



# Release Notes for Cisco IOS Release 12.0 SZ

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**December 23, 2002**

**Cisco IOS Release 12.0(23)SZ**

**Text Part Number** OL-2858-02

These release notes for the Cisco 12000 Series Internet Routers support Cisco IOS Release 12.0 SZ. These release notes describe new features, memory requirements, hardware support, software platforms, and related documents.

Cisco IOS Release 12.0 SZ is based on Cisco IOS Release 12.0(23)S1 and is tailored for service provider environments. Cisco IOS Release 12.0 S is the follow-on release to Cisco IOS Release 11.1 CC, which was also targeted to the service provider environment. Additionally, many of the features in Cisco IOS Release 12.0 S were first introduced for the Cisco 12000 Series Internet Routers on Cisco IOS Release 11.2 GS.

For a list of the software caveats that apply to Cisco IOS Release 12.0 S, see the [Caveats for Cisco IOS Release 12.0](#) document. The caveats document is updated for every maintenance release and is located on [Cisco.com](#) and the Documentation CD-ROM.

Use these release notes in conjunction with the [Release Notes for Cisco IOS Release 12.0](#) located on [Cisco.com](#) and the Documentation CD-ROM.

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# Introduction

Cisco IOS Release 12.0(5)S was the first public release of this software. Many of the features and hardware support in this software have previously been released to customers on other software releases.

For information on new features and Cisco IOS commands supported by Release 12.0 SZ, see the [“New and Changed Information”](#) section on page 15 and the [“Related Documentation”](#) section on page 20.

## System Requirements

This section describes the system requirements for Cisco IOS Release 12.0 SZ and includes the following sections:

- [Memory Requirements, page 2](#)
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- [Determining Your Software Release, page 3](#)
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## Memory Requirements

[Table 1](#) lists the memory requirements for the platforms supported in Cisco IOS Release 12.0(21) SZ.

**Table 1** *Memory Requirements for the Cisco 12000 Series Internet Routers*

Feature Set by Router	Image Name	Required Flash Memory	Required RP DRAM Memory	Runs from
Service Provider	gsr-p-mz	20 MB	128 MB	RAM
Service Provider/ Secured Shell 56	gsr-k3p-mz	20 MB	128 MB	RAM
Service Provider/ Secured Shell 3DES	gsr-k4p-mz	20 MB	128 MB	RAM



### Note

To obtain this software release you must contact Bala Nagesh (bnagesh@cisco.com), Product Manager, IPSBU - Product Marketing.

## Hardware Supported

Cisco IOS Release 12.0 SZ supports the following platforms:

- Cisco 12000 Series Internet Routers (including the Cisco 12008, 12012, 12016, 12404, 12406, 12410, and 12416)

The Cisco 12016 Internet Router is supported in Cisco IOS Release 12.0(8)S and later releases. The Cisco 12410 Internet Router is supported in Cisco IOS Release 12.0(16)S and later releases. The Cisco 12404 Internet Router is supported in Cisco IOS Release 12.0(21)S and later releases.

For detailed descriptions of the new hardware features, see the “[New and Changed Information](#)” section on page 15.

## Determining Your Software Release

To determine the version of Cisco IOS software running on your Cisco router, log in to the router and enter the **show version EXEC** command:

```
Cisco Internetwork Operating System Software
IOS (tm) 12000 Software (C12000-P-M), Version 12.0(21)SZ, RELEASE SOFTWARE
```

## Upgrading to a New Software Release

For general information about upgrading to a new software release, see the *Software Installation and Upgrade Procedure* located at the following URL:

[http://www.cisco.com/warp/public/130/sw\\_upgrade\\_proc\\_ram.shtml](http://www.cisco.com/warp/public/130/sw_upgrade_proc_ram.shtml)

## Feature Set Table

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.



**Caution**

Cisco IOS images with strong encryption (including, but not limited to, 128-bit Triple Data Encryption Standard [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 are likely to require an export license. Customer orders may be denied or subject to delay because of United States government regulations. When applicable, purchaser and user must obtain local import and use authorizations for all encryption strengths. Please contact your sales representative or distributor for more information, or send an e-mail to [export@cisco.com](mailto:export@cisco.com).

**Table 2** lists the features and feature sets supported by the Cisco 12000 Series Internet Routers in Cisco IOS Release 12.0 SZ and uses the following conventions:

- Yes—The feature is supported in the software image.
- No—The feature is not supported in the software image.
- In—The number in the “In” column indicates the Cisco IOS 12.0 S release in which the feature was introduced. For example, (7) means a feature was introduced in Cisco IOS Release 12.0(7)S. If a cell in this column is empty, the feature was included in the initial base release.

**Note**

This table might not be cumulative or list all the features in each image. The parent release for Cisco IOS Release 12.0 S is Cisco IOS Release 12.0. To find information about inherited features, refer to Cisco.com or Feature Navigator. For Cisco.com, go to <http://www.cisco.com/univercd/home/home.htm>, select the appropriate software release under Cisco IOS Software, and click Release Notes. If you have a Cisco.com login account, you can use the Feature Navigator tool at <http://www.cisco.com/go/fn>.

**Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers**

Features	In	Software Images by Feature Sets			
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES	
1OC-12/STM-4 SRP Line Card	(6)	Yes	Yes	Yes	
1OC-48/STM-16 SRP Line Card	(11)	Yes	Yes	Yes	
1-Port 10-Gigabit Ethernet Line Card	(23)	Yes	Yes	Yes	
1-Port OC-48/STM-16 IP Services Engine Line Cards	(21)	Yes	Yes	Yes	
2 x 32-Bit Counters	(10)	Yes	Yes	Yes	
2xCHOC-3/STM1-DS1/E1 Line Card	(17)	Yes	Yes	Yes	
3-Port Gigabit Ethernet Line Card	(11)	Yes	Yes	Yes	
3-Port Gigabit Ethernet Line Card Enhancements	MPLS VPN Bundled in EoMPLS Microcode	(23)	Yes	Yes	Yes
	MPLS VPN Carrier Supporting Carrier	(23)	Yes	Yes	Yes
	MPLS VPN Interautonomous System	(23)	Yes	Yes	Yes
	MPLS VPN—VRF Selection Based on Source IP Address	(23)	Yes	Yes	Yes
	Support for the CWDM GBIC Solution	(23)	Yes	Yes	Yes
	Unicast Reverse Path Forwarding Bundled in Sampled NetFlow Microcode	(23)	Yes	Yes	Yes
3-Port Gigabit Ethernet Line Card MPLS-VPN Features	(22)	Yes	Yes	Yes	
4OC-48c/STM-16c DPT Line Card	(23)	Yes	Yes	Yes	
6DS3-SMB Line Card	(6)	Yes	Yes	Yes	
6E3-SMB and 12E3-SMB Line Cards	(15)	Yes	Yes	Yes	
6-Port Channelized T3-SMB Line Card	(13)	Yes	Yes	Yes	
8-Port Fast Ethernet Line Card	(6)	Yes	Yes	Yes	

