



Text Part Number: 78-7258-10 Rev A0

Release Notes for Cisco uBR7200 Series for Cisco IOS Release 12.0(15)SC

February 19, 2002

Note You can find the most current Cisco IOS documentation on Cisco.com. This set of electronic documents may contain updates and modifications made after the hard-copy documents were printed.

These release notes for the Cisco uBR7200 series universal broadband routers describe the enhancements provided in Cisco IOS Release 12.0(15)SC1, which is an early deployment release that provides a platform for cable products with essential new features and fixes to software caveats. Cisco IOS Release 12.0 SC is an early-deployment release based on Cisco IOS Release 12.0 S and contains all cable functionality provided in Cisco IOS Release 12.0(5)T.

These release notes are updated as needed to describe memory requirements, new features, new hardware support, software platform deferrals, and related documents.

For a list of the software caveats that apply to Release 12.0(15)SC1, see the “Caveats” section on page 33 and *Caveats for Cisco IOS Release 12.0*. The caveats document is updated for every maintenance release and is located on Cisco.com and the Documentation CD-ROM.

Contents

These release notes describe the following topics:

- Introduction, page 2
- Early Deployment Releases, page 4
- System Requirements, page 6
- New and Changed Information, page 13
- MIBs, page 26
- Limitations and Restrictions, page 29

Corporate Headquarters

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

Copyright © 1999-2001
Cisco Systems, Inc.
All rights reserved.

- Important Notes, page 30
- Caveats, page 33
- Related Documentation, page 58
- Obtaining Documentation, page 64
- Obtaining Technical Assistance, page 65

Introduction

The Cisco uBR7200 series universal broadband routers—the Cisco uBR7223, the Cisco uBR7246, and the Cisco uBR7246 VXR—are based on the Data-over-Cable Service Interface Specification (DOCSIS) standards. Each is designed to be installed at a cable operator’s headend facility or distribution hub and to function as the cable modem termination system (CMTS) for subscriber-end devices such as Cisco uBR904 and Cisco uBR924 cable access routers, and other DOCSIS-based cable modems (CMs) and set-top boxes (STBs).

Cisco uBR7200 series universal broadband routers allow two-way transmission of digital data and Voice over IP (VoIP) traffic over a hybrid fiber-coaxial (HFC) network.

Note The Cisco IOS Release 12.0 SC software supports only two-way, DOCSIS-based cable modems and set-top box (STB) units with integrated DOCSIS modems. The SC release excludes support of the clock card in the Cisco uBR7246 VXR. The SC release also excludes DOCSIS 1.0 extension support, as well as telco-return where the cable modem’s return path to the CMTS is via a dial-up telephone line connection instead of an upstream channel over the coaxial cable.

The Cisco uBR7200 series routers support IP routing with a wide variety of protocols and combinations of Ethernet, Fast Ethernet, Gigabit Ethernet, serial, High-Speed Serial Interface (HSSI), Packet over SONET (POS) OC-3 and OC-12c, and Asynchronous Transfer Mode (ATM) media. Additional protocols and media may be added as they become available for the Cisco uBR7200 series routers.

For information on new features and Cisco IOS commands supported by Cisco IOS Release 12.0(15)SC, see the “New and Changed Information” section on page 13 and the “Related Documentation” section on page 58.

Cisco IOS Release 12.0(15)SC1 supports the Cisco uBR7246 VXR, Cisco uBR7246, and Cisco uBR7223.

Cisco uBR7246 VXR Universal Broadband Router

The Cisco uBR7246 VXR offers an industry-proven CMTS and carrier-class router in a scalable platform with a high-performance network processing engine to support data, voice, and video services for medium to large network installations.

The Cisco uBR7246 VXR provides the following major hardware features:

- High-performance network processing engine
- I/O controller
- Up to two network interface port adapters
- Up to four cable modem cards

- Up to two removable power supplies providing load-sharing and redundancy capabilities
- Two Personal Computer Memory Card International Association (PCMCIA) slots that allow for software upgrades through the use of Flash memory cards

Note The Cisco uBR7246 VXR chassis does not support the MC11-FPGA cable modem card.

Cisco uBR7246 Universal Broadband Router

The Cisco uBR7246 offers an industry-proven CMTS and carrier-class router in a scalable platform to support data, voice, and video services for medium to large network installations.

The Cisco uBR7246 provides the following major hardware features:

- Network processing engine
- I/O controller
- Up to two network interface port adapters
- Up to four cable modem cards
- Up to two removable power supplies providing load-sharing and redundancy capabilities
- Two PCMCIA slots that allow for software upgrades through the use of Flash memory cards

Cisco uBR7223 Universal Broadband Router

The Cisco uBR7223 is a cost-effective, scalable interface between subscriber cable modems and the backbone data network, and is designed specifically for small to medium network installations.

The Cisco uBR7223 provides the following major hardware features:

- Network processing engine
- I/O controller
- One network interface port adapter
- Up to two cable modem cards
- One removable power supply (The Cisco uBR7223 does not feature load-sharing and redundant power supply capability like the Cisco uBR7246 VXR and Cisco uBR7246.)
- Two PCMCIA slots that allow for software upgrades through the use of Flash memory cards

Universal Broadband Router Overview

Table 1 provides a quick overview of the major hardware features of the three universal broadband routers.

Table 1 Universal Broadband Router Overview

Hardware Supported	Cisco uBR7246 VXR	Cisco uBR7246	Cisco uBR7223
Network Processing Engine	One of the following: <ul style="list-style-type: none"> • NPE-225 • NPE-300 	One of the following: <ul style="list-style-type: none"> • NPE-150 • NPE-200 • NPE-225 	One of the following: <ul style="list-style-type: none"> • NPE-150 • NPE-200 • NPE-225
I/O Controller	1	1	1
Network Interface Port Adapters	up to 2	up to 2	1
Cable Modem Cards	up to 4	up to 4	up to 2
Removable Power Supplies	up to 2	up to 2	1
PCMCIA Slots	2	2	2

Note Earlier release notes stated that the NPE-175 was also supported on the Cisco uBR7200 series routers. Because the NPE-175 has reached its end of life and was never made orderable on the Cisco uBR7200 series routers, it has been removed from the table.

Early Deployment Releases

These release notes describe the Cisco uBR7200 series universal broadband routers for Cisco IOS Release 12.0(15)SC1. Release 12.0 SC is an early deployment (ED) release based on Release 12.0 S; early deployment releases contain fixes to software caveats, as well as support for new Cisco hardware and software features. Table 2 shows Release 12.0 SC early deployment releases.

Table 2 Early Deployment Releases for the Cisco uBR7200 Series Routers

ED Release	Additional Software Features ¹	Additional Hardware Features	Availability
Cisco IOS Release 12.0(15)SC1	None	None	2/18/2002
Cisco IOS Release 12.0(15)SC	None	None	3/5/2001
Cisco IOS Release 12.0(14)SC	None	None	1/8/2001
Cisco IOS Release 12.0(13)SC	CLI and MIB Enhancements	None	11/27/2000
Cisco IOS Release 12.0(12)SC	MIB Enhancements	None	9/5/2000
Cisco IOS Release 12.0(11)SC	<ul style="list-style-type: none"> • Multicast BPI² MIB³ Support • Support for RFC 2233 LinkUp/Down Traps 	None	7/05/2000
Cisco IOS Release 12.0(10)SC1	None	None	6/05/2000

Table 2 Early Deployment Releases for the Cisco uBR7200 Series Routers (continued)

ED Release	Additional Software Features ¹	Additional Hardware Features	Availability
Cisco IOS Release 12.0(10)SC All Cisco IOS 12.0(10)SC release images have been deferred. Please refer to Important Notes, page 30.	<ul style="list-style-type: none"> Implementation of RFC 2665 Support for Cisco uBR7200 SSH⁴ Support in “k1” Images for Cisco uBR7200 	None	4/03/2000
Cisco IOS Release 12.0(9)SC	<ul style="list-style-type: none"> Support for Dynamic Mobile Hosts Support DOCSIS OSSI⁵ Required Objects in RFC 2665 for Cisco uBR7200 Support DOCSIS OSSI Required Objects in RFC 2233 for Cisco uBR7200 	None	2/28/2000
Cisco IOS Release 12.0(8)SC1	Bug fixes	None	
Cisco IOS Release 12.0(8)SC All Cisco IOS 12.0(8)SC release images have been deferred. Please refer to Important Notes, page 30.	Cable Interface Bundling	MC16E Cable Modem Card	3/2000
Cisco IOS Release 12.0(7)SC	None	<ul style="list-style-type: none"> PA-SRP-OC12SML PA-SRP-OC12SMI PA-SRP-OC12MM IEEE 802.3z Gigabit Ethernet Port Adapter NPE-300 Network Processing Engine (for uBR7246 VXR only) Cisco uBR7246 VXR Chassis 	Now 12/1999 1/2000 1/2000
Cisco IOS Release 12.0(6)SC	<ul style="list-style-type: none"> Encrypted Baseline Privacy Key Exchange DOCSIS Quality of Service Enhancements Spectrum Management Enhancements (in earlier ED releases) Upstream Traffic Shaping Downstream Rate Shaping with IP⁶ ToS⁷ Bits 	<ul style="list-style-type: none"> MC11C Cable Modem Card MC11-FPGA Cable Modem Card MC12C Cable Modem Card MC14C Cable Modem Card MC16B Cable Modem Card MC16C Cable Modem Card For port adapters, refer to Table 5 on page 8 	Now

¹ Only major features are listed. See the *Release Notes* for each particular release for a comprehensive feature list.

² BPI = baseline privacy interface

³ MIB = Management Information Base

- 4 SSH = Secure Shell
- 5 OSSI = Operations Support System Interface
- 6 IP = Internet Protocol
- 7 ToS = type of service

System Requirements

This section describes the system requirements for Release 12.0(15)SC1 and includes the following sections:

- Memory Recommendations, page 6
- System Interoperability, page 7
- Supported Hardware, page 7
- Determining the Software Version, page 11
- Upgrading to a New Software Release, page 11
- Feature Set Tables, page 11

Memory Recommendations

Table 3 displays the memory recommendations of the Cisco IOS feature sets for the Cisco uBR7200 series universal broadband routers for Cisco IOS Release 12.0(15)SC. Cisco uBR7200 series routers are available with a 16-MB or 20-MB Type II PCMCIA Flash memory card.

