted, these caveats apply to all 12.0 releases up to and including 12.0(2)XD.

Basic System Services

- CSCdk51491
Configuring the layer3 switching with access filter in and out on the hssi interface with the Frame relay ietf encap, then try to configure the smds encap will cause the router to crash.
- CSCdk66827
When configuring a mc3810 for CCS cross-connect, it's possible that calls will stop getting connected after a period of time.

DECnet

- CSCdk65997
This problem is specific to the RSM platform and for DECnet over VLANs.
The code for DECnet support over VLANs uses a cache to store VLAN-header information, and this cache is used in the fast-switch path.
When there is a routing topology change, the fast-switching code continues to look at the stale cache entry, and as a result, packets destined via the new route end up getting black-holed.
The work-around is to disable DECnet fast-switching on the relevant interface.

IBM Connectivity

- CSCdk77166
Router running DLSw with FST/Direct/LLC2(Lite) encapsulations could crash.
Workaround for this is to use DLSw with TCP encapsulation.

Interfaces and Bridging

- CSCdj43445
FDDI PA will now have a software address filter at VIP level to filter out unwanted multicast packets. This helps performance and also unnecessary entries in netflow tables.
- CSCdk66019
If “no keepalive” (or 0 keepalive) is configured on fastethernet, the line will stay up even though the MII is removed or the cable is disconnected. If the interface is then reconfigured with “keepalive” (of non-zero value) while the physical media stayed down, the link would still indicate up. The only workaround is by doing a shut/no shut, or clear interface command.
- CSCdk74431
A large packet sent over a MLP bundle of over 2 links with VPDN on a ATM PPP tunnel on a ATM-Lite interface will be corrupted sometimes. A workaround is to disable the fastswitching on the ATM-lite interface.

IP Routing Protocols

- CSCdj88650

If ospf has both an external and a summary route to the same network and a partial spf run deletes the summary route, the external route will not be installed.

The external LSA may have the routing bit set, even if it is not installed in the routing table. This is caused by a failure to reset the external's routing bit when the summary route replaces the external route in the ip routing table. The following sequence of events illustrates the problem, given external and summary routes to network 1.0.0.0:

 1. ospf installs external route to 1.0.0.0. The external LSA for 1.0.0.0 has its routing bit set
 2. ospf installs summary route to 1.0.0.0, replacing the external route. The routing bit is not reset on the external LSA for 1.0.0.0.
 3. ospf performs a partial spf to remove the summary route to 1.0.0.0. The external route to 1.0.0.0 is not installed. To add to the confusion, the routing bit is still set on the external LSA for 1.0.0.0.

A 'clear ip route *' will force the installation of the external route. Alternatively, a 'clear ip ospf redist' at the router that originates the external route will trigger installation of the external route.
- CSCdk30085

Guaranteed service flowspec in RSVP RESV messages must contain certain fields within a certain range (as indicated by RFC 2212). This fix puts these checks in the code
- CSCdk66969

With sync and certain topologies, some bgp routes may not get advertised after peer reset. The workaround is to configure "no sync", or "clear ip bgp x.x.x.x".

ISO CLNS

- CSCdk36270

On all platforms which do not use the old mci controller, fast-switching of clns traffic with non-zero N-Selector does not work.

Miscellaneous

- CSCdi72371

When running 2523 and 2524 serial ports in asynchronous mode, modem control is only supported when using DTE style 5-in-1 cables (in order to connect to DCE devices). The DCE 5-in-1 cable (in order to connect to DTE devices) will not support modem control for the asynchronous mode. In order to support DTE devices with modem control, it is required to use the DTE style cables with a null modem adapter.
- CSCdk29115

When you configure Bisync (**encapsulation bstun**) with the ASCII character set (**bsc char-set ascii**) on the first port of a serial WIC (1T, 2T, or 2A/S) in WIC slot 0 of a Cisco 2600 series router, only the first character of each frame is received, and the BSTUN tunnel is not established. This only affects Bisync mode when it is configured with the ASCII character set. Other encapsulations are not affected, and using the EBCDIC character set with Bisync works correctly.

For the first serial port in WIC slot 0, the parity detection is not configured correctly for Bisync in ASCII mode. The first character of each frame generates a parity error that causes the receiver to discard the frame after the first character received.

Workaround: Use a different serial port: either the second serial port (port 1) on a 2T or 2A/S WIC in WIC slot 0 or any serial port in WIC slot 1. If you have only one serial WIC, moving it from WIC slot 0 to WIC slot 1 fixes this problem.