**Table 2** Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)

Features		In	Software Images by Feature Sets		
			Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES
8-Port OC-3 STM-1 ATM Line Card Enhancements	128 ACLs	(23)	Yes	Yes	Yes
	ATM Cell Loss Priority Setting	(23)	Yes	Yes	Yes
	ATM VC Bundle Management	(23)	Yes	Yes	Yes
	MPLS VPN Carrier Supporting Carrier	(23)	Yes	Yes	Yes
	MPLS VPN Interautonomous System	(23)	Yes	Yes	Yes
8-Port OC-3 STM-1 ATM Line Card for Cisco 12000 Series Internet Routers		(22)	Yes	Yes	Yes
8xOC-3 POS or 16xOC-3 POS Line Card		(10)	Yes	Yes	Yes
10 Gbps POS Enhanced Services Line Cards		(22)	Yes	Yes	Yes
10-Port 1-Gigabit Ethernet Line Card Enhancements		(21)	Yes	Yes	Yes
10-Port 1-Gigabit Ethernet Line Card for Cisco 12000 Series Internet Routers		(19)	Yes	Yes	Yes
64-Bit SNMP Counters		(17)	Yes	Yes	Yes
448 ACL Support on the 3-Port Gigabit Ethernet Line Card		(15)	Yes	Yes	Yes
Access List Performance Improvements for Cisco 12000 Series Internet Routers		(10)	Yes	Yes	Yes
ACL Table Optimization for Engine 2 Line Cards		(21)	Yes	Yes	Yes
Any Transport over MPLS: ATM AAL5 over MPLS		(22)	Yes	Yes	Yes
Any Transport over MPLS: Ethernet over MPLS in Cisco 12000 Series Internet Routers		(22)	Yes	Yes	Yes
APS Reflector Mode		(8)	Yes	Yes	Yes
ARP Optimization		(22)	Yes	Yes	Yes
ATM OAM Emulation		(23)	Yes	Yes	Yes
ATM OAM Ping		(21)	Yes	Yes	Yes
ATM OAM Traffic Reduction		(23)	Yes	Yes	Yes
ATM PVC Trap Support		(5)	Yes	Yes	Yes
Automatic Protection Switching on 2-Port Channelized OC-3/STM-1 (DS1/E1) Line Cards		(22)	Yes	Yes	Yes
BGP 4 MIB Support for per-Peer Received Routes		(21)	Yes	Yes	Yes
BGP Conditional Route Injection		(22)	Yes	Yes	Yes
BGP Convergence Optimization		(22)	Yes	Yes	Yes
BGP Hybrid CLI		(22)	Yes	Yes	Yes
BGP Increased Support of Numbered AS-Path Access Lists to 500		(22)	Yes	Yes	Yes

Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)

Features	In	Software Images by Feature Sets			
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES	
BGP Next Hop Propagation	(22)	Yes	Yes	Yes	
BGP Policy Accounting	BGP Policy Accounting	(9)	Yes	Yes	Yes
	BGP Policy Accounting on 3-Port Gigabit Ethernet Line Cards	(14)	Yes	Yes	Yes
	BGP Policy Accounting on 3-Port Gigabit Ethernet Line Cards per VLAN Support	(22)	Yes	Yes	Yes
	BGP Policy Accounting on Engine 2	(13)	Yes	Yes	Yes
	BGP Policy Accounting on Engine 4 Plus Line Cards	(22)	Yes	Yes	Yes
	BGP Policy Accounting Output Interface Accounting	(22)	Yes	Yes	Yes
BGP Prefix-Based Outbound Route Filtering	(22)	Yes	Yes	Yes	
BGP Route-Map Policy List Support	(22)	Yes	Yes	Yes	
BGP Restart Session After Max-Prefix Limit	(22)	Yes	Yes	Yes	
Bit Error Rate Testing for 2-Port Channelized OC-3/STM-1 Line Cards	(17)	Yes	Yes	Yes	
Bit Error Rate Testing for 4-Port Channelized OC-12/STM-4 Line Cards	(21)	Yes	Yes	Yes	
Bit Error Rate Testing for 6-Port Channelized T3 Line Cards	(14)	Yes	Yes	Yes	
Bit Error Rate Testing Enhancements for 6-Port Channelized T3 Line Cards	(21)	Yes	Yes	Yes	
Cisco 12000 Series Field Diagnostics	(22)	Yes	Yes	Yes	
Cisco 12016 Internet Router	(8)	Yes	Yes	Yes	
Cisco 12404 Internet Router	(21)	Yes	Yes	Yes	
Cisco 12406 Internet Router	(17)	Yes	Yes	Yes	
Cisco 12410 Internet Router	(16)	Yes	Yes	Yes	
Cisco 12416 Internet Router	(15)	Yes	Yes	Yes	
CISCO-APS-MIB	(22)	Yes	Yes	Yes	
CISCO-ENHANCED-WRED-MIB	(22)	Yes	Yes	Yes	
Cisco IOS Event Tracer	(18)	Yes	Yes	Yes	
Cisco Nonstop Forwarding with Stateful Switchover	Cisco Nonstop Forwarding	(22)	Yes <sup>1</sup>	Yes <sup>1</sup>	Yes <sup>1</sup>
	Stateful Switchover	(22)	Yes <sup>1</sup>	Yes <sup>1</sup>	Yes <sup>1</sup>
	SNMP for Stateful Switchover	(22)	Yes <sup>1</sup>	Yes <sup>1</sup>	Yes <sup>1</sup>
Cisco Nonstop Forwarding with Stateful Switchover on the Cisco 12000 Series Performance Route Processor and the Cisco 12000 Series 1-Port and 3-Port Gigabit Ethernet Line Cards	(23)	Yes	Yes	Yes	

**Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)**

Features	In	Software Images by Feature Sets		
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES
CISCO-OPTICAL-MONITORING-MIB	(22)	Yes	Yes	Yes
Cisco Optical Regenerator	(10)	Yes	Yes	Yes
clear context Command	(17)	Yes	Yes	Yes
CLI String Search	(5)	Yes	Yes	Yes
CNS Configuration Agent	(22)	Yes	Yes	Yes
CNS Event Agent	(22)	Yes	Yes	Yes
Diff-Serv-Aware Traffic Engineering (DS-TE) for the Cisco 12000 Series Internet Routers	(22)	Yes	Yes	Yes
Distributed Traffic Shaping on POS Engine 2 Line Cards	(16)	Yes	Yes	Yes
Eight Queues Per Slot in Engine 3 Line Cards	(23)SZ	Yes		
Engine 4 POS Line Card Enhancements	(21)	Yes	Yes	Yes
Enhanced EIGRP Stub Routing	(15)	Yes	Yes	Yes
Enhanced Memory Pool MIB	(21)	Yes	Yes	Yes
Enhanced OC-48c/STM-16c Layer 3 Packet-over-SONET Line Card	(7)	Yes	Yes	Yes
Enhanced Password Security, Phase I	(18)	Yes	Yes	Yes
Enhanced Quad OC-12c/STM-4c Layer 3 Packet-over-SONET Line Card	(8)	Yes	Yes	Yes
Entity FRU Control MIB	(21)	Yes	Yes	Yes
Event MIB	(12)	Yes	Yes	Yes
Explicit Null	(22)	Yes	Yes	Yes
Explicit Tracking of Hosts, Groups, and Channels for IGMP Version 3	(19)	Yes	Yes	Yes
Extended ACLs on PSA	(14)	Yes	Yes	Yes
Extended Ethernet Frame Size Support	(10)	Yes	Yes	Yes
Frame Relay Extended Addressing	(17)	Yes	Yes	Yes
Frame Relay Switching Diagnostics and Troubleshooting	(12)	Yes	Yes	Yes
Frame Relay Switching on Engine 2	(11)	Yes	Yes	Yes
Frame Relay Traffic Policing	(17)	Yes	Yes	Yes
FRF2.1 Annex 1	(14)	Yes	Yes	Yes
Gigabit Ethernet Line Card	(5)	Yes	Yes	Yes
GRE Tunneling	(21)	Yes	Yes	Yes
GRP Redundant Processor Support	(5)	Yes	Yes	Yes
Hot Standby Router Protocol MIB	(12)	Yes	Yes	Yes
HSRP Support for MPLS VPNs	(22)	Yes	Yes	Yes
ICMP and PIRC Support on 3-Port Gigabit Ethernet Line Cards	(15)	Yes	Yes	Yes

Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)

Features	In	Software Images by Feature Sets			
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES	
ICMP Rate Limiting on Engine 2 POS Line Cards	(14)	Yes	Yes	Yes	
IF-MIB Enhancements	(21)	Yes	Yes	Yes	
ifIndex Persistence	(11)	Yes	Yes	Yes	
Individual SNMP Trap Support	(21)	Yes	Yes	Yes	
IP Event Dampening	(22)	Yes	Yes	Yes	
IP Options Selective Drop	(23)	Yes	Yes	Yes	
IP Packet Marking	(13)	Yes	Yes	Yes	
ip pim sparse-mode-register Command	(18)	Yes	Yes	Yes	
IP QoS for 3-Port Gigabit Ethernet Line Cards	(15)	Yes	Yes	Yes	
IP Receive ACL	(22)	Yes	Yes	Yes	
IP Services Engine Line Cards for the Cisco 12000 Series Internet Routers	(19)	Yes	Yes	Yes	
IP Services Engine Line Card Enhancements (1)	(21)	Yes	Yes	Yes	
IP Service Engine Line Card Enhancements (2)	ATM AAL5 over MPLS on Cisco 12000 Series ISE Line Cards	(23)	Yes	Yes	Yes
	Access Control Entry (ACE) Counters	(23)	Yes	Yes	Yes
	BGP Policy Accounting	(23)	Yes	Yes	Yes
	IP and MPLS Subinterface Counters	(23)	Yes	Yes	Yes
	IPv6 Hardware Forwarding	(23)	Yes	Yes	Yes
	Modular Quality of Service Command-Line Interface (MQC) MIB Support	(23)	Yes	Yes	Yes
	Modular Quality of Service Command-Line Interface (MQC) to Configure QoS on Frame Relay Subinterfaces	(23)	Yes	Yes	Yes
	MPLS Traffic Engineering (TE)—Automatic Bandwidth Adjustment for (TE) Tunnels	(23)	Yes	Yes	Yes
	MPLS Traffic Engineering (TE)—Diff-Serv-Aware	(23)	Yes	Yes	Yes
	Policy-Based Routing	(23)	Yes	Yes	Yes
Route Processor Redundancy Plus	(23)	Yes	Yes	Yes	
IP Source Tracker	(21)	Yes	Yes	Yes	

**Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)**

Features		In	Software Images by Feature Sets		
			Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES
IPv6	CEFv6/dCEFv6—Cisco Express Forwarding	(22)	Yes	Yes	Yes
	IPv6 for Cisco IOS Software	(22)	Yes	Yes	Yes
	CEFv6/dCEFv6—Cisco Express Forwarding	(22)	Yes	Yes	Yes
	IPv6 Provider Edge Router over MPLS	(22)	Yes	Yes	Yes
	IPv6 RIP Enhancements	(22)	Yes	Yes	Yes
	Secure Shell (SSH) over an IPv6 Transport	(22)	Yes	Yes	Yes
IPv6 Extended Access Control Lists		(23)	Yes	Yes	Yes
IPv6 on Additional Cisco 12000 Series Line Cards		(23)	Yes	Yes	Yes
IS-IS HMAC-MD5 Authentication		(22)	Yes	Yes	Yes
Label-Controlled ATM Interface (LC-ATM)		(22)	Yes	Yes	Yes
Layer 2 Tunneling Protocol Version 3		(23)	Yes	Yes	Yes
Link Bundling		(23)	Yes	Yes	Yes
Load Balancing Enhancements with CEF for Engine 4+ Line Cards		(23)SZ	Yes		
Manual IPv6 Tunnels		(23)	Yes	Yes	Yes
Modular Gigabit Ethernet Line Card		(23)	Yes	Yes	Yes
Modular Quality of Service Command-Line Interface		(15)	Yes	Yes	Yes
MPLS Egress NetFlow Accounting		(22)	Yes	Yes	Yes
MPLS Enhancements to the Interfaces MIB		(23)	Yes	Yes	Yes
MPLS Interface MIB Enhancements		(17)	Yes	Yes	Yes
MPLS Label Distribution Protocol (LDP)	MPLS Label Distribution Protocol (LDP)	(22)	Yes	Yes	Yes
	MPLS Label Distribution Protocol (LDP) MIB	(22)	Yes	Yes	Yes
	MPLS LDP—MIB Traps	(22)	Yes	Yes	Yes
MPLS Label Switching Router MIB		(22)	Yes	Yes	Yes
MPLS Multiprotocol Label Switching		(22)	Yes	Yes	Yes
MPLS Quality of Service (QoS)	MPLS Quality of Service (QoS)	(22)	Yes	Yes	Yes
	MPLS Quality of Service Enhancements	(22)	Yes	Yes	Yes
MPLS Scalability Enhancements for the LSC and ATM LSR		(22)	Yes	Yes	Yes
MPLS Static Labels		(23)	Yes	Yes	Yes

Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)