Table 3 Memory Recommendations for the Cisco uBR7200 Series Routers, Release 12.0(13) SC Feature Sets

Feature Set	Image Name	Recommended Flash Memory	Recommended DRAM Memory	Runs From	Added in Cisco IOS Release
DOCSIS 2-WAY	ubr7200-p-mz	16 MB Flash	64 MB DRAM	RAM	12.0(6)SC
DOCSIS 2-WAY IP+	ubr7200-ps-mz	16 MB Flash	64 MB DRAM	RAM	12.0(6)SC
DOCSIS 2-WAY W/BPI	ubr7200-klp-mz	16 MB Flash	64 MB DRAM	RAM	12.0(6)SC
DOCSIS 2-WAY IP+ W/BPI	ubr7200-klps-mz	16 MB Flash	64 MB DRAM	RAM	12.0(6)SC

The image subset legend for Table 3 is as follows:

- k1 = DOCSIS Baseline Privacy, which is subject to export controls
- p = IP routing with Intermediate System-to-Intermediate System (IS-IS), Border Gateway Protocol (BGP), and Inter-Switch Link (ISL); no bridging and no Network Address Translation (NAT)
- s = “Plus” features: Virtual Private Network (VPN) and Inter-Switch Link (ISL)

Note All Cisco IOS Release 12.0 SC images require 64 MB of DRAM.

System Interoperability

This section clarifies the operation of certain features in the Cisco uBR7200 series universal broadband routers:

- Encryption Baseline Privacy Support—To support the baseline privacy feature sets, encryption/decryption software must be present and enabled at both the Cisco uBR7200 series router and the cable modem.

Supported Hardware

Cisco IOS Release 12.0(15)SC1 supports the following Cisco uBR7200 series universal broadband routers:

- Cisco uBR7223
- Cisco uBR7246
- Cisco uBR7246 VXR

Network Processing Engines

The Cisco uBR7223 and the Cisco uBR7246 support the following Network Processing Engines (NPE) in Cisco IOS Release 12.0(15)SC1:

- NPE-150
- NPE-200
- NPE-225

The Cisco uBR7246 VXR supports the following NPEs in Cisco IOS Release 12.0(15)SC1:

- NPE-225
- NPE-300

Note The NPE-300 is not supported on the Cisco uBR7223 and the Cisco uBR7246. The NPE-150 and NPE-200 are not supported on the Cisco uBR7246 VXR.

Cable Modem Cards

Cisco IOS Release 12.0(15)SC1 supports the following cable modem cards, all of which provide connection to the HFC network:

- MC11C cable modem cards (which replace the original MC11-FPGA cable modem cards that are also supported for existing installations) offer the following ports:
 - one upstream port
 - one downstream port
- MC12C cable modem cards (which replace the original MC12 cable modem cards) offer the following ports:
 - two upstream ports
 - one downstream port

- MC14C cable modem cards (which replace the original MC14 cable modem cards) offer the following ports;
 - four upstream ports
 - one downstream port
- MC16C cable modem cards (which replace the MC16B cable modem cards that are also supported for existing installations) offer the following ports:
 - six upstream ports
 - one downstream port
- MC16E cable modem cards provide connection to an HFC network using the proposed EuroDOCSIS (Annex A) standard, and offer the following ports:
 - six upstream ports
 - one downstream port

Table 4 provides a quick overview of the cable modem cards that are supported in Cisco IOS Release 12.0(15)SC1.

Table 4 Cisco uBR7200 Cable Modem Cards

Cable Modem Card	Upstream Ports	Downstream Ports	Additional Features
MC11C	1	1	
MC12C	2	1	
MC14C	4	1	
MC16C	6	1	
MC16E	6	1	EuroDOCSIS (Annex A) Support

Port Adapter Cards

Table 5 lists and describes the port adapters supported by Cisco uBR7200 series routers in Cisco IOS Release 12.0(15)SC1.

Note Not all Cisco uBR7200 series universal broadband routers support the same mixture of port adapters in Cisco IOS releases. Also, some port adapters must be at certain revision levels to be used in the Cisco uBR7246 VXR router. See the “Port Adapter Support for Cisco uBR7246 VXR” section on page 30 for more details.

Table 5 Supported Interfaces on the Cisco uBR7200 Series Routers

Product Number ¹	Description	Supported Platforms	Cisco IOS Release ²
ATM			
PA-A1-OC3SMI	1-port ATM OC-3c/STM-1 single-mode intermediate reach port adapter	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-A1-OC3MM	1-port ATM OC-3c/STM-1 multimode port adapter	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-A2-4E1XC-OC3SM	5-port ATM CES ³ (4 E1 120-ohm CBR ⁴ ports and 1 OC-3 ATM single-mode port) port adapter	Cisco uBR7246	Release 12.0(6)SC

Table 5 Supported Interfaces on the Cisco uBR7200 Series Routers (continued)

Product Number ¹	Description	Supported Platforms	Cisco IOS Release ²
PA-A2-4E1XC-E3ATM	5-port ATM CES ³ (4 E1 120-ohm CBR ⁴ ports and 1 E3 ATM port) port adapter	Cisco uBR7246	Release 12.0(6)SC
PA-A2-4T1C-OC3SM	5-port ATM CES ³ (4 T1 CBR ⁴ ports and 1 OC-3 ATM single-mode port) port adapter	Cisco uBR7246	Release 12.0(6)SC
PA-A2-4T1C-T3ATM	5-port ATM CES ³ (4 T1 CBR ⁴ ports and 1 T3 ATM port) port adapter	Cisco uBR7246	Release 12.0(6)SC
PA-A3-E3	1-port E3 ATM, PCI ⁵ -based port adapter	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-A3-T3	1-port T3 ATM, PCI-based port adapter	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-A3-OC3MM	1-port OC-3c/STM-1 multimode port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-A3-OC3SMI	1-port OC-3c/STM-1 single-mode, intermediate reach port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-A3-OC3SML	1-port OC-3c/STM-1 single-mode, long reach port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
Ethernet			
PA-4E	4-port Ethernet 10BASE-T port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-8E	8-port Ethernet 10BASE-T port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-FE-TX	1-port 100BASE-TX Fast Ethernet port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-FE-FX	1-port 100BASE-FX Fast Ethernet port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-2FEISL-TX	2-port 100BASE-TX Fast Ethernet port adapter with token-ring Inter-Switch Link (ISL) support	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-2FEISL-FX	2-port 100BASE-FX Fast Ethernet port adapter with token-ring Inter-Switch Link (ISL) support	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-12E/2FE	12-port 10BASE-T and 2-port 10/100BASE-TX port adapter	Cisco uBR7246	Release 12.0(6)SC
PA-GE	1-port IEEE 802.3z Gigabit Ethernet port adapter	Cisco uBR7246 VXR only	Release 12.0(7)SC
High-Speed Serial Interfaces (HSSI)			
PA-H	1-port HSSI port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-2H	2-port HSSI port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
Packet over SONET (POS)			
PA-POS-OC3SML	1-port POS OC-3 (STM-3c,STM-1/SDH) single-mode, long reach port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-POS-OC3SMI	1-port POS OC-3 (STM-3c,STM-1/SDH) single-mode, intermediate reach port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC
PA-POS-OC3MM	1-port POS OC-3 (STM-3c,STM-1/SDH) multimode port adapter	All Cisco uBR7200 series routers	Release 12.0(7)SC

Table 5 Supported Interfaces on the Cisco uBR7200 Series Routers (continued)

Product Number¹	Description	Supported Platforms	Cisco IOS Release²
Dynamic Packet Transport (DPT)			
PA-SRP-OC12SMI	2-port OC-12c (STM4c) single-mode fiber, intermediate reach DPT port adapter	Cisco uBR7246, Cisco uBR7246 VXR	Release 12.0(7)SC
PA-SRP-OC12SML	2-port OC-12c (STM4c) single-mode fiber, long reach DPT port adapter	Cisco uBR7246, Cisco uBR7246 VXR	Release 12.0(7)SC
PA-SRP-OC12SMX	2-port OC-12c (STM4c) single-mode fiber, extended reach DPT port adapter	Cisco uBR7246, Cisco uBR7246 VXR	Release 12.0(7)SC
PA-SRP-OC12MM	2-port OC-12c (STM4c) multimode fiber DPT port adapter	Cisco uBR7246, Cisco uBR7246 VXR	Release 12.0(7)SC
Serial			
PA-4T+	4-port synchronous serial port adapter	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-8T-232	8-port EIA/TIA-232 synchronous serial port adapter	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-8T-V35	8-port V.35 synchronous serial port adapter	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-8T-X21	8-port X.21 synchronous serial port adapter	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-4E1G/75	4-port unbalanced (75-ohm) E1-G.703/G.704 synchronous serial port adapter	All Cisco uBR7200 series routers	Release 12.0(12)SC
PA-4E1G/120	4-port balanced (120-ohm) E1-G.703/G.704 synchronous serial port adapter	All Cisco uBR7200 series routers	Release 12.0(12)SC
PA-E3	1-port E3 serial port adapter	All Cisco uBR7200 series routers	Release 12.0(12)SC
PA-T3	1-port T3 serial port adapter	All Cisco uBR7200 series routers	Release 12.0(12)SC
PA-2E3	2-port E3 serial port adapter	All Cisco uBR7200 series routers	Release 12.0(12)SC
PA-2T3	2-port T3 serial port adapter	All Cisco uBR7200 series routers	Release 12.0(12)SC
PA-MC-E3	1 multichannel E3, medium-speed serial interface	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-MC-T3	1 multichannel T3 interface with BNC connectors	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-MC-4T1	1 multichannel DS1/PRI with 4 T1 interfaces (RJ-48C connectors)	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-MC-8T1	1 multichannel DS1/PRI with 8 T1 interfaces (RJ-48C connectors)	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC
PA-MC-8E1/120	1 multichannel E1/PRI with 8 E1 interfaces (RJ-48C connectors)	Cisco uBR7223, Cisco uBR7246	Release 12.0(6)SC

1 Refer to the Documentation CD-ROM, <http://www.cisco.com> , or http://www.cisco.com/public/countries_languages.shtml for the most current list of supported port adapters.

2 This column indicates the minimum required maintenance release for support of the adapter on all platforms mentioned in the column *Platforms Supported*.

3 CES = circuit emulation services.

4 CBR = constant bit rate.

5 PCI = Peripheral Component Interconnect.

Determining the Software Version

To determine the version of Cisco IOS software running on the Cisco uBR7200 series universal broadband router, log in to the router and enter the **show version EXEC** command:

```
Router> show version
Cisco Internetwork Operating System Software
IOS (tm) ubr7200 Software (ubr7200-p-mz), Version 12.0(15)SC1, RELEASE SOFTWARE
```

Upgrading to a New Software Release

For information on upgrading to a new software release, see the *Cisco IOS Software Release 12.0 S Ordering Procedures* product bulletin located on Cisco.com at:

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

Under **Cisco IOS 12.0**, click *Cisco IOS Software Release 12.0 T (#819:0999)*.