- CSCdk42816

When running Tag Switching and CEF on an Ethernet interface, it is possible for the interface to get into a state where the IP packets are not forwarded properly.

The problem occurs when a CEF entry is improperly pointing at a Tag data structure. To check whether this is the problem, do

show adjacency detail

for the next hop on the failing route. In the failure case, the packet counts on the “IP” adjacency will not be increasing, but those on the “TAG” one will.

Workaround: disable Tag switching on the interface

- CSCdk46820

When enrolling certificate with Entrust VPN, you might fail to get CA certificates. So far, this problem only happened on the Cisco 2500 platform and there is no work around. Please upgrade to the next build.

- CSCdk46853

In Release 11.2P and 11.3 when Fast Ethernet subinterfaces are configured for encryption, if the crypto map is only applied to the main interface and the IP address is configured in the subinterface, the packets could be switched in the clear. In Release 12.0, enabling CEF could cause the packets to get dropped.

- CSCdk59049

When you run TRISL to a Cisco 7000 family router, some frames larger than 1535 bytes might not be forwarded. This condition occurs when you run TRISL between two VLANs that are on switches.

Workaround: Do not use TRISL. Use an external device to router or bridge between the two different VLANs. Or modify the end devices so that they do not send packets larger than 1500 bytes.

- CSCdk59879

From enclosure: Release-note

A Cisco 1600 router or Cisco 3600 series router will reload when IPSEC is configured over the ISDN link. This condition is caused by the IP route-cache that is enabled by default on all interfaces.

The workaround is to turn off fast switching with the **no ip route-cache** command on the ISDN interfaces.

From enclosure: Release-note-2

This crash has also been seen on the 3600 platform.

- CSCdk77426

If a UDP packet with an invalid length is sent to port 514 (the “syslog” port) on an IOS device, the device is likely to crash, possibly without saving a stack trace. Such packets are sent by the popular “nmap” port scanning program.

Wide-Area Networking

- CSCdk70026

StatusMsg with endpointRef is not processed in multipoint state table. This could result in releasing multipoint vc.

Resolved Caveats – Release 12.0 T

All the caveats listed in this section are resolved in release 12.0(2)T.

IP Routing Protocols

- CSCdk37843

workaround:

The workaround is to configure "router rip" on the router first, before configuring the address on the interface.

Miscellaneous

- CSCdk38476

RADIUS accounting does not work if you have separate authentication and accounting servers.

- CSCdk41902

An IP client might not be able to ping the Route Switch Module (RSM). This situation might occur during Token-Ring Virtual LAN (TR VLAN) configuration on the RSM. It is most common when the IP client sends an address resolution protocol (ARP) without a routing information field (RIF), then sends an ARP with a RIF. The situation might also occur if the concentrator relay function (CRF), to which the client is connected, is configured for source-route bridging (SRB). Workaround: Change the CRF mode from SRB to source-route transparent (SRT) bridging.

Novell IPX, XNS, and Apollo Domain

- CSCdk52372

The Internetwork Packet Exchange (IPX) input process might run out of stack, causing a system reload or reduced performance. There is no workaround.

Related Documentation

The following sections describe the documentation available for the Cisco 3600 series routers. Typically, these documents consist of hardware installation guides, software installation guides, Cisco IOS configuration and command references, system error messages, and feature modules, which are updates to Cisco IOS documentation. Documentation is available as printed manuals or electronic documents, except for feature modules, which are available online only.

The most up-to-date documentation can be found on the Web via Cisco Connection Online (CCO) and the Documentation CD-ROM. These electronic documents might contain updates and modifications made after the hard copy documents were printed.

These release notes should be used in conjunction with the documents listed in the following sections:

- Release-Specific Documents, page 17
- Feature Modules, page 18
- Platform-Specific Documents, page 18
- Cisco IOS Software Document Set, page 20

Release-Specific Documents

The following documents are specific to Release 12.0 T, on which Release 12.0(2)XD is based. They are located on CCO and the Documentation CD-ROM:

- *Release Notes for Cisco IOS Release 12.0 T*

To reach the cross-platform *Release Notes for Cisco IOS Release 12.0 T* on CCO, follow this path:

Software & Support: Cisco Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0: Release Notes: Cross-Platform Release Notes for Cisco IOS Release 12.0 T

To reach the cross-platform *Release Notes for Cisco IOS Release 12.0* on the Documentation CD-ROM, follow this path:

Cisco IOS Software Configuration: Cisco IOS Release 12.0: Release Notes: Cross-Platform Release Notes for Cisco IOS Release 12.0 T

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

To reach these documents, refer to the Software Center at this path on CCO:

Software & Support: Software Center: Cisco IOS Software

- Caveat documents

As a supplement to the caveats listed in the “Caveats” section in these release notes, see the *Caveats for Cisco IOS Release 12.0 T* document, which contains caveats applicable to all platforms for all maintenance releases of Release 12.0 T.