Features	In	Software Images by Feature Sets			
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES	
MPLS Support on Dynamic Packet Transport (DPT)	(22)	Yes	Yes	Yes	
MPLS Switching Support for Gigabit Ethernet	(7)	Yes	Yes	Yes	
MPLS Traceroute	(22)	Yes	Yes	Yes	
MPLS Traffic Engineering (TE)	MPLS Traffic Engineering	(5)	Yes	Yes	Yes
	MPLS Traffic Engineering and Enhancements	(22)	Yes	Yes	Yes
	MPLS Traffic Engineering (TE)—Automatic Bandwidth Adjustment for (TE) Tunnels	(22)	Yes	Yes	Yes
	MPLS Traffic Engineering (TE)—Configurable Path Calculation Metric for Tunnels	(22)	Yes	Yes	Yes
	MPLS Traffic Engineering (TE)—Fast Reroute (FRR) Node Protection, with RSVP Hellos Support	(22)	Yes	Yes	Yes
	MPLS Traffic Engineering (TE)—Interarea Tunnels	(22)	Yes	Yes	Yes
	MPLS Traffic Engineering IP Explicit Address Exclusion	(14)	Yes	Yes	Yes
	MPLS Traffic Engineering MIB	(17)	Yes	Yes	Yes
	MPLS Traffic Engineering MIB Traps	(17)	Yes	Yes	Yes
	MPLS Traffic Engineering OSPF Support	(8)	Yes	Yes	Yes
	MPLS Traffic Engineering (TE)—Overload Avoidance Support for IS-IS	(22)	Yes	Yes	Yes
	MPLS Traffic Engineering (TE)—Scalability Enhancements	(22)	Yes	Yes	Yes
Multiprotocol BGP (MP-BGP)—MPLS VPN	(22)	Yes	Yes	Yes	

**Table 2** Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)

Features		In	Software Images by Feature Sets		
			Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES
Multiprotocol Label Switching (MPLS) Virtual Private Network (VPN)	MPLS Virtual Private Network (VPN)	(22)	Yes	Yes	Yes
	MPLS VPN Line Cards for Cisco 12000 Series Internet Routers: <ul style="list-style-type: none"> <li>MPLS VPN and Fast Reroute on 10 Gbps POS Enhanced Services Line Cards</li> <li>MPLS VPN and IP Marking on Engine 2 POS Line Cards</li> <li>MPLS VPN and Traffic Engineering Support on the 6CT3-SMB Line Card</li> <li>MPLS VPN and Traffic Engineering Support on the 6E3-SMB and 12E3-SMB Line Cards</li> <li>MPLS VPN Support for POS, DPT, and Channelized Line Cards</li> <li>MPLS VPN Support for the QOC-12 ATM Line Card</li> <li>MPLS VPN, TE, and LDP Support for the OC-192c and QOC-48c Line Cards</li> </ul>	(22)	Yes	Yes	Yes
	MPLS VPN MIB and MPLS VPN MIB Traps	(22)	Yes	Yes	Yes
	MPLS VPN Support for EIGRP Between Provider Edge (PE) and Customer Edge (CE)	(22)	Yes	Yes	Yes
	MPLS VPN—VRF Selection Based on Source IP Address	(22)	Yes	Yes	Yes
	MPLS VPN Carrier Supporting Carrier	MPLS VPN Carrier Supporting Carrier on Engine 0, Engine 2, and IP Service Engine (ISE) Line Cards	(22)	Yes	Yes
MPLS VPN Carrier Supporting Carrier—IPv4 BGP Label Distribution on Engine 0 and Engine 2 Line Cards		(22)	Yes	Yes	Yes

Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)

Features	In	Software Images by Feature Sets			
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES	
MPLS VPN Carrier Supporting Carrier for Additional Cisco 12000 Series Line Cards	MPLS VPN Carrier Supporting Carrier on the Cisco 12000 Series 3-Port Gigabit Ethernet Line Card and 8-Port OC-3 STM-1 ATM Line Card	(23)	Yes	Yes	Yes
	MPLS VPN Carrier Supporting Carrier—IPv4 BGP Label Distribution on the Cisco 12000 Series 3-Port Gigabit Ethernet Line Card and 8-Port OC-3 STM-1 ATM Line Card	(23)	Yes	Yes	Yes
MPLS VPN Features for Additional Cisco 12000 Series Line Cards	MPLS-VPN Support on the Cisco 12000 Series Modular Gigabit Ethernet Line Card and the 1-Port 10-Gigabit Ethernet Line Card	(23)	Yes	Yes	Yes
	Ethernet over MPLS on the Cisco 12000 Series Modular Gigabit Ethernet Line Card and the 1-Port 10-Gigabit Ethernet Line Card	(23)	Yes	Yes	Yes
	VLAN-to-MPLS VPN Mapping on the Cisco 12000 Series Modular Gigabit Ethernet Line Card and the 1-Port 10-Gigabit Ethernet Line Card	(23)	Yes	Yes	Yes
MPLS VPN Interautonomous System	MPLS VPN—Interautonomous Systems Support on Engine 0, Engine 2, and IP Service Engine (ISE) Line Cards	(22)	Yes	Yes	Yes
	MPLS VPN Inter-AS—IPv4 BGP Label Distribution on Engine 0, Engine 2, and IP Service Engine (ISE) Line Cards	(22)	Yes	Yes	Yes
MPLS VPN Interautonomous System on Additional Cisco 12000 Series Line Cards	MPLS VPN—Interautonomous System Support on the Cisco 12000 Series 3-Port Gigabit Ethernet Line Card and 8-Port OC-3 STM-1 ATM Line Card	(23)	Yes	Yes	Yes
	MPLS VPN Inter-AS—IPv4 BGP Label Distribution on the Cisco 12000 Series 3-Port Gigabit Ethernet Line Card and 8-Port OC-3 STM-1 ATM Line Card	(23)	Yes	Yes	Yes

**Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)**

Features	In	Software Images by Feature Sets			
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES	
Multicast BGP	(5)	Yes	Yes	Yes	
Multicast Distributed Switching	(5)	Yes	Yes	Yes	
Multicast Forwarding in Cisco 12000 Series Internet Routers	(21)	Yes	Yes	Yes	
Multicast Forwarding on IP Service Engine Line Cards	(22)	Yes	Yes	Yes	
Multicast Routing Monitor	(5)	Yes	Yes	Yes	
Multicast Source Discovery Protocol	(5)	Yes	Yes	Yes	
Multilink Frame Relay	(17)	Yes	Yes	Yes	
Named Community Lists	(10)	Yes	Yes	Yes	
NetFlow on Cisco 12000 Series Internet Routers	(6)	Yes	Yes	Yes	
NetFlow Export Version 5	(14)	Yes	Yes	Yes	
NetFlow Multiple Export Destinations	(19)	Yes	Yes	Yes	
NetFlow Support for Gigabit Ethernet	(7)	Yes	Yes	Yes	
NetFlow ToS-Based Aggregation	(15)	Yes	Yes	Yes	
OC-192c/STM-64c DPT Line Card	(23)	Yes	Yes	Yes	
OC-192c/STM-64c POS Line Card	(15)	Yes	Yes	Yes	
OC-3c/STM-1c POS/SDH ISE Line Cards	(22)	Yes	Yes	Yes	
OSPF Sham-Link Support for MPLS VPN	(22)	Yes	Yes	Yes	
OSPF Support for Multi-VRF on CE Routers	(22)	Yes	Yes	Yes	
OSPF Support for Fast Hellos	(23)	Yes	Yes	Yes	
Output ACLs on Engine 4 Line Cards	(18)	Yes	Yes	Yes	
Parser Cache	(22)	Yes	Yes	Yes	
Performance Route Processor	(22)	Yes	Yes	Yes	
Per-Interface Rate Control	(11)	Yes	Yes	Yes	
Per-Packet Load Balancing on Engine 2 Line Cards	(21)	Yes	Yes	Yes	
Per-VC Queueing	(7)	Yes	Yes	Yes	
PIM Scalability Enhancement	(18)	Yes	Yes	Yes	
PIM: Subsecond DR Failover	(22)	Yes	Yes	Yes	
Policy-Based Routing	Policy-Based Routing onto MPLS TE Tunnels	(22)	Yes	Yes	Yes
	Policy-Based Routing on Engine 4 Plus Line Cards	(22)	Yes	Yes	Yes
Policy Routing on Engine 0 and Engine 1	(13)	Yes	Yes	Yes	
Precedence Rewrite Interoperability	(23)SZ	Yes			