This document can also be found on Cisco.com at:

http://www.cisco.com/warp/public/cc/cisco/mkt/ios/rel/120/prodlit/819_pp.htm.

(You must have an account on Cisco.com to access this URL.)

Feature Set Tables

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

Table 6 lists only the cable-specific features and feature sets, with the exception of Management Information Bases (MIBs), supported by the Cisco uBR7200 series in Cisco IOS Release 12.0 SC1 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 Cisco IOS release that first introduced a feature. For example, (6) means a feature was introduced in 12.0(6)SC, and (10) means a feature was first introduced in 12.0(10)SC. If a cell is empty in this column, the feature was included in the initial base release.

Note This feature set table only contains a selected list of features. This table is not cumulative, nor does it list all the features in each image. Features that are not listed are in all images. You can find the most current Cisco IOS documentation on Cisco.com. This set of electronic documents may contain updates and modifications made after the hard-copy documents were printed. If you have a Cisco.com login account, you can find image and release information regarding features prior to Cisco IOS Release 12.0(15)SC1 by using the Feature Navigator tool at: <http://www.cisco.com/go/fn>.

Table 6 Cable-Specific Feature List by Feature Sets for the Cisco uBR7200 Series Routers

Feature	Feature Set				
	In ¹	DOCSIS 2-WAY	DOCSIS 2-WAY W/BPI	DOCSIS 2-WAY IP+	DOCSIS 2-WAY IP+ W/BPI
IP Routing					
Per-Modem Filters	(6)	Yes	Yes	Yes	Yes
Management					
Cisco Call History MIB Command-Line Interface	(6)	Yes	Yes	Yes	Yes
Cisco IOS Internationalization	(6)	Yes	Yes	Yes	Yes
Entity MIB, Phase 1	(6)	Yes	Yes	Yes	Yes
MIB Enhancements	(6)	Yes	Yes	Yes	Yes
Multicast BPI MIB Support	(11)	Yes	Yes	Yes	Yes
SNMPv2C ² and SNMPv3 ³	(6)	Yes	Yes	Yes	Yes
Support for RFC 2665 (Ethernet MIB)	(10)	Yes	Yes	Yes	Yes
Support for RFC 2233 (IF-MIB)	(9)	Yes	Yes	Yes	Yes
Support for RFC 2233 LinkUp/Down Traps	(11)	Yes	Yes	Yes	Yes
Operations					
Support for Dynamic Mobile Hosts	(9)	Yes	Yes	Yes	Yes
Quality of Service (QoS)					
Downstream QoS Handling	(6)	Yes	Yes	Yes	Yes
Downstream Traffic Shaping	(6)	Yes	Yes	Yes	Yes
Upstream Traffic Shaping	(6)	Yes	Yes	Yes	Yes
Improved Upstream QoS	(6)	Yes	Yes	Yes	Yes
QoS Configuration	(6)	Yes	Yes	Yes	Yes
QoS Profile Enforcement	(6)	Yes	Yes	Yes	Yes

Table 6 Cable-Specific Feature List by Feature Sets for the Cisco uBR7200 Series Routers (continued)

Feature	Feature Set				
	In ¹	DOCSIS 2-WAY	DOCSIS 2-WAY W/BPI	DOCSIS 2-WAY IP+	DOCSIS 2-WAY IP+ W/BPI
Security					
Baseline Privacy Interface (BPI) Encryption	(6)	No	Yes	No	Yes
Per-Modem and Per-Host Access List Support	(6)	Yes	Yes	Yes	Yes
Secure Shell (SSH) Support for “k1” Images	(10)	No	Yes	No	Yes

1 This column indicates the maintenance release in which the feature was introduced. For example, (6) means a feature was introduced in 12.0(6)SC, and (7) means a feature was introduced in 12.0(7)SC. If a cell in this column is empty, this feature was introduced in the base release.

2 SNMPv2C = Simple Network Management Protocol version 2C

3 SNMPv3 = Simple Network Management Protocol version 3

New and Changed Information

The following sections list the new hardware and software features supported by the Cisco uBR7200 series routers for Cisco IOS Release 12.0 SC1.

No New Hardware Features in Release 12.0(15)SC1

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(15)SC1.

No New Software Features in Release 12.0(15)SC1

There are no new software features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(15)SC1.

No New Hardware Features in Release 12.0(15)SC

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(15)SC.

No New Software Features in Release 12.0(15)SC

There are no new software features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(15)SC.

No New Hardware Features in Release 12.0(14)SC

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(14)SC.

No New Software Features in Release 12.0(14)SC

There are no new software features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(14)SC.

No New Hardware Features in Release 12.0(13)SC

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(13)SC.

New Software Features in Release 12.0(13)SC

The following CLI and MIB enhancements are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(13)SC.

Cable Downstream Frequency Override CLI

The following new CLI command turns off the cable downstream frequency override on a per-interface basis:

[no] cable downstream override

The default configuration enables the cable downstream frequency override. Only the **[no] cable downstream override** command is displayed and allows the cable downstream frequency override to be turned off.

Enhancements for the “cdxCmtsCmOnOffTrapEnable” Object

The following new CLI commands are supported for the “cdxCmtsCmOnOffTrapEnable” object:

[no] cable enable-trap cmonoff-notification

[no] cable enable-trap cmonoff-interval < time 0 to 86400 >

These commands have the following default settings:

no cable enable-trap cmonoff-notification

no cable enable-trap cmonoff-interval

After the default setting has been changed and the new configuration has been saved, the new configuration will remain active after the CMTS reloads.

Syntax examples:

- **cable enable-trap cmonoff-notification**—This command enables “cdxCmtsCmOnOffNotification” in the RF MAC interface. Alternatively, the user can set the SNMP object “cdxCmtsCmOnOffTrapEnable” to true (1).
- **no cable enable-trap cmonoff-notification**—This command disables “cdxCmtsCmOnOffNotification” in the RF MAC interface. Alternatively, the user can set the SNMP object “cdxCmtsCmOnOffTrapEnable” to false (2).
- **cable enable-trap cmonoff-interval <time 0 to 86400>**—This command sets the interval for “cdxCmtsCmOnOffNotification” sent by the CMTS for one online/offline CM state change when “cdxCmtsCmOnOffTrapEnable” is set to true (1). Alternatively, the user can set the SNMP object “cdxCmtsCmOnOffTrapInterval” to the same time value.

- **no cable enable-trap cmonoff-interval**—This command sets the interval “cdxCmtsCmOnOffNotification” to 0 so that “cdxCmtsCmOnOffNotification” will be sent for every online/offline CM state change when “cdxCmtsCmOnOffTrapEnable” is set to true (1). Alternatively, the user can set the SNMP object “cdxCmtsCmOnOffTrapInterval” to 0.

Note The default for “cdxCmtsCmOnOffTrapInterval” is 0.

Enhancements for DOCS-IF-MIB

For an MC16E cable modem card in ANNEX-A mode, DOCS-IF-MIB is compliant with Euro-DOCSIS; for any other cable modem card (that is, any “non-E” cable modem card), DOCS-IF-MIB is compliant with DOCSIS.

The “docsIfUpChannelFrequency” object now shows the actual frequency (instead of the configured frequency) for an Euro-DOCSIS-compliant cable modem card, while it shows the configured frequency for a DOCSIS-compliant cable modem card.

The following new CLI command allows the default-compliance mode (that is, actual frequency for Euro-DOCSIS or configured frequency for DOCSIS) of the “docsIfUpChannelFrequency” object to be changed:

test cable docs-if-mib [show | change option-code]

In this command, **show** indicates the current compliance-mode, while **change option-code** can have a value of 1, 2, or 3:

- **test cable docs-if-mib 1** sets the compliance-mode to default
- **test cable docs-if-mib 2** sets the compliance-mode to DOCSIS (independent from the cable modem card)
- **test cable docs-if-mib 3** sets the compliance-mode to Euro-DOCSIS (independent from the cable modem card)

No New Hardware Features in Release 12.0(12)SC

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(12)SC.

New Software Features in Release 12.0(12)SC

The following MIB enhancements are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(12)SC.

MIB Enhancements

Prior to Release 12.0(12)SC, DOCS-IF-MIB was only DOCSIS-compliant. Release 12.0(12)SC adds Euro-DOCSIS compliance to DOCS-IF-MIB.

For an MC16E cable modem card in ANNEX A mode, DOCS-IF-MIB is compliant with Euro-DOCSIS; for any other cable modem card (that is, any “non-E” cable modem card), DOCS-IF-MIB is compliant with DOCSIS.

No New Hardware Features in Release 12.0(11)SC

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(11)SC.

New Software Features in Release 12.0(11)SC

The following new software features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(11)SC.

Multicast BPI MIB Support

Because a multicast Service Identifier (SID) on CMTS will not be determined until the CMTS receives an Internet Group Management Protocol (IGMP) join request from a host, there are some limitations that apply to “docsBpiIpMulticastServiceId” and “docsBpiMulticastServiceId”:

- docsBpiIpMulticastServiceId
 - It is read-only.
 - Zero is its value when no (SID) is assigned to it.
 - Zero is its value when its sibling “docsBpiIpMulticastPrefixLength” is less than 32.
- docsBpiMulticastServiceId
 - Value must derive from multicast SIDs created when the CMTS handled IGMP join requests.

Support for RFC2233 LinkUp/Down Traps

The objects in the varbind list based on the Internet Engineering Task Force (IETF) standard are defined in IF-MIB. Since IF-MIB supports subinterfaces, all objects in this varbind list are also supported for subinterfaces. The feature allows the user to specify the LinkUp/Down trap varbind list to be based on a Cisco-specific or IETF standard with a new command line interface (CLI) configuration command:

```
snmp-server link-trap [cisco | ietf]
```

The default is a Cisco-specific link trap (**snmp-server link-trap cisco**). The user can switch between Cisco and IETF standard.

SNMP Objects for Clear Host, Clear Cable Modem, and Show Current CPEs

Clearing host or cable modems (CMs) can be done via “cdxCmCpeResetNow” MIB object. Displaying the number of current CPEs can be done via “cdxCmtsCmCurrCpeNumber” MIB object.

No New Hardware Features in Release 12.0(10)SC1

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(10)SC1.

No New Software Features in Release 12.0(10)SC1

There are no new software features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(10)SC1.

No New Hardware Features in Release 12.0(10)SC

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(10)SC.

New Software Features in Release 12.0(10)SC

The following new software features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(10)SC.