To reach the caveat document on CCO, follow this path:

Products & Ordering: Cisco Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0: Caveats: Caveats for Cisco IOS Release 12.0 T

To reach the caveat document on the Documentation CD-ROM, follow this path:

Cisco Product Documentation: Cisco IOS Software Configuration: Cisco IOS 12.0: Caveats: Caveats for Cisco IOS Release 12.0 T

Note 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 can be found at <http://www.cisco.com/support/bugtools>, or from CCO, select **Software & Support: Tools: Bug Toolkit II**.

Feature Modules

Feature modules describe new features supported by Release 12.0 T and are an update to the Cisco IOS documentation set. They consist of a brief overview of the feature, benefits, configuration tasks, and a command reference. As updates, the features modules are available online only. The feature module information is included in the next printing of the Cisco IOS documentation set.

To reach the feature modules on CCO, follow this path:

Products & Ordering: Cisco Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0: New Feature Documentation: New Features in Release 12.0 T

To reach the feature modules on the Documentation CD-ROM, follow this path:

Cisco Product Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0: New Feature Documentation: New Features in Release 12.0 T

Platform-Specific Documents

The documents listed in Table 6 are available for the Cisco 3600 series routers. These documents are also available online at Cisco Connection Online (CCO) and on the Documentation CD-ROM.

To reach Cisco 3600 series documentation on CCO, follow this path:

Products & Ordering: Cisco Documentation: Access Servers and Access Routers: Modular Access Routers: Cisco 3600 Series Routers

To reach Cisco 3600 series documentation on the Documentation CD-ROM, follow this path:

Access Servers and Access Routers: Modular Access Routers: Cisco 3600 Series Routers

Table 6 Platform Documents for the Cisco 3600 Series

Book	Chapter Topics
<i>Cisco 3620 Router Installation and Configuration Guide</i>	About This Guide Overview of the Cisco 3620 Router Preparing to Install the Router Installing the Router Configuring the Software Maintaining the Router Troubleshooting Cable Specifications ROM Monitor Virtual Configuration Register

Table 6 Platform Documents for the Cisco 3600 Series (continued)

Book	Chapter Topics
Cisco 3640 Router Installation and Configuration Guide	<ul style="list-style-type: none"> About This Guide Overview of the Cisco 3640 Router Preparing to Install the Router Installing the Router Configuring the Software Maintaining the Router Troubleshooting Cable Specifications ROM Monitor Virtual Configuration Register
Network Module Hardware Installation Guide	<ul style="list-style-type: none"> About This Guide Overview of Cisco Network Modules Preparing to Install Network Modules Installing a Network Module Connecting Ethernet Network Modules Connecting Serial Network Modules Connecting ISDN BRI Network Modules Connecting ISDN PRI Network Modules Connecting Voice Network Modules Connecting Digital Modem Network Modules Connecting an ATM Network Module Connecting HSSI Network Modules Connecting a Compression Network Module FCC Class B Compliance
Update to Network Module Hardware Installation Guide	
WAN Interface Cards Hardware Installation Guide	<ul style="list-style-type: none"> About This Guide Overview of Cisco WAN Interface Cards Installing a WAN Interface Card in Cisco Modular Routers Connecting Cisco WAN Interface Cards to a Network Configuring WAN Interface Cards
Update to WAN Interface Cards Hardware Installation Guide	
Cisco 3600 Series Configuration Notes	<ul style="list-style-type: none"> 1-Port Fast Ethernet (FX) Network Module Configuration Note 4-Port Serial Network Module Configuration Note Cisco 3600 Series Modem Portware Upgrade Configuration Note Voice Network Module and Voice Interface Card Config Note Voice over IP Quick Start Guide Installing and Configuring Flash Memory Cards Cisco 3600 Series Memory Upgrade Configuration Note Cisco 3600 and RPS Rack-Mount and Wall-Mount Config Note Cisco 3600 Series Power Supply Configuration Note Installing the Cisco RPS Adapter Plate in Cisco 3620 Routers Installing the Cisco RPS Adapter Plate in Cisco 3640 Routers Installing Cisco 3600 Series NEBS Level 3 Compliance Kits
Regulatory Compliance and Safety Information for the Cisco 3600 Series	<ul style="list-style-type: none"> ISDN Safety and Compliance Conditions Serial WAN Interface Card Independent of Host Operating Conditions for Canada Operating Conditions for the United Kingdom Operating Conditions for the European Community Agency Approvals Safety Information