Table 2 Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)

Features	In	Software Images by Feature Sets		
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES
Privilege Command Enhancements	(22)	Yes	Yes	Yes
Process MIB	(6)	Yes	Yes	Yes
Process MIB Enhancement	(21)	Yes	Yes	Yes
Quad OC-12c/STM-4c ATM Line Card	(13)	Yes	Yes	Yes
Quad OC-48c/STM-16c POS Line Card	(15)	Yes	Yes	Yes
Reserve Memory for Console Access	(22)	Yes	Yes	Yes
RFC 1483 Bridged PVC Encapsulation	(5)	Yes	Yes	Yes
Router-ports Group Management Protocol (RGMP)	(10)	Yes	Yes	Yes
Sampled NetFlow and 128 ACLs on 3-Port Gigabit Ethernet Line Cards	(21)	Yes	Yes	Yes
RPR+ in the Cisco 12000 Series Internet Router	(22)	Yes	Yes	Yes
Sampled NetFlow and 128 ACLs on Engine 2 POS Line Cards	(18)	Yes	Yes	Yes
Sampled NetFlow on 3-Port Gigabit Ethernet Line Cards	(16)	Yes	Yes	Yes
Sampled NetFlow on Engine 2 POS Line Cards	(14)	Yes	Yes	Yes
Section Data Communications Channel (SDCC) <sup>2</sup>	(10)	Yes	Yes	Yes
Secure Copy	(21)	No	Yes	Yes
Secure Shell Client Version 1	(10)	No	Yes	Yes
Secure Shell Version 1	(5)	No	Yes	Yes
Service Assurance Agent	(8)	Yes	Yes	Yes
show idb Command	(18)	Yes	Yes	Yes
Single Ring Recovery Protocol	(16)	Yes	Yes	Yes
SNMP IF-MIB Support for VLAN (802.1Q) Subinterfaces	(21)	Yes	Yes	Yes
SNMP Notification Logging	(22)	Yes	Yes	Yes
SNMP Support for Border Gateway Protocol (BGP) Policy Accounting	(10)	Yes	Yes	Yes
SNMP Support for Class Based QoS on Cisco 12000 Series Line Cards	(22)	Yes	Yes	Yes
SNMP Support for VPNs	(23)	Yes	Yes	Yes
SNMPv3 Community MIB Support	(22)	Yes	Yes	Yes
SNMP Version 3	(6)	Yes	Yes	Yes
SONET MIB	(18)	Yes	Yes	Yes
Source MAC Address Accounting on the 3-Port Gigabit Ethernet Line Card	(15)	Yes	Yes	Yes
Source Specific Multicast with IGMPv3	(15)	Yes	Yes	Yes
Tag Switching	(5)	Yes	Yes	Yes
tunnel mpls traffic-eng autoroute announce Command	(22)	Yes	Yes	Yes

**Table 2** Feature List by Feature Set for the Cisco 12000 Series Internet Routers (continued)

Features	In	Software Images by Feature Sets		
		Service Provider	Service Provider/Secured Shell 56	Service Provider/Secured Shell 3DES
Tunnel ToS	(17)	Yes	Yes	Yes
Turbo Access Control Lists (ACLs)	(6)	Yes	Yes	Yes
Unequal Cost Enhancements to Load Sharing Ratio	(23)SZ	Yes		
Unicast Reverse Path Forwarding on Engine 2 Line Cards	(19)	Yes	Yes	Yes
Unicast Reverse Path Forwarding on Engine 4 Plus Line Cards	(22)	Yes	Yes	Yes
Unicast Reverse Path Forwarding on IP Services Engine (ISE) Line Cards	(22)	Yes	Yes	Yes
Universal Transport Interface	(18)	Yes	Yes	Yes
Universal Transport Interface on 2-Port Channelized E1/T1 and 6-Port Channelized T3 Line Cards	(21)	Yes	Yes	Yes
Universal Transport Interface on Frame Relay Point-to-Point Subinterfaces in the Cisco 12000 Series Internet Routers	(19)	Yes	Yes	Yes
UTI VLAN	(21)	Yes	Yes	Yes
Virtual Path Traffic Shaping	(8)	Yes	Yes	Yes
Virtual Router Redundancy Protocol (VRRP)	(22)	Yes	Yes	Yes
VLAN ifTable Relationship MIB	(21)	Yes	Yes	Yes
VPN-Aware DHCP Relay for Nonoverlapping Addresses	(22)	Yes	Yes	Yes
VPN-Aware PING MIB	(22)	Yes	Yes	Yes
VPN Routing/Forwarding (VRF) ARP Entry Support	(22)	Yes	Yes	Yes
VPN Slow-Path Support on Engine 2 at Deaggregation Point (Between PE-P)	(22)	Yes	Yes	Yes
VPN Routing/Forwarding (VRF) CLI Command	(22)	Yes	Yes	Yes
VRF over FR Subinterfaces	(22)	Yes	Yes	Yes
Weighted Random Early Detection (WRED)	(10)	Yes	Yes	Yes

- In Cisco IOS Release 12.0(22)S, the Cisco Stateful Switchover with Nonstop Forwarding (SSO/NSF) feature is supported on the Route Processor (RP) but not on the Performance Route Processor (PRP). The SSO/NSF feature is supported on the PRP in Cisco IOS Release 12.0(23)S and later releases. However, in Cisco IOS Release 12.0(22)S, the PRP is NSF aware, meaning that it runs NSF software and can maintain session information with a peer device following a switchover of the peer device
- SDCC is supported on Cisco 12000 Series Internet Router OC-48-based line cards.

## New and Changed Information

This section lists the new hardware and software features supported by the Cisco 12000 Series Internet Routers in Cisco IOS Release 12.0 SZ:

## New Features in Cisco IOS Release 12.0(23)SZ

The following new features are supported in Cisco IOS Release 12.0(23)SZ.