Secure Shell (SSH) Supported in “k1” Images for Cisco uBR7200

In Cisco IOS Release 12.1 T, the definition of “k1” images for Cisco uBR924 cable access routers was changed from support for BPI only, to also include support for Secure Shell (SSH). This change caused an inconsistency with Cisco uBR7200 series images, since the definition of “k1” for the Cisco uBR7200 was not changed and did not include SSH.

In Cisco IOS Release 12.0(10)SC, the Cisco uBR7200 series “k1” images now support SSH.

Cisco uBR7200 series universal broadband routers support the Cisco IOS Firewall feature. This feature set offers Network Address Translation (NAT) and is designed to prevent unauthorized, external access to your internal network, blocking attacks on your network, while still allowing authorized users to access network resources. This feature is described in detail in the *Cisco IOS Firewall Feature Set* feature module, available on Cisco.com and the Documentation CD-ROM. As of Cisco IOS Release 12.0(10)SC, SSH is a part of the Cisco IOS Firewall feature set.

No New Hardware Features in Release 12.0(9)SC

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(9)SC.

New Software Features in Release 12.0(9)SC

The following new software features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(9)SC.

Dynamic Mobile Hosts

When an existing cable modem is swapped with a new one, such as a field replacement, the Media Access Control (MAC) address for the PC will be associated with the old cable modem. This could also happen if a PC is moved from one cable modem to another.

This feature allows the CMTS administrator to bring up a PC behind one CM, then move it to another CM. Software adds information for the hosts involved in host tables. To prevent security breaches, the software supports pinging the host using the old SID to verify that it has indeed been moved.

DHCP server is used to verify addresses and can be configured with the **cable source-verify dhcp** command; the **no cable arp** command should be configured in the CMTS to prevent it from sending ARP requests.

Support DOCSIS OSSI Required Objects in RFC 2665 for Cisco uBR7200 Series Routers

Cisco uBR7200 series routers support the required objects in RFC 2665 for DOCSIS Operations Support System Interface (OSSI) compliance now.

- A new MIB file ETHERLIKE-MIB.my that matches RFC 2665 is added.
- The following new objects are now supported in ETHERLIKE-MIB:
 - dot3StatsSymbolErrors
 - dot3StatsDuplexStatus
- Two new tables in RFC2665 are not yet supported:
 - dot3ControlTable
 - dot3PauseTable
- Also, “dot3CollTable” is not yet supported.

Support DOCSIS OSSI Required Objects in RFC 2233 for Cisco uBR7200 Series Routers

Cisco uBR7200 series routers support the required objects in RFC 2233 for DOCSIS OSSI compliance now.

- IF-MIB.my is updated to match RFC 2233.
- The following new object is now supported:
 - ifCounterDiscontinuityTime

No New Hardware Features in Release 12.0(8)SC1

There are no new hardware features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(8)SC1.

No New Software Features in Release 12.0(8)SC1

There are no new software features supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(8)SC1.

New Hardware Features in Release 12.0(8)SC

The following new hardware features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(8)SC.

Cable Modem Card (MC16E)

The MC16E cable modem card provides one downstream and six upstream connections to the cable network, similar to the MC16C cable modem card, except that it supports the ITU J.83 (Annex A) physical layer and the proposed EuroDOCSIS (Annex A) standard (Cable Labs ECR RFI-R-98036). The MC16E card has the following differences from the current MC16C card:

- Downstream 36.125 MHz interface, with an 8 MHz DAVIC/DVB channel width and interleave factor of I=12, J=17
- Downstream symbol rate of 6.592 Msymbols/sec at 256-QAM

- Downstream channel range of 85 to 860 MHz
- Upstream channel range from 5 to 65 MHz
- Supported in the Cisco uBR7200 series MIBs
- Supports EuroDOCSIS-compliant cable modems and set-top boxes (STBs)

New Software Features in Release 12.0(8)SC

The following new software features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(8)SC.

Deferral Notice for Cisco IOS Release 12.0(8)SC

The following defect has caused all images in the Cisco IOS Release 12.0(8)SC to be deferred:

- CSCdp73826 Bus error at “cmts_delete_sid_state”

To prevent this potential hazard to customer networks, Cisco Systems Inc. has deferred and removed the affected images from Cisco.com.

If you already have this image in your network, please replace it with images from the Cisco IOS Release 12.0(8)SC1 release, currently available on Cisco.com.

Cable Interface Bundling

Cable interface bundling allows a service provider to share one IP subnet across multiple cable interfaces that are grouped into a cable interface bundle. All of the cable interfaces on a Cisco uBR7200 series universal broadband router can be grouped into a single bundle so that only one subnet is required for each router. This eliminates the requirement that a separate IP subnet be used for each individual cable interface. This in turn avoids the performance, memory, and security problems that would result if a bridging solution were used to manage the subnets, especially for a large number of subscribers.

Two new Cisco IOS interface commands implement this feature:

- **cable bundle** *number* [**master**]—Configures cable interfaces into bundles.
- **show cable bundle** *number* **forwarding-table**—Displays all the currently known cable devices in the bundle.

New Hardware Features in Release 12.0(7)SC

The following new hardware features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(7)SC.

IEEE 802.3z Gigabit Ethernet Port Adapter

The IEEE 802.3z Gigabit Ethernet Port Adapter (PA-GE) is a single-port adapter that provides a full-duplex, IEEE 802.3z compliant Gigabit Ethernet (GE) interface. The PA-GE is supported on the Cisco uBR7246 VXR universal broadband router; it is not supported on the Cisco uBR7223 and Cisco uBR7246 routers.

The PA-GE port adapter supports the following IEEE 802.3z interfaces:

- 1000BaseSX—Full-duplex operation with short-wavelength (850-nm) devices over multimode optical fiber.

- 1000BaseLX—Full-duplex operation with long-wavelength (1300-nm) devices over multimode or single-mode optical fiber.
- 1000BaseLX called Long Haul (LH)—This enhancement to the IEEE 802.3z standard complies with the IEEE 802.3z 1000BaseLX specification but extends the transmission distance up to 6.21 miles (10 km).

Note The PA-GE requires optical fiber cable and a Gigabit Interface Converter (GBIC) appropriate to the interface being used.

Network Processing Engines (NPE-300)

In addition to the previously supported network processing engines (NPE), Cisco IOS Release 12.0(7)SC or later images support the NPE-300 card. The NPE-300 has an RM7000 RISC microprocessor that operates at an internal clock speed of 262 MHz. The microprocessor has three levels of cache: a primary cache (32 KB, divided equally between instruction and data) and a secondary unified cache (256 KB, used for both data and instructions) that are internal to the microprocessor, and a third external cache (2 MB) that provides additional high-speed storage for both data and instructions.

The NPE-300 uses SDRAM (64 MB to 256 MB) for code, data, and packet storage. The card boots from its onboard Boot ROM (512 KB), so it does not require an upgrade to the Boot ROM on the I/O controller.



Caution The NPE-300 card is supported only on the Cisco uBR7246 VXR chassis when using Cisco IOS Releases 12.0(7)SC or later SC images. Also, the NPE-300 card does not support the original MC11-FPGA modem card, so you must use the MC11C modem card or other current modem card (see the “Cable Modem Cards” section on page 7).

For information on replacing the network processing engine, see *Network Processing Engine Replacement Instructions*, available on Cisco.com and the Documentation CD-ROM.

PA-SRP-OC12SMI, PA-SRP-OC12SML, PA-SRP-OC12SMX, and PA-SRP-OC12MM

The OC-12c dynamic packet transport (DPT) port adapters are dual-width OC-12c port adapters that provide a shared IP over Synchronous Optical Network (SONET) capability. The DPT port adapters are available in four models: single-mode fiber intermediate reach, single-mode fiber long reach, single-mode fiber extended reach, and multimode fiber.

The DPT port adapters provide the Cisco uBR7246 universal broadband router with two SC duplex ports. Each SC duplex port provides the physical connection to a device in a SONET OC-12 DPT ring. DPT rings can also be connected to SONET add-drop multiplexers (ADMs), thus allowing for the creation of small or very large DPT rings.

Note The DPT port adapters cannot be used on the Cisco uBR7223 universal broadband router. The DPT port adapters require Cisco IOS Release 12.0(7)SC or later SC releases.

Cisco uBR7246 VXR Chassis

Cisco IOS Release 12.0(7)SC or later images support the Cisco uBR7246 VXR chassis, a high-performance platform that contains four slots for cable modem cards, two port adapter slots (supporting either two single-width or one dual-width port adapter), one slot for an input/output (I/O) controller card, and one slot for the NPE-300 high-performance network processing engine (NPE). An additional slot is available for a national clock card (which is not yet released). The Cisco uBR7246 VXR also supports dual power supplies; the second power supply is optional but provides redundancy and load-sharing capabilities.

Note The Cisco uBR7246 VXR router does not support the original MC11-FPGA cable modem card, and the NPE-150 and NPE-200 processor cards.

No New Software Features in Release 12.0(7)SC

There are no new software features supported by the Cisco uBR7200 series in Cisco IOS Release 12.0(7)SC.

New Hardware Features in Release 12.0(6)SC

The following new cable modem cards are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(6)SC.

Cable Modem Cards (MC12C and MC14C)

The software for the MC12C and MC14C cable modem cards is a driver running on the Cisco uBR7200 series universal broadband routers. Using a Protocol Control Information (PCI) interface, the universal broadband router line card software interacts with the cable modem card. Data is passed back and forth, as direct memory access (DMA) transfers, from the Cisco uBR7200's memory to the cable modem card.

Additionally, the MC12C and MC14C cable modem cards support universal broadband router line card management and control with the modem card Management Information Bases (MIBs), Media Access Control (MAC) control software, and logical link management software based on DOCSIS standards.

Cable Modem Card (MC16B)

The MC16B cable modem card is available for the Cisco uBR7200 series universal broadband router. The software for the MC16B modem card is a driver running on the router and interacts with the card using a PCI interface. Data is passed back and forth, using direct memory access (DMA) transfers, from the Cisco uBR7200 memory to the MC16B card.

Additionally, the MC16B card supports universal broadband router line card management and control with the MC16 MIB, MAC control software, and logical link management software based on MCNS standards.

For more information, refer to the *Update to the Cisco uBR7200 Series Cable Modem Card Installation and Configuration for the MC16B EFT Card* publication.

Cable Modem Card (MC16C)

The software for the MC16C cable modem card is a driver running on the Cisco uBR7200 series universal broadband routers. Using a PCI interface, the universal broadband router line card software interacts with the MC16C cable modem card. Data is passed back and forth, as DMA transfers, from the Cisco uBR7200's memory to the MC16C cable modem card.