Cisco IOS Software Document Set

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

Documentation Modules and Indexes

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, and Cisco IOS software functionality and contain comprehensive configuration examples. Chapters in a command reference provide complete command syntax information. Each configuration guide can be used in conjunction with its corresponding command reference.

On CCO and the Documentation CD-ROM, two master hot-linked indexes provide indexing information for the Cisco IOS software documentation set: an index for the configuration guides and an index for the command references. In addition, individual books contain a book-specific index.

To reach these indexes on CCO, follow this path:

Products & Ordering: Cisco Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0: Cisco IOS Release 12.0 Configuration Guides and Command References: Configuration Guide Master Index or Command Reference Master Index

To reach these indexes on the Documentation CD-ROM, follow this path:

Cisco IOS Software Configuration: Cisco IOS Release 12.0: Cisco IOS Release 12.0 Configuration Guides and Command References: Configuration Guide Master Index or Command Reference Master Index

To reach documentation related to an index entry, click on the page number following the entry.

Release 12.0 Documentation Set

Table 7 details the contents of the Cisco IOS Release 12.0 software documentation set. The document set is available in electronic form, and also in printed form upon request.

Note The most current Cisco IOS documentation can be found on the latest Documentation CD-ROM and on the Web. These electronic documents might contain updates and modifications made after the paper documents were printed.

To reach the Cisco IOS documentation set on CCO, follow this path:

Products & Ordering: Cisco Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0

To reach the Cisco IOS documentation set on the Documentation CD-ROM, follow this path:

Cisco IOS Software Configuration: Cisco IOS Release 12.0

Table 7 Cisco IOS Software Documentation Set for Release 12.0

Books	Chapter Topics
<ul style="list-style-type: none"> • <i>Configuration Fundamentals Configuration Guide</i> • <i>Configuration Fundamentals Command Reference</i> 	Configuration Fundamentals Overview Cisco IOS User Interfaces File Management System Management
<ul style="list-style-type: none"> • <i>Bridging and IBM Networking Configuration Guide</i> • <i>Bridging and IBM Networking Command Reference</i> 	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 NCIA Client/Server Topologies Cisco Mainframe Channel Connection Airline Product Set
<ul style="list-style-type: none"> • <i>Dial Solutions Configuration Guide</i> • <i>Dial Solutions Command Reference</i> 	Dial-In Port Setup Dial-In Terminal Services Dial-on-Demand Routing (DDR) Dial Backup Dial-Out Modem Pooling Large-Scale Dial Solutions Cost-Control Solutions ISDN X.25 over ISDN VPDN Dial Business Solutions and Examples
<ul style="list-style-type: none"> • <i>Cisco IOS Interface Configuration Guide</i> • <i>Cisco IOS Interface Command Reference</i> 	Interface Configuration Overview
<ul style="list-style-type: none"> • <i>Network Protocols Configuration Guide, Part 1</i> • <i>Network Protocols Command Reference, Part 1</i> 	IP Addressing IP Services IP Routing Protocols
<ul style="list-style-type: none"> • <i>Network Protocols Configuration Guide, Part 2</i> • <i>Network Protocols Command Reference, Part 2</i> 	AppleTalk Novell IPX
<ul style="list-style-type: none"> • <i>Network Protocols Configuration Guide, Part 3</i> • <i>Network Protocols Command Reference, Part 3</i> 	Apollo Domain Banyan VINES DECnet ISO CLNS XNS
<ul style="list-style-type: none"> • <i>Security Configuration Guide</i> • <i>Security Command Reference</i> 	AAA Security Services Security Server Protocols Traffic Filtering and Firewalls IP Security and Encryption Passwords and Privileges Neighbor Router Authentication IP Security Options

Table 7 Cisco IOS Software Documentation Set for Release 12.0 (continued)