### Precedence Rewrite Interoperability

Platform: Cisco 12000 Series Internet Routers

Prior to this release, remarked precedence did not change the output queuing, if the Egress line card was not an Engine 3 line card. In this event, the precedence remarking occurred after the output queue on the legacy line card had been selected.

With the precedence rewrite interoperability feature, the selection of local output queue or output queue is now performed after all MQC processing on the ingress is completed. Remarking of precedence now results in redirection to the appropriate egress queue for all line cards interoperating with Engine 3 line cards. Functionality is consistent for the following commands:

- **set ip precedence**
- **set ip dscp**
- **set mpls experimental**

### Support for Eight Queues Per Slot or Physical Port in Engine 3 Line Cards

Platform: Cisco 12000 Series Internet Routers

The implementation of the ToFab queuing on Engine 3 line cards has been enhanced such that each slot or physical port now supports eight priority queues, with up to seven queues allocated for normal priority and one queue allocated for low latency/high priority. WRED and MDRR are configurable for each of the priority queues.

### Load Balancing Enhancements with CEF for Engine 4+ Line Cards

Platform: Cisco 12000 Series Internet Routers

Engine 4+ line cards support a maximum number of eight buckets for IP or MPLS load balancing. CEF allows for up to sixteen buckets for IP or MPLS load balancing. Therefore, a discrepancy exists between the CEF bucket allowance and the maximum configurable on Engine 4+ line cards. This feature adds the following enhancements to load balancing for Engine 4+ line cards:

- The CEF algorithm now accounts for the bucket discrepancy and balances the traffic with equal distribution across all eight buckets.
- The output of the CEF command **show ip cef prefix internal** has been changed to include the hardware bucket size as well as the bucket count as follows:

```
Load distribution: 0 1 2 3 4 0 1 2 3 4 0 1 2 3 4 (refcount 1)
Tags distribution: 0 1 2 3 4 0 1 2 3 4 0 1 2 3 4 (addr 44A21A18)
HW distribution: 0 1 2 3 4 (total 5 HW buckets)
```

## Unequal Cost Enhancements to Load-Sharing Ratio

Platform: Cisco 12000 Series Internet Routers

This feature improves the IP routing algorithm such that the ratio of bucket distribution to path load sharing is a more precise integer value. Prior to this enhancement, some bucket allocations had led to distortions of the actual ratio when unequal cost load balancing was employed.

## New Features in Cisco IOS Release 12.0(21)SZ

The following new features are supported in Cisco IOS Release 12.0(21)SZ.

### Modular Fast Ethernet Line Card

Platform: Cisco 12000 Series Internet Routers

The Modular Fast Ethernet line card, the first modular line card for Gigabit Ethernet and Fast Ethernet on the Cisco 12000 Series Internet Routers, is designed for high-density and server-aggregation applications. It provides the Cisco 12416, Cisco 12410, Cisco 12406, and Cisco 12404 Internet Routers with up to 10 optical 802.3 Gigabit Ethernet interfaces. These interfaces provide high-speed interconnects to other network devices, such as other Cisco 12000 Series Internet Routers, or to other routers or layer 2 or layer 3 switches that support Gigabit Ethernet interfaces.

Because the Modular Fast Ethernet line card requires a card cage slot that is 1.8 inches (4.5 centimeters) wide, you can use the Modular Fast Ethernet line card in only the Cisco 12416 Internet Router, Cisco 12410 Internet Router, Cisco 12406 Internet Router, or Cisco 12404 Internet Router. The system must be configured for full switching fabric capacity, which is one clock and scheduler card (CSC) and three switch fabric cards (SFCs). The Modular Fast Ethernet line card requires one CSC plus three SFCs for the Cisco 12416 Internet Router, Cisco 12406 Internet Router, and Cisco 12404 Internet Router, but one CSC plus four SFCs (at least) for the Cisco 12410 Internet Router where the SFCs are all 10-Gigabit-capable.

#### Field-Replaceable SFP Gigabit Ethernet Laser Optical Transceiver Module

The Gigabit Ethernet laser optical transceiver module is a field-replaceable SFP module that plugs into the receptacle on the Ethernet port adapter (EPA) located on the Modular Fast Ethernet line card and provides the Gigabit Ethernet optical interface. The modules consists of two optical interfaces—laser transmit (TX) and laser receive (RX)—and an electrical interface (to the line card).



**Note**

For more information on the Modular Fast Ethernet Line Card, refer to the Cisco.com documentation.

### 1-Port 10-Gigabit Ethernet Line Card

Platform: Cisco 12000 Series Internet Routers

The 1-Port 10-Gigabit Ethernet line card, the first 10-Gigabit Ethernet Router line card in the industry, is designed for high-density and server-aggregation applications. It provides the Cisco 12416, Cisco 12410, Cisco 12406, and Cisco 12404 Internet Routers with one optical 802.3ae 10-Gigabit Ethernet interface. This interface provides high-speed interconnects to other network devices, such as other Cisco 12000 Series Internet Routers, or to other routers or layer 2 or layer 3 switches that support 10-Gigabit Ethernet interfaces.

Because the 1-Port 10-Gigabit Ethernet line card requires a card cage slot that is 1.8 inches (4.5 cm) wide, you can use the 1-Port 10-Gigabit Ethernet line card in only the Cisco 12416 Internet Router, Cisco 12410 Internet Router, Cisco 12406 Internet Router, or Cisco 12404 Internet Router. The system must be configured for full switching fabric capacity, which is one clock and scheduler card (CSC) and three switch fabric cards (SFCs). In addition, the 1-Port 10-Gigabit Ethernet line card requires a switch fabric that supports 10-Gigabit Ethernet, available only on the Cisco 12416 Internet Router, Cisco 12410 Internet Router, Cisco 12406 Internet Router, and Cisco 12404 Internet Router.

#### 10-Gigabit Ethernet Laser Optical Transceiver

The 10-Gigabit Ethernet laser optical transceiver is hardwired to the 1-Port 10-Gigabit Ethernet line card and provides the 10-Gigabit Ethernet optical interface. The port consists of two optical interfaces—laser transmit (TX) and laser receive (RX)—and an electrical interface (to the line card). The 10-Gigabit Ethernet transceiver is a long haul, or long wavelength, (1310 nm nominal) transceiver, used for 1000BASE-LR links.



**Note**

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For more information on the 1-Port 10-Gigabit Ethernet line card, refer to the Cisco.com documentation.

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## 8-Port OC-3 STM-1 ATM Line Card

Platform: Cisco 12000 Series Internet Routers

The 8-Port OC-3 Synchronous Transfer Mode -1 (STM-1) Asynchronous Transfer Mode (ATM) line card is supported by all Cisco 12000 Series Internet Routers in Cisco IOS Release 12.0(21)SZ.