Additionally, the MC16C cable modem card supports line card management and control with the MC16C MIB, MAC software, and logical link management software based on DOCSIS standards.

For more information, refer to the *Cisco uBR7200 Series Cable Modem Card Installation and Configuration* and *Update to the Cisco uBR7200 Series Cable Modem Card Installation and Configuration for the MC16C Cards* publications.

New Software Features in Release 12.0(6)SC

The following new software features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.0(6)SC.

Baseline Privacy Interface MIB

Cisco uBR7200 series universal broadband routers now include support for the DOCSIS Baseline Privacy Interface (BPI) MIB. This allows an SNMP manager to monitor and manage the router's BPI configuration, including whether BPI is enabled, status of current authorization keys, current timeout values, real-time status counters, and additional information about authorization errors.

Note The SNMP manager must load the DOCS-BPI-MIB.my MIB to access the BPI attributes.

Downstream Frequency Override

This feature allows Cisco uBR7200 series universal broadband routers to change the downstream frequency for any or all cable modems, overriding the DOCSIS configuration file settings.

Additional or Changed Show Commands

The Cisco uBR7200 series universal broadband routers contain the following additional or changed **show** commands:

- The **show cable qos** command is changed to **show cable qos profile n** command, where the optional argument *n* can be used to display a specific profile.

Note The release notes up to and including Cisco IOS Release 12.0(12)SC stated that the **show cable qos** command was changed to **show cable qos-profile n** command, with a hyphen between "qos" and "profile". This was incorrect.

- The **show int cx/y sid** command displays more complete Service ID (SID) status information.
- The **show cable modem** command displays a list of options for a single modem to be specified by entering either the cable modem's IP address or MAC address.
- The **show cable burst-profile** command has been removed. Its functions have been incorporated into the **show cable modulation-profile** command, which now includes an added option *number* that displays the modulation profile *number*.

Burst Profile Configuration

For each modulation/burst profile configuration, Cisco uBR7200 series universal broadband routers will support burst profile number, burst profile interval usage code, burst type, preamble length and unique word length, differential encoding enable/disable, forward error correction (FEC) correctable bytes value, FEC code word length, scrambler seed value, maximum burst size, guard time size, last code word shortened/lengthened, and scrambler enable/disable.

Note Multiple burst profiles are supported on the MC11C, MC12C, MC14C, MC16B, and MC16C cable modem cards. Only one profile is supported on the original MC11-FPGA card.

DHCP Client ID/Remote ID Options

This feature—also known as the Customer Premises Equipment (CPE) Limitation—allows Cisco uBR7200 series universal broadband routers to report and limit the number of CPEs that can use the cable modem to access the cable network.

Note This feature is separate from the cable modem's ability to support multiple CPE devices. For example, depending on the Cisco IOS software release being used, Cisco uBR900 series cable access routers can support a maximum of either 3 or 254 CPE devices. Also, by default, a DOCSIS-based cable modem supports one CPE device, but this can be changed by modifying the MAX CPE parameter in the modem's DOCSIS configuration file.

DHCP Cable Modem Host ID

This feature—also known as Cable Modem and Host Subnet Addressing—allows the Cisco uBR7200 series universal broadband router to set the GIADDR field of DHCPDISCOVER and DHCPREQUEST packets with a Relay IP address to help automate the provisioning of cable modems on systems that use multiple IP subnets. The **cable dhcp-giaddr [policy | primary]** command enables this feature on a per-interface basis.

DOCSIS 1.0 Quality of Service

The Cisco uBR7200 series universal broadband routers support quality of service (QoS) as defined by the DOCSIS 1.0 specification. Service class profiles can be configured through the command-line interface to support the QoS profile number, traffic priority, maximum upstream bandwidth, guaranteed upstream bandwidth, maximum downstream bandwidth, maximum transmit burst length, baseline privacy enable/disable, and type of service (ToS) overwrite byte.

QoS Profile Enforcement allows cable modem termination system (CMTS) operators to control the QoS to eliminate any interference from improper local-rate limiting implemented on the cable modem. The CMTS provisions a registering cable modem with a default DOCSIS 1.0 service class assigned by the operator, overriding any service class that previously existed on the modem. This service class has no upstream or downstream rate limits, so that the CMTS can do traffic shaping based on the QoS profile enforced by the operator.

The following commands are available on Cisco uBR7200 series universal broadband routers to update the QoS table:

- **create-snmp**—Permit creation of QoS table entries by SNMP
- **modems**—Permit creation of QoS table entries by modem registration requests
- **update-snmp**—Permit dynamic update of QoS table entries by SNMP

Downstream Channel ID

This feature allows all cable modems in an HFC network to identify themselves via unique downstream channel IDs instead of their downstream frequencies.

Downstream Rate Shaping with IP Type of Service Bits

Cisco uBR7200 series routers support downstream data rate shaping on a per-modem basis. The Type of Service (ToS) bits in the IP packet header can be set to specify that packet's class of service, allowing packets for certain traffic flows (such as VoIP) to be given precedence over packets for other flows (such as data).

Downstream rate shaping with ToS bits allows you to configure multiple data rates for a given modem. Also, by specifying a maximum data rate for a particular ToS, you can override the common maximum downstream data rate. Packets that contain ToS bytes that have not been configured for downstream data rates continue to use the common data rate limits.

Prior releases set the ToS bits to zero; however, with the advent of virtual private network (VPN) and QoS applications, it is desirable to copy the ToS bits when the router encapsulates the packets using generic routing encapsulation (GRE). Thus, intermediate routers between tunnel endpoints can also take advantage of QoS features such as weighted fair queuing (WFQ) and weighted random early detection (WRED).

Encrypted Baseline Privacy Key Exchange

Baseline privacy extensions permit the encryption of data transferred between the cable modem and the Cisco uBR7200 series universal broadband router. The key management protocol defined by baseline privacy allows Cisco uBR7200 series universal broadband routers to provide two types of keys to cable modems. The Key Exchange Key (KEK) decrypts the Traffic Exchange Keys (TEK). The TEK is the key used to encrypt and decrypt data packets.

Management Information Base Enhancements

The Management Information Base (MIB) support in the Cisco uBR7200 series universal broadband routers provides much of the same ability to configure the router as using CLI commands at the router's console port. Additionally, the Radio Frequency (RF) Interface MIB has changed to improve the object support for traps and to add the following QoS and service class support:

- “docsIfUpChannelFrequency” now has a range starting with 0, where 0 indicates that the frequency is unknown or not specified.
- “docsIfUpChannelWidth” now has a range of 0–16 MHz. The value of 0 means the channel width is unknown or not configured.
- “docsIfQosProfileTable” is now read-create.
- “docsIfQosProfBaselinePrivacy” is a new object.
- “docsIfQosProfStatus” is a new object.
- “docsIfCmtsQosProfilePermissions” is a new object.
- “docsIfCmtsCmStatusValue” is a new object.

Per-Modem Filters

This feature—also known as Per-Modem and Per-Host Access Lists—allows Cisco uBR7200 series universal broadband routers to filter incoming packets from individual hosts or cable modems based on the source MAC or IP address. This allows access lists to be specified on a per-interface or a per-address basis.

Spectrum Management Enhancements

The following spectrum management enhancements are available in the Cisco uBR7200 series universal broadband routers:

- An expanded range of channel widths in addition to the fixed 1.6 MHz channel width that was supported in earlier software releases.
- Frequency hopping—The following techniques for frequency hopping can be used when no clean frequency band is available: blind hopping, time scheduled, combination blind and time scheduled, and guided frequency.
- Flapping Modem Detector—The Cisco uBR7200 series universal broadband router maintains a flap list containing the MAC address for each cable modem having problems maintaining its connection. (A “flapping modem” is a cable modem that rapidly disconnects and reconnects to the CMTS.)
- Modem Flap-List—Supports new **clear cable modem flap-list** command.
- State Change Logging—Supports new **show cable modem flap-list** command.
- Multiple upstream ports in a single spectrum group—Supports new **cable spectrum-group [number] shared** command.

Upstream Address Verification

This feature prevents the spoofing of IP addresses by verifying the IP address against the cable modem’s MAC address. The **cable source-verify [dhcp]** cable interface command specifies that DHCP lease query requests are sent to verify any unknown source IP address found in upstream data packets. This feature requires a DHCP server that supports the new LEASEQUERY message type.

Upstream and Downstream Traffic Shaping

This feature was introduced in Cisco IOS Release 12.0(6)SC. The Cisco uBR7200 series universal broadband router supports buffering both upstream and downstream grants to cable modems that are exceeding their allocated bandwidth. This strategy helps to avoid the TCP timeouts and the retransmission of the associated packets that would further degrade overall throughput.

Previously, whenever a cable modem was found to be exceeding its configured peak upstream or downstream rate, the Cisco uBR7200 series universal broadband router would simply drop the bandwidth requests from that cable modem until it could be allowed to send more data.

The **cable downstream *port number* rate-limit token-bucket shaping** and **cable upstream *port number* rate-limit token-bucket shaping** commands configure the Cisco uBR7200 series universal broadband router to perform rate shaping by buffering the grants for rate-exceeded modems.

Cisco IOS SNMPv3

Cisco IOS Release 12.0(6)SC implements the latest revision (version 3) of the Simple Network Management Protocol (SNMPv3), which builds on top of the previous SNMPv1 and SNMPv2 versions of the protocol to provide a much more secure network environment. SNMPv3 also improves the remote configuration of the SNMP entities, which makes the remote administration of SNMP agents, such as cable modems, a much simpler task.

SNMPv3 uses the concept of an engine to link specific applications and security features with a group of SNMP entities. Each SNMP entity has an EngineID identifier, and SNMP communication is possible only when an SNMP entity knows the EngineID identity of its peer SNMP device.

SNMPv3 provides for synchronization between SNMP entities so that any management requests that appear outside of the synchronization windows are rejected. Security is also enhanced by the use of a user-based security model (USM) that provides message encryption to protect against the following types of attacks on the network:

- Modification of information—Protection against some unauthorized SNMP entity altering in-transit SNMP messages generated on behalf of an authorized principal
- Masquerade—Protection against attempting management operations not authorized for some principal by assuming the identity of another principal that has the appropriate authorizations
- Message Stream Modification—Protection against messages being maliciously reordered, delayed, or replayed in order to effect unauthorized management operations
- Disclosure—Protection against eavesdropping on the exchanges between SNMP engines. Three different types of communication mechanisms are available for this protection strategy:
 - Communication without authentication and privacy (NoAuthNoPriv)
 - Communication with authentication and without privacy (AuthNoPriv)
 - Communication with authentication and privacy (AuthPriv)

The SNMPv3 protocol is defined by RFC 2570, RFC 2571, RFC 2572, RFC 2573, RFC 2574, and RFC 2575.