Books	Chapter Topics
<ul style="list-style-type: none"> • <i>Cisco IOS Switching Services Configuration Guide</i> • <i>Cisco IOS Switching Services Command Reference</i> 	Switching Paths for IP Networks Virtual LAN (VLAN) Switching and Routing
<ul style="list-style-type: none"> • <i>Wide-Area Networking Configuration Guide</i> • <i>Wide-Area Networking Command Reference</i> 	ATM Frame Relay SMDS X.25 and LAPB
<ul style="list-style-type: none"> • <i>Voice, Video, and Home Applications Configuration Guide</i> • <i>Voice, Video, and Home Applications Command Reference</i> 	Voice over IP Voice over Frame Relay Voice over ATM Voice over HDLC Video Support Universal Broadband Features
<ul style="list-style-type: none"> • <i>Quality of Service Solutions Configuration Guide</i>¹ • <i>Quality of Service Solutions Command Reference</i>¹ 	Classification Scheduling Packet Drop Traffic Shaping ATM QoS SNA QoS Line Protocols
<ul style="list-style-type: none"> • <i>Cisco IOS Software Command Summary</i> • <i>Dial Solutions Quick Configuration Guide</i> • <i>System Error Messages</i> • <i>Debug Command Reference</i> 	

¹ This book will not be available until January 1999.

Service and Support

For service and support for a product purchased from a reseller, contact the reseller. Resellers offer a wide variety of Cisco service and support programs, which are described in the section “Service and Support” in the information packet that 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 TAC Home Page

For helpful tips on configuring Cisco products, follow this path on CCO:

Software & Support: Technical Tips (button on left margin)

“Hot Tips” are popular tips and hints gathered from Cisco's Technical Assistance Center (TAC). Most of these documents are also available from the TAC's Fax-on-Demand service. To reach Fax-on-Demand and receive documents at your fax machine, call 888-50-CISCO (888-502-4726). From international areas, call 650-596-4408.

The following sections are provided from the Technical Tips page:

- **Field Notices**—Designed to provide notification of critical issues regarding Cisco products. These include problem descriptions, safety or security issues, and hardware defects.
- **Hardware**—Technical Tips related to specific hardware platforms.
- **Internetworking Features**—Tips on using and deploying Cisco IOS software features and services.
- **Sample Configurations**—Actual configuration examples complete with topology and annotations.
- **Software Products**—MultiNet & Cisco Suite 100, Network Management, Cisco IOS Software Bulletins, CiscoPro Configurations.
- **Special Collections**—Other Helpful Documents: Frequently Asked Questions, Security Advisories, References & RFCs, Case Studies, CiscoPro Documentation CD-ROM.

Cisco Connection Online

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

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

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

You can 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 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 reach 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 documents mentioned in the "Related Documentation" section on page 17.

AccessPath, Any to Any, AtmDirector, the CCIE logo, CD-PAC, Centri, the Cisco Capital logo, *CiscoLink*, the Cisco Management Connection logo, the Cisco NetWorks logo, the Cisco Powered Network logo, the Cisco Press logo, the Cisco Technologies logo, ClickStart, ControlStream, DAGAZ, Fast Step, FireRunner, IGX, IOS, JumpStart, Kernel Proxy, LoopRunner, MGX, Natural Network Viewer, NetRanger, NetRanger Director, NetRanger Sensor, NetSonar, *Packet*, PIX, Point and Click Internetworking, Policy Builder, Precept, RouteStream, Secure Script, SMARTnet, SpeedRunner, Stratum, StreamView, *The Cell*, TrafficDirector, TransPath, ViewRunner, VirtualStream, VlanDirector, Workgroup Director, and Workgroup Stack are trademarks; Changing the Way We Work, Live, Play, and Learn, Empowering the Internet Generation, The Internet Economy, and The New Internet Economy are service marks; and BPX, Catalyst, Cisco, Cisco IOS, the Cisco IOS logo, Cisco Systems, the Cisco Systems logo, Enterprise/Solver, EtherChannel, FastHub, ForeSight, FragmentFree, IP/TV, IPX, LightStream, LightSwitch, MICA, Phase/IP, StrataSphere, StrataView Plus, and SwitchProbe are registered trademarks of Cisco Systems, Inc. in the U.S. and certain other countries. All other trademarks mentioned in this document are the property of their respective owners. (9811R)

Copyright © 1998, Cisco Systems, Inc.
All rights reserved.