The 8-Port OC-3 STM-1 ATM Line Card supports traffic shaping, and delivers line rate OC-3/STM-1 bandwidth while performing traffic shaping and per-virtual circuit (VC) queueing. It also supports per-VC MDRR (Modified Deficit Round Robin) and per-VC low latency queueing (LLQ).

CBWFQ is implemented on a per-VC basis, with up to eight queues per VC. One of the queues is a low-latency queue. Both per-VC WRED and per-VC CBWFQ are performed in hardware.

The 8-Port OC-3 STM-1 ATM line card provides the Cisco 12000 Series Internet Router with eight 155 Mbps ATM interfaces. The card communicates with the Cisco 12000 Series Internet Router switch fabric.



**Note**

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For more information on the 8-Port OC-3 STM-1 ATM Line Card, refer to the Cisco.com documentation.

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## Important Notes for Cisco IOS Release 12.0 SZ

Please be aware that failure to upgrade the affected IOS images may result in network downtime.

## Caveats

Caveats describe unexpected behavior in Cisco IOS software releases. Severity 1 caveats are the most serious caveats; severity 2 caveats are less serious. Severity 3 caveats are moderate caveats, and only select severity 3 caveats are included in the caveats document.

Because Cisco IOS Release 12.0 SZ is based on Cisco IOS Release 12.0, many caveats that apply to Cisco IOS Release 12.0 will also apply to Cisco IOS Release 12.0 S. For information on severity 1 and 2 caveats in Cisco IOS Release 12.0, see the *Caveats for Cisco IOS Release 12.0* document located on Cisco.com and the Documentation CD-ROM.

**Note**

If you have an account with Cisco.com, you can also use the Bug Toolkit to find select caveats of any severity. To reach the Bug Toolkit, log in to Cisco.com and click **Service and Support: Technical Assistance Center: Select & Download Software: Jump to a software resource: Software Bug Toolkit/Bug Watcher**. Another option is to go to [http://www.cisco.com/cgi-bin/Support/Bugtool/launch\\_bugtool.pl](http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl).

The caveats section consists of the following subsections:

- [Open Caveats—Cisco IOS Release 12.0\(23\)SZ, page 19](#)
- [Resolved Caveats—Cisco IOS Release 12.0\(23\)SZ, page 19](#)
- [Resolved Caveats—Cisco IOS Release 12.0\(21\) SZ, page 20](#)

## Open Caveats—Cisco IOS Release 12.0(23)SZ

This section describes possibly unexpected behavior by Cisco IOS Release 12.0(23) SZ.

For more information on open caveats in Cisco IOS Release 12.0(23)S, refer to the *Caveats for Cisco IOS Release 12.0* document.

- CSCdz28243

Precedence Rewrite Interperability between Engine 3 and Legacy Engine Local Output Queue/Output Queue

Forwarding performance on Engine 3 line cards drops to 3.63 Mpps with 40 byte packet size load balancing between four paths. Without load balancing, performance can reach 3.97 Mpps.

## Resolved Caveats—Cisco IOS Release 12.0(23)SZ

The following caveats were resolved in Cisco IOS Release 12.0(23)SZ. For resolved caveats specific to Cisco IOS Release 12.0(23)S, see the *Caveats for Cisco IOS Release 12.0* document. The caveats document is updated for every maintenance release and is located on [Cisco.com](http://Cisco.com) and the Documentation CD-ROM.

- CSCdx87564

Tos bit change does not change the output queue.

Prior to this release, there was no ability to set the IP Precedence, IP DSCP, or MPLS EXP bits for the ingress of Engine 3 line cards, hence no egress port match and allocation to the correct output queue. This release fixes this limitation by making the ingress able to mark the traffic using any supported traffic marking-mechanism, such as MQC policies, PBR, or QPPB.

- CSCdw42820

Legacy CLI should allow at least 2 DRR queues on top of SPQ on ToFab queue.

Before this release, Engine 3 line cards were able to support two ToFab or ingress queues per Cisco 12000 Series Internet Router destination slot. With this release, the implementation of ToFab queuing has been changed so that each slot or physical port has seven low priority queues. RED can

be performed on all these queues. This implementation is similar to the Engine 2 line card implementation of ToFab queuing, except for the priority queue. There is one priority queue per destination slot on Engine 3 line cards, as this is a hardware restriction.

- CSCdz43313

2 QoS Phase: set ip/exp does not work on Engine 3 line card egress.

Setting IP Precedence, IP DSCP, or MPLS EXP bits function was broken prior to this release. Now the user is able to use MQC outbound policy applied on Engine 3 line card interfaces to change the mentioned values on the header of the IP or MPLS packet header.

## Resolved Caveats—Cisco IOS Release 12.0(21)SZ

There are no resolved caveats for Cisco IOS Release 12.0(21)SZ.

For resolved caveats specific to Cisco IOS Release 12.0(21)S, see the [Caveats for Cisco IOS Release 12.0](#) document. The caveats document is updated for every maintenance release and is located on [Cisco.com](#) and the Documentation CD-ROM.

## Related Documentation

The following sections describe the documentation available for the Cisco 7000 family and Cisco 12000 Series Internet Routers. These documents consist of hardware and software installation guides, Cisco IOS configuration and command reference publications, 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 [Cisco.com](#) and the Documentation CD-ROM.

Use these release notes with these resources:

- [Release-Specific Documents, page 20](#)
- [Platform-Specific Documents, page 21](#)
- [Feature Modules, page 21](#)
- [Feature Navigator, page 22](#)
- [Cisco IOS Software Documentation Set, page 22](#)

## Release-Specific Documents

The following documents are specific to Release 12.0 and are located on [Cisco.com](#) and the Documentation CD-ROM:

- [Cross-Platform Release Notes for Cisco IOS Release 12.0](#)

On [Cisco.com](#) at:

**Technical Documentation on Cisco Connection Online: 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 Cisco.com at:

**Technical Documents**

- [Caveats for Cisco IOS Release 12.0](#)

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

On Cisco.com 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**



**Note**

If you have an account with Cisco.com, you can use Bug Navigator II to find caveats of any severity for any release. To reach Bug Navigator II, log in to Cisco.com and click **Software Center: Cisco IOS Software: Bug Toolkit: Bug Navigator II**. Another option is to go to [http://www.cisco.com/cgi-bin/Support/Bugtool/launch\\_bugtool.pl](http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl).

## Platform-Specific Documents

These documents are available for the Cisco 7000 family and Cisco 12000 Series Internet Routers on Cisco.com and the Documentation CD-ROM:

- Installation and Configuration Guides and Configuration Notes
- User Guides
- Hardware Installation and Maintenance Guides
- Regulatory Compliance and Safety Documentation

On Cisco.com 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 Cisco IOS Release 12.0 S 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 Cisco.com at:

**Technical Documents: Documentation Home Page: 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 S**

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 S**

## Feature Navigator

Cisco Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

Cisco Feature Navigator is available 24 hours a day, 7 days a week. To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at <http://www.cisco.com/register>.