Use the **ip flow-cache**, **ip flow-export**, and **ip route-cache** commands to configure Netflow Switching. See the *Cisco IOS Release 12.0 Cisco IOS Switching Services Configuration Guide* on the Documentation CD-ROM and Cisco.com for more details.

Generic MIBs

The addition of the CISCO-PROCESS-MIB and changes to the CISCO-MEMORY-POOL-MIB will allow you to retrieve more CPU and memory statistics. The CISCO-CALL-HISTORY-MIB will let you retrieve call information for accounting purposes.

MIBs

Current MIBs

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

The uBR7200 series universal broadband routers support the following categories of MIBs:

- **SNMP standard MIBs**—These are the MIBs that are required by any agent supporting SNMPv1 or SNMPv2 network management.
- **Cisco’s platform and network-layer enterprise MIBs**—Common across most of Cisco’s router platforms. If your network management applications are already configured to support other Cisco routers, such as the 2600 series or 7200 series, no further configuration is needed unless the version of Cisco IOS software being used has updated these MIBs.
- **Cable-specific MIBs**—Provide information about the cable interfaces and related information on the uBR7200 series routers. They include both DOCSIS-specific MIBs and Cisco-specific enterprise MIBs. If your network management applications have not already been configured for the uBR7200 series routers, these MIBs must be loaded.
- **Deprecated MIBs**—Supported in earlier releases of Cisco IOS software but have been replaced by more standardized, scalable MIBs. Network Management applications and scripts should convert to the replacement MIBs as soon as possible.

The Cable Specific MIBs and Deprecated and Replaced MIBs are described in the following sections. For information on the SNMP standard MIBs and Cisco’s platform and network-layer enterprise MIBs, see Cisco’s MIB website at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

Cable Specific MIBs

Table 7 shows the cable-specific MIBs that are supported on the Cisco uBR7200 series universal broadband routers, including both DOCSIS-specific MIBs and SNMP standard MIBs common across most of Cisco’s router platforms. The table also provides a brief description of each MIB’s contents and the Cisco IOS Software Release in which the MIB was initially functional—earlier releases might have had unsupported prototype versions of the MIB; later releases might have added new attributes and functionality. Because of interdependencies, the MIBs must be loaded in the order given in the table.

Note The names given in Table 7 are the filenames for the MIBs as they exist on Cisco’s FTP site (<ftp://ftp.cisco.com/pub/mibs/> or <http://www.cisco.com/public/mibs>). Most MIBs are available in both SNMPv1 and SNMPv2 versions; the SNMPv1 versions have *V1SMI* as part of their filenames.

Table 7 Cable-specific MIBs Supported on the Cisco uBR7200 Routers

MIB Filename	Description	Release
SNMPv2-SMI.my SNMPv2-SMI-V1SMI.my	This module specifies the Structure of Management Information (SMI) for SNMPv2, as defined in RFC 1902.	12.0(6)SC
SNMPv2-TC.my SNMPv2-TC-V1SMI.my	This module defines the textual conventions as specified in RFC 1903.	12.0(6)SC
SNMPv2-MIB.my	This module provides for the exchange of messages that convey management information between the agents and the management stations, as defined in RFC 1907.	12.0(6)SC
CISCO-SMI.my CISCO-SMI-V1SMI.my	This module specifies the SMI for Cisco’s enterprise MIBs.	12.0(6)SC

Table 7 Cable-specific MIBs Supported on the Cisco uBR7200 Routers (continued)

MIB Filename	Description	Release
CISCO-TC.my CISCO-TC-V1SMI.my	This module defines the textual conventions used in Cisco's enterprise MIBs.	12.0(6)SC
IF-MIB.my IF-MIB-V1SMI.my	This module describes generic objects for the Layer 3 network interface sublayers. This MIB is an updated version of MIB-II's <i>if</i> table, and incorporates the extensions defined in RFC 2233.	12.0(6)SC 12.0(9)SC 12.0(11)SC
ETHERLIKE-MIB.my	This module defines managed objects for the Ethernet-like interface types, as defined in RFC 2665.	12.0(9)SC
BRIDGE-MIB.my	This module supports all objects, tables, and groups except "dot1dBasePortTable", "dot1dTpPortTable", and "dot1DStaticGroup", as defined in RFC 1493. Not supported in ubr7200-p-mz and ubr7200-ps-mz images.	12.0(9)SC
UDP-MIB.my	This module defines managed objects for managing implementations of the User Datagram Protocol (UDP), as defined in RFC 2013.	12.0(6)SC
RFC1213-MIB.my	This module defines managed objects for managing implementations of the Internet Protocol (IP) and its associated Internet Control Message Protocol (ICMP), as defined in RFC 2011.	12.0(6) SC
DOCS-IF-MIB.my DOCS-IF-MIB-V1SMI.my	This module describes the DOCSIS-compliant Radio Frequency (RF) interfaces in cable modems and cable modem termination systems, as defined in RFC 2670.	12.0(8)SC
DOCS-BPI-MIB.my	This module—available in an SNMPv2 version only—describes the attributes for the DOCSIS-specified Baseline Privacy Interface (BPI) on cable modems and the CMTS.	12.0(9)SC 12.0(11)SC
CISCO-DOCS-EXT-MIB.my CISCO-DOCS-EXT-MIB-V1SMI.my	This module extends the DOCSIS standard RFI MIB (DOCS-IF-MIB) with Cisco-specific extensions, such as QoS attributes and connection status and other information regarding the cable modems and CPE devices supported by the CMTS.	12.0(6)SC
CISCO-CABLE-SPECTRUM-MIB.my CISCO-CABLE-SPECTRUM-MIB-V1SMI.my	This module describes the spectrum management flap-list attributes.	12.0(6)SC

Deprecated and Replaced MIBs

A number of older Cisco-provided MIBs have been replaced with more scalable, standardized MIBs; the MIBs have filenames that start with "*OLD*" and first appeared in Cisco IOS Release 10.2. The functionality of these MIBs has already been incorporated into replacement MIBs, but the old MIBs are still present to support existing Cisco IOS products or Network Management System (NMS) applications. However, because the deprecated MIBs will be removed from support in the future, you should update your network management applications and scripts to refer to the table names and attributes that are found in the replacement MIBs.

Table 8 shows the deprecated MIBs and their replacements. In most cases, SNMPv1 and SNMPv2 replacements are available, but some MIBs are available only in one version. A few of the deprecated MIBs do not have replacement MIBs; support for these MIBs will be discontinued when Cisco IOS software no longer supports the corresponding feature set.

Table 8 Replacements for Deprecated MIBs

Deprecated MIB	Replacement MIBs	
	SNMPv1 MIB	SNMPv2 MIB
OLD-CISCO-APPLETALK-MIB	RFC1243-MIB	
OLD-CISCO-CHASSIS-MIB	ENTITY-MIB-V1SMI.my	ENTITY-MIB
OLD-CISCO-CPU-MIB		CISCO-PROCESS-MIB.my
OLD-CISCO-DECNET-MIB		
OLD-CISCO-ENV-MIB	CISCO-ENVMON-MIB-V1SMI.my	CISCO-ENVMON-MIB
OLD-CISCO-FLASH-MIB	CISCO-FLASH-MIB-V1SMI.my	CISCO-FLASH-MIB
OLD-CISCO-INTERFACES-MIB	IF-MIB-V1SMI.my CISCO-QUEUE-MIB-V1SMI.my	IF-MIB CISCO-QUEUE-MIB
OLD-CISCO-IP-MIB		
OLD-CISCO-MEMORY-MIB	CISCO-MEMORY-POOL-MIB-V1SMI.my	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-V1SMI.my	CISCO-CONFIG-COPY-MIB
OLD-CISCO-TCP-MIB	CISCO-TCP-MIB-V1SMI.my	CISCO-TCP-MIB
OLD-CISCO-TS-MIB		
OLD-CISCO-VINES-MIB	CISCO-VINES-MIB-V1SMI.my	CISCO-VINES-MIB
OLD-CISCO-XNS-MIB		

Note Some of the MIBs listed in Table 8 represent feature sets that are not supported on Cisco uBR7200 series universal broadband routers.

Limitations and Restrictions

Cisco IOS Release 12.0(15)SC1 for the Cisco uBR7200 series universal broadband routers contains the following limitations and restrictions. Unless otherwise indicated, these limitations and restrictions apply to all previous software releases as well.

Distinguishing Between Cable Modems

The MC16E cable modem card cannot distinguish between EuroDOCSIS cable modems and set-top boxes (STBs).

Online Insertion and Removal of Cable Modem Cards

When replacing a cable modem card using online insertion and removal (OIR), Cisco recommends you use the **shutdown** interface command on the card's interfaces before removing the card. After inserting the replacement card, use the **no shutdown** command to reenable the card's interfaces.

This is especially important when replacing the cable modem card that supplies the MAP timer. If you remove this cable modem card without using the **shutdown** command, it disables the MAP timer and causes all cable modems attached to the Cisco uBR7200 series router to go offline. The

Important Notes

shutdown command, however, transfers the MAP timer function to the next available cable modem card, so that the cable modems attached to the other interfaces are not affected by the OIR of this particular cable modem card.

Note Use the **show controller** command to display which cable modem card is supplying the MAP timer.

Port Adapter Support for Cisco uBR7246 VXR

The port adapters shown in Table 9 must be at the indicated hardware revision levels to be used in the Cisco uBR7246 VXR router. If an earlier revision level of one of these port adapters is installed in a Cisco uBR7246 VXR router, the port adapter is disabled and the following error message is displayed:

```
%PA-3-REVNOTSUPPORTED: PA in slot x (xxxx) requires base h/w revision of (x.xx) for this chassis
```

Table 9 Minimum Required Hardware Revision for Port Adapters Installed in the Cisco uBR7246 VXR Router

Port Adapter	Required Hardware Revision	Minimum Part Number
PA-4E	1.14	800-02070-04
PA-8E	1.14	800-02069-04
PA-H	1.17	800-02747-06
PA-2H	1.3	800-03306-02

Note The Cisco uBR7223 and Cisco uBR7246 routers are not affected by this note and do not require these revision levels. Port adapters not shown in Table 9 are supported as described in the section “Port Adapter Cards” on page 8.

Signal-Noise Ratio Statistics

The Signal-Noise Ratio (SNR) output in the **cable show controller** command is supported only on the MC11C, MC12C, MC14C, and MC16C cable modem cards. Although this command might display SNR statistics for some versions of the MC16B cable modem card, that output should be disregarded.

Important Notes

The following sections contain important notes about Cisco IOS Release 12.0(15)SC1 that apply to Cisco uBR7200 series universal broadband routers.

Cable Bundling

To reduce the number of subnets consumed per Cisco CMTS, cable interface bundling is used. Multiple cable interfaces can share a single IP subnet. An IP subnet is required for each bundle. You can bundle all cable interfaces on a Cisco CMTS into a single bundle.

Note Cable interface bundling is applicable only in two-way cable configurations. It is not supported in telco-return configurations.

Using the CLI, first configure a master interface for a cable interface bundle. The master interface has an IP address assigned and is visible for IP routing functionality. After you configure the master interface, add additional cable interfaces to the same interface bundle. Those interfaces must not have an IP address assigned. You can also configure multiple bundle interfaces.

Use the following commands to configure and view cable interface bundles:

[no] cable bundle n master

show cable bundle

Up to four interface bundles can be configured. In each bundle, specify exactly one interface as the master interface, using the "master" keyword. In the case of a subinterface over a cable bundle, 'x' is the interface number of the bundle master [1]. The subinterface number starts from 1.

Caution Configure an IP address on the master interface only. An attempt to add an interface to a bundle will be rejected if an IP address is configured and the interface is not specified as a master interface. When bundling cable interfaces, only the interface configured to be the bundle master is allowed to have subinterfaces. An interface that has subinterface(s) defined over it will not be allowed to be part of a bundle. MIB objects on cable interface bundles are not supported as of the date of this publication.

For more information on cable bundling, see the chapter *Understanding System Operations of the Cisco uBR7200 Series Software Configuration Guide*.

Configuring the Routing Protocol Causes a Reset of the Cable Modems

Be aware that when configuring a routing protocol on a Cisco uBR7200 series cable interface, the Cisco IOS software must reset the interface to enable the change. This in turn causes all cable modems on that particular downstream to reinitialize, potentially interfering with data transmission on that downstream. Therefore you should use the interface configuration commands, such as **router rip**, on a cable interface only when a minimum of subscribers would be affected.

Deferral Notice for Cisco IOS Release 12.0(10)SC

The following defect has caused all images in the Cisco IOS Release 12.0(8)SC to be deferred:

- CSCdr38877: Crash with bus error at "cmts_sid_modified"
- CSCdr36952: <http://router-ipaddr/%> crashes router hard

To prevent this potential hazard to customer networks, Cisco Systems Inc. has deferred and removed the affected images from Cisco.com.

If you already have this image in your network, please replace it with images from the Cisco IOS Release 12.0(10)SC1 release, currently available on Cisco.com.

Deferral Notice for Cisco IOS Release 12.0(8)SC

The following defect has caused all images in the Cisco IOS Release 12.0(8)SC to be deferred:

CSCdp73826 Bus error at "cmts_delete_sid_state"

To prevent this potential hazard to customer networks, Cisco Systems Inc. has deferred and removed the affected images from Cisco.com.

If you already have this image in your network, please replace it with images from the Cisco IOS Release 12.0(8)SC1 release, currently available on Cisco.com.

MC11 Support

The original MC11 modem card (MC11-FPGA) is supported only on Cisco uBR7223 and Cisco uBR7246 routers that are using the NPE-150 or NPE-200 processor cards. If the router is using a later processor card, such as the NPE-300, the MC11-FPGA is not supported and current modem cards such as the MC11C card must be used.

Note The MC11-FPGA modem card is not supported on the Cisco uBR7246 VXR routers.

Minimum 64 MB of DRAM is Required

The Cisco uBR720 series universal broadband router must have a minimum of 64 MB of DRAM to run all Cisco IOS Release 12.0(15)SC1 images.

Upgrading from Previous Releases

Because of changes in handling the MAC address between Cisco IOS Software Release 11 and Release 12.0 SC, you must clear the Address Resolution Protocol (ARP) tables after upgrading from Cisco IOS Release 11 to Release 12.0(15)SC1. Failure to do this could cause cable modem registration to fail during time-of-day (ToD) provisioning. Clearing the ARP tables must be done on all routers and ToD servers connected to the Cisco uBR7200 series cable router.

Upgrading from a Previous Version of a Modem Card

Online insertion and removal (OIR) is supported only for the same version and model of a modem card (for example, replacing an MC16C modem card with another MC16C modem card). If you are upgrading from one version of a modem card, hot-swapping does not preserve the card's configuration because the Cisco IOS software recognizes that the new card is not identical to the old one.

You can use OIR to hot-swap an older version of a modem card with a newer one, but you must then reload the card's configuration from NVRAM to restore the modem card to operational status.

Warning Messages During Boot

When the Cisco uBR7223 or Cisco uBR7246 router first powers on, messages similar to the following can appear immediately after the boot image loads and initializes:

```
%PA-2-UNDEFPA: Undefined Port Adapter type 248 in bay 3
%PA-2-UNDEFPA: Undefined Port Adapter type 248 in bay 4
%PA-2-UNDEFPA: Undefined Port Adapter type 243 in bay 5
%PA-3-DEACTIVATED: port adapter in bay [3] powered off.
%PA-3-DEACTIVATED: port adapter in bay [4] powered off.
%PA-3-DEACTIVATED: port adapter in bay [5] powered off.
%SYS-6-BOOT_MESSAGES: Messages above this line are from the boot loader.
```

The exact number of messages depends on the number of port adapters and cable modem cards installed in the Cisco uBR7200 series chassis. The messages about undefined port adapters can be safely ignored because the boot loader is not expected to recognize the cable modem cards. Instead, the cable modem cards are activated by the Cisco IOS software image, which the boot loader loads immediately after displaying the above messages.

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.

All caveats in Cisco IOS Release 12.0 are also in Cisco IOS Release 12.0(15)SC1. For information on caveats in Cisco IOS Release 12.0, see *Caveats for Cisco IOS Release 12.0*.

This document, which lists severity 1 and 2 caveats and only select severity 3 caveats, is located on Cisco.com and the Documentation CD-ROM.

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: Cisco Bugtool Navigator II**. Another option is to go to

Note <http://www.cisco.com/support/bugtools>.

Open Caveats for Release 12.0(15)SC1

There are no open caveats in Cisco IOS Release 12.0(15)SC1.

Closed or Resolved Caveats for Release 12.0(15)SC1

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(15)SC1. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdw65903

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

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

Open Caveats for Release 12.0(15)SC

This section documents possible unexpected behavior by Cisco IOS Release 12.0(15)SC, and describes only severity 1 and 2 caveats and select severity 3 caveats. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(15)SC.

- CSCds25141

An SRP interface on a Cisco UBR7246 router running Cisco IOS Release 12.0(10)SC1 or later might not allow IP traffic to pass. When this condition occurs, the SRP interface will record “input errors” and “ignored” when viewing the output of the **show interface srp x/y** command (where x=slot, y=port, example: 1/0).

Workaround: Reload the router (that is, perform a warm boot). Upon reboot, the SRP interface will allow IP traffic to pass.

- CSCdt31882

Configuring the Routing Information Protocol (RIP) on a Cisco uBR7246 router might cause the cable modems to lose synchronization and go offline. There is no workaround.

- CSCdt34099

An upgrade from Cisco IOS Release 12.0(8)SC to Release 12.0(12)SC might cause half of the configuration to become lost upon reload of the cable router.

- CSCdt35057

A Cisco uBR7200 series router using an NPE-200 processor board might randomly reboot as if it is power cycled. There is no workaround.

Closed or Resolved Caveats for Release 12.0(15)SC

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(15)SC. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCds04747

Connection setup improvements.

These improvements are integrated in Cisco IOS Release 12.0(15)SC.

- CSCds81283

SNMP cannot query the individual cable RF upstream and downstream port description fields. There is no workaround.

This is resolved in Cisco IOS Release 12.0(15)SC: The “ifAlias” object identifier (OID) is now supported for upstream and downstream port description fields and the following new CLI command to configure the downstream port description fields is introduced:

cable downstream description <string>

- CSCdt42520

On a Cisco uBR7246 running Cisco IOS Release 12.0(14)SC, polling the “CmCpeTable” table causes the CPU usage to increase up to 90 percent for a period of three to five minutes. This is because for every SNMP request for the “CmCpeTable” table, a new sorted CM/CPE list is generated in order to search the right entry to return.

Workaround: Get the CM/CPE list through another source (for example, through an external database).

This is resolved in Cisco IOS Release 12.0(15)SC. The CM/CPE list is still generated when there is a SNMP request for the “CmCpeTable” table, but in order to improve the performance, different SNMP requests for the “CmCpeTable” table can now use the same generated CM/CPE list, if this list is not too old.

Use the following new CLI command to determine if the CM/CPE list is recent enough to respond to an SNMP request for the “CmCpeTable” table:

[**no**] **cable cmcpe-list valid-time** [<seconds>]

If the time-value generated by this command minus the time-value of the SNMP request-time is greater than the number of configured seconds, the CM/CPE list is regenerated to respond to the SNMP request. Otherwise, the old CM/CPE list is used again to respond to the SNMP request. The default time of *seconds* is 180 seconds. Note that in large systems the generation of a new CM/CPE list is still time consuming and requires a high CPU utilization.

No Open Caveats for Release 12.0(14)SC

There are no new caveats listed as open in Cisco IOS Release 12.0(14)SC. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(14)SC.

Closed or Resolved Caveats for Release 12.0(14)SC

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(14)SC. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdm45164

Enabling Weighted Fair Queuing (WFQ) on an interface that belongs to a (transparent bridging) bridge-group might cause packets that are egressing that interface to be sent out of order. This situation causes failure in terminated and bridged Logical Link Control 2 (LLC2) sessions.

Workaround: Disable WFQ with the **no fair-queue** interface configuration command.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCdr61724

Resolution of recursive routes by Cisco Express Forwarding (CEF) may add 1 to 15 seconds to the end-to-end route convergence time. There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds18702

A Cisco uBR7200 series router might reload unexpectedly when the hidden CLI command **show int cx/y modem 0** is invoked.

Workaround: Use the CLI command **show int cx/y modem <sid>** instead.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds19172

A Cisco uBR7200 series router running Cisco IOS Release 12.0(10)SC1 or later might unexpectedly reload due to memory corruption. There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds26009

When you use the **summary-address** router configuration command in Open Shortest Path First (OSPF), it might cause high CPU problems. This situation occurs if the routing table is 10K or above.

Workaround: Remove the **summary-address** command.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds29345

Under some specific conditions and with as many as 6000 cable modems or Set-Top Boxes configured, a Cisco uBR7200 series router running Cisco IOS Release 12.0(12)SC or later might log some tracebacks.