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

## Cisco IOS Software Documentation Set

The Cisco IOS software documentation set consists of the Cisco IOS configuration guides, Cisco IOS command reference publications, and several other supporting documents. The Cisco IOS software documentation set is 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 one or more configuration guides and one or more corresponding command references. 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. Use each configuration guide with its corresponding command reference.

On Cisco.com 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**

## Cisco IOS Release 12.0 Documentation Set Contents

Table 3 lists the contents of the Cisco IOS Release 12.0 software documentation set, which is available in electronic form and in printed form if ordered.



**Note**

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

On Cisco.com 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 3 Cisco IOS Software Release 12.0 Documentation Set**

Books	Chapter Topics
<ul style="list-style-type: none"> <li>• <i>Configuration Fundamentals Configuration Guide</i></li> <li>• <i>Configuration Fundamentals Command Reference</i></li> </ul>	Configuration Fundamentals Overview Cisco IOS User Interfaces File Management System Management
<ul style="list-style-type: none"> <li>• <i>Bridging and IBM Networking Configuration Guide</i></li> <li>• <i>Bridging and IBM Networking Command Reference</i></li> </ul>	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 3 Cisco IOS Software Release 12.0 Documentation Set (continued)**

Books	Chapter Topics
<ul style="list-style-type: none"> <li>• <i>Dial Solutions Configuration Guide</i></li> <li>• <i>Dial Solutions Command Reference</i></li> </ul>	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 and T1 Dial Backup for Dialer Profiles Dial Backup Using Dialer Watch Dial Backup for Serial Lines Peer-to-Peer DDR with Dialer Profiles Dial-Out 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
<ul style="list-style-type: none"> <li>• <i>Cisco IOS Interface Configuration Guide</i></li> <li>• <i>Cisco IOS Interface Command Reference</i></li> </ul>	Interface Configuration Overview LAN Interfaces Logical Interfaces Serial Interfaces
<ul style="list-style-type: none"> <li>• <i>Network Protocols Configuration Guide, Part 1</i></li> <li>• <i>Network Protocols Command Reference, Part 1</i></li> </ul>	IP Overview IP Addressing and Services IP Routing Protocols
<ul style="list-style-type: none"> <li>• <i>Network Protocols Configuration Guide, Part 2</i></li> <li>• <i>Network Protocols Command Reference, Part 2</i></li> </ul>	AppleTalk Novell IPX
<ul style="list-style-type: none"> <li>• <i>Network Protocols Configuration Guide, Part 3</i></li> <li>• <i>Network Protocols Command Reference, Part 3</i></li> </ul>	Network Protocols Overview Apollo Domain Banyan VINES DECnet ISO CLNS XNS
<ul style="list-style-type: none"> <li>• <i>Security Configuration Guide</i></li> <li>• <i>Security Command Reference</i></li> </ul>	AAA Security Services Security Server Protocols Traffic Filtering and Firewalls IP Security and Encryption Passwords and Privileges Neighbor Router Authentication IP Security Options
<ul style="list-style-type: none"> <li>• <i>Cisco IOS Switching Services Configuration Guide</i></li> <li>• <i>Cisco IOS Switching Services Command Reference</i></li> </ul>	Switching Services Switching Paths for IP Networks Virtual LAN (VLAN) Switching and Routing

**Table 3 Cisco IOS Software Release 12.0 Documentation Set (continued)**

Books	Chapter Topics
<ul style="list-style-type: none"> <li>• <i>Wide-Area Networking Configuration Guide</i></li> <li>• <i>Wide-Area Networking Command Reference</i></li> </ul>	Wide-Area Network Overview ATM Frame Relay SMDS X.25 and LAPB
<ul style="list-style-type: none"> <li>• <i>Voice, Video, and Home Applications Configuration Guide</i></li> <li>• <i>Voice, Video, and Home Applications Command Reference</i></li> </ul>	Voice over IP Voice over Frame Relay Voice over ATM Voice over HDLC Frame Relay-ATM Internetworking Synchronized Clocks Video Support Universal Broadband Features
<ul style="list-style-type: none"> <li>• <i>Quality of Service Solutions Configuration Guide</i></li> <li>• <i>Quality of Service Solutions Command Reference</i></li> </ul>	Policy-Based Routing QoS Policy Propagation via BGP Committed Access Rate Weighted Fair Queueing Custom Queueing Priority Queueing Weighted Random Early Detection Scheduling Signalling RSVP Packet Drop Frame Relay Traffic Shaping Link Fragmentation RTP Header Compression
<ul style="list-style-type: none"> <li>• <i>Cisco IOS Software Command Summary</i></li> <li>• <i>Dial Solutions Quick Configuration Guide</i></li> <li>• <i>System Error Messages</i></li> <li>• <i>Debug Command Reference</i></li> </ul>	



**Note**

*Cisco Management Information Base (MIB) User Quick Reference* is no longer published. For the latest list of MIBs supported by Cisco, see *Cisco Network Management Toolkit* on Cisco Connection Online. From Cisco.com, click on the following path: **Service & Support: Software Center: Network Mgmt Products: Cisco Network Management Toolkit: Cisco MIB.**

# Obtaining Documentation

The following sections explain how to obtain documentation from Cisco Systems.

## World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following URL:

<http://www.cisco.com>

Translated documentation is available at the following URL:

[http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml)

## Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which is shipped with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

## Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:  
[http://www.cisco.com/cgi-bin/order/order\\_root.pl](http://www.cisco.com/cgi-bin/order/order_root.pl)
- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:  
<http://www.cisco.com/go/subscription>
- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

## Documentation Feedback

If you are reading Cisco product documentation on Cisco.com, you can submit technical comments electronically. Click the **Fax** or **Email** option under the “Leave Feedback” at the bottom of the Cisco Documentation home page.

You can e-mail your comments to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

Cisco Systems  
Attn: Document Resource Connection  
170 West Tasman Drive  
San Jose, CA 95134-9883

We appreciate your comments.

## Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools by using the Cisco Technical Assistance Center (TAC) Web Site. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC Web Site.

### Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com is a highly integrated Internet application and a powerful, easy-to-use tool that provides a broad range of features and services to help you to

- Streamline business processes and improve productivity
- Resolve technical issues with online support
- Download and test software packages
- Order Cisco learning materials and merchandise
- Register for online skill assessment, training, and certification programs

You can self-register on Cisco.com to obtain customized information and service. To access Cisco.com, go to the following URL:

<http://www.cisco.com>

### Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available through the Cisco TAC: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

## Cisco TAC Web Site

The Cisco TAC Web Site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to the following URL:

<http://www.cisco.com/tac>

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

<http://www.cisco.com/register/>

If you cannot resolve your technical issues by using the Cisco TAC Web Site, and you are a Cisco.com registered, you can open a case online by using the TAC Case Open tool at the following URL:

<http://www.cisco.com/tac/caseopen>

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web Site.

## Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number.

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