The tracebacks might look like the following examples:

```
%SYS-2-LINKED: Bad enqueue of 61C7CAD8 in queue
614EDFFC
-Process= "CMTS MAC Protocol", ipl= 3, pid= 26
-Traceback= 60432890 60255D58 60289564 60258018 602556F0 602558B0 6028F68C
60288
```

and/or

```
%SYS-2-NOTQ: unqueue didn't find 61C7CAD8 in queue
614EDFFC
-Process= "CMTS sid timer task", ipl= 3, pid= 27
-Traceback= 60432A84 60255CE0 60275E68 602760B4 6027616C 6041C2AC 6041C298
```

This is resolved in Cisco IOS Release 12.0(14)SC.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds36201

A Cisco uBR7200 series router running Cisco IOS Release 12.0(10)SC1 or later might display the following message in its log:

```
%UBR7200-3-SPIERRRBS: SPI BUS READ 0x01 BYTES SHORT(Cable4/0):
spistat=0x60042002, chid=0x05, cmd=0x20, regaddr=0x24
%UBR7200-3-SPIERRNRD: SPI PENDING NO READ DATA(Cable3/0):
spist at=0x60042002, chid=0x05, cmd=0x20, regaddr=0x24
```

There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds41382

The command **show int cable 3/0 modem 0** shows the CM as the host. There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds43432

The maximum size of the "ccsFlapListMaxSize" list is not enforced. There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds45630

The Cisco uBR7200 series router does not recognize the 7200 I/O Controller. There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds46705

A Cisco uBR7200 series router running Cisco IOS Release 12.0(10)SC1 or later might unexpectedly reload due to an “FPU Exception.” There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds50648

When some types of corrupted IP packets are received at an odd memory address, the CMTS might reload unexpectedly. There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds63989

A Cisco uBR7200 series router running Cisco IOS Release 12.0(10)SC1 or later might drop the PCs from the cable plant every 11 hours and 50 minutes. This is directly related to the BPI traffic exchange key (TEK) life-time interval, for which the default is 12 hours. Changing the BPI TEK life-time interval does not solve the problem.

Workaround: Perform a “release/renew” on the PCs or let the PCs recover on their own. The latter may take up to 20 minutes.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds77386

The per-modem and per-host access list works correctly from the command line but delays for a couple of minutes before you can apply an access list through SNMP. There is no workaround.

This is resolved in Cisco IOS Release 12.0(14)SC.

- CSCds84925

Invoking a CLI command such as **show tech**, **show int cx/y modem 0**, or **show int cx/y modem <sid>**, might corrupt the memory that stores the frequency-hopping information. When frequency hops for any reason—from noise avoidance to invoking test-hopping CLI commands—the router reloads.

Workaround: Make sure that there are no more than 16 CPEs behind a CM at any time.

Alternate workaround: Never invoke the CLI commands **show tech**, **show int cx/y modem 0**, and **show int cx/y modem <sid>**. That is, do not invoke these CLI commands either from the console or through a background SNMP script session.

Open Caveats for Release 12.0(13)SC

This section documents possible unexpected behavior by Cisco IOS Release 12.0(13)SC, and describes only severity 1 and 2 caveats and select severity 3 caveats. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(13)SC.

- CSCdm45164

Enabling Weighted Fair Queuing (WFQ) on an interface that belongs to a (transparent bridging) bridge-group might cause packets that are egressing that interface to be sent out-of-order. This situation causes failure in terminated and bridged Logical Link Control 2 (LLC2) sessions.

Workaround: Disable WFQ with the **no fair-queue** interface configuration command.

- CSCdr61724

Resolution of recursive routes by Cisco Express Forwarding (CEF) may add 1 to 15 seconds to the end-to-end route convergence time. There is no workaround.

- CSCds26009

When you use the **summary-address** router configuration command in Open Shortest Path First (OSPF), it might cause high CPU problems. This situation occurs if the routing table is 10K or above.

Workaround: Remove the **summary-address** command.

- CSCds45630

The Cisco uBR7200 series router does not recognize the 7200 I/O Controller. There is no workaround.

- CSCds63989

A Cisco uBR7200 series router running Cisco IOS Release 12.0(10)SC1 or later might drop the PCs from the cable plant every 11 hours and 50 minutes. This is directly related to the BPI traffic exchange key (TEK) life-time interval, for which the default is 12 hours. Changing the BPI TEK life-time interval does not solve the problem.

Workaround: Perform a “release/renew” on the PCs or let the PCs recover on their own. The latter may take up to 20 minutes.

Closed or Resolved Caveats for Release 12.0(13)SC

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(13)SC. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdr37767

When spectrum management is enabled on an upstream port and the upstream frequency changes due to the Dynamic Upstream Modulation feature or otherwise, the MAC scheduler/MAC-PHY chip on the CMTS resets. This unnecessary reset might cause jitter spikes for constant bit rate (CBR) voice slots.

The VoIP packets at the cable modem that would have traveled in these slots get dropped at the cable modem. This results in a momentary drop of the voice quality. There is no workaround.

This is resolved in Cisco IOS Release 12.0(13)SC.

- CSCdr42490

At low upstream symbol rates, the CMTS might be continuously requesting timing adjustments from the cable modem. The timing error correction loop controlled by the CMTS exhibits this oscillatory behavior due to insufficient timing adjustment damping.

Workaround: For each symbol rate, apply the following CLI to control the timing-adjustment loop at the CMTS:

— When using a symbol rate of 160 Ksym/sec (us-channel-width = 200000 Hz):

```
Router (config-if) # cable upstream port <n> timing-adjust threshold 32
```

```
Router (config-if) # cable upstream port <n> timing-adjust continue 48
```

— When using a symbol rate of 320 Ksym/sec (us-channel-width = 400000 Hz):

```
Router (config-if) # cable upstream port <n> timing-adjust threshold 16
```

```
Router (config-if) # cable upstream port <n> timing-adjust continue 24
```

— When using a symbol rate of 640 Ksym/sec (us-channel-width = 800000 Hz):

```
Router (config-if) # cable upstream port <n> timing-adjust threshold 8
```

```
Router (config-if) # cable upstream port <n> timing-adjust continue 12
```

- When using a symbol rate of 1280 Ksym/sec (us-channel-width = 1600000 Hz):
 Router (config-if) # **cable upstream port <n> timing-adjust threshold 4**
 Router (config-if) # **cable upstream port <n> timing-adjust continue 6**
- When using a symbol rate of 2560 Ksym/sec (us-channel-width = 3200000 Hz):
 Router (config-if) # **cable upstream port <n> timing-adjust threshold 2**
 Router (config-if) # **cable upstream port <n> timing-adjust continue 3**

Note <n> = 0-5 is the upstream port number.

This is resolved in Cisco IOS Release 12.0(13)SC.

- CSCdr76123

Cable modems do not come on line when different modulation profiles are used for different upstreams on the same cable line card. There are two workarounds:

Workaround 1: Use the same modulation profile for all upstreams, even those in the “admin down” state.

Workaround 2: Use the **cable upstream X shut** and **no cable upstream X shut** commands to reset individual upstreams one at a time. Using the **shutdown** and **no shutdown** commands at interface level does not work.

This is resolved in Cisco IOS Release 12.0(13)SC.

- CSCds21565

When configuring a spectrum group, the CLI commands do not permit to set the upstream frequency higher than 42 MHz in an MC16E cable modem card. However, EuroDOCSIS supports an upstream-frequency range of 5 MHz to 65 MHz. There is no workaround.

This is resolved in Cisco IOS Release 12.0(13)SC and the MC16E cable modem card now supports an upstream frequency up to 65 MHz. However, if both an MC16E cable modem card and an MC16C and/or and MC16S cable modem card are present in the chassis, a spectrum group in the 42 MHz to 65 MHz range should not be assigned.

Note Cisco IOS Release 12 SC does not support the MC16S cable modem card, but does support the MC16C cable modem card.

- CSCds25179

The Cisco ubr7200-boot-mz image is too big to fit bootflash in Cisco IOS Release 12.0(11)SC and Release 12.0(12)SC.

Workaround: Use the ubr7200-boot-mz image in a release prior to Cisco IOS Release 12.0(11)SC.

This is resolved in Cisco IOS Release 12.0(13)SC.

- CSCds29162

When a large number (>2400) of cable modems are provisioned on a single line card, the periodic ranging server code might cause the cable modems to suddenly go offline due to a polling-timeout.

Workaround: Reduce the polling interval on each cable interface serving a large number of cable modems, using the following guidelines:

Num of CMs on the linecard	Polling-interval
2000-3000	20 secs
3000-5000	15 secs
5000-8000	10 secs

Reduce the polling interval with the following command:

Router(config-if)#cable polling-interval <n>

where <n> is the polling interval value in msec

Note This command is an unsupported command that is only to be used for working around the problem described above.

Reducing the polling interval increases the DOCSIS maintenance overhead per line card. However, since the polling interval is in seconds, the overhead is not critical for typical US channels with a bit-rate of ≥ 2.56 Mbps.

This is resolved in Cisco IOS Release 12.0(13)SC.

Open Caveats for Release 12.0(12)SC

This section documents possible unexpected behavior by Cisco IOS Release 12.0(12)SC, and describes only severity 1 and 2 caveats and select severity 3 caveats. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(12)SC.

- CSCdr42490

At low upstream symbol rates, the CMTS might be continuously requesting timing adjustments from the cable modem. The timing error correction loop controlled by the CMTS exhibits this oscillatory behavior due to insufficient timing adjustment damping.

Workaround: For each symbol rate, apply the following CLI to control the timing-adjustment loop at the CMTS:

— When using a symbol rate of 160 Ksym/sec (us-channel-width = 200000 Hz):

```
Router (config-if) # cable upstream port <n> timing-adjust threshold 32
Router (config-if) # cable upstream port <n> timing-adjust continue 48
```

— When using a symbol rate of 320 Ksym/sec (us-channel-width = 400000 Hz):

```
Router (config-if) # cable upstream port <n> timing-adjust threshold 16
Router (config-if) # cable upstream port <n> timing-adjust continue 24
```

— When using a symbol rate of 640 Ksym/sec (us-channel-width = 800000 Hz):

```
Router (config-if) # cable upstream port <n> timing-adjust threshold 8
Router (config-if) # cable upstream port <n> timing-adjust continue 12
```

— When using a symbol rate of 1280 Ksym/sec (us-channel-width = 1600000 Hz):

```
Router (config-if) # cable upstream port <n> timing-adjust threshold 4
Router (config-if) # cable upstream port <n> timing-adjust continue 6
```

— When using a symbol rate of 2560 Ksym/sec (us-channel-width = 3200000 Hz):

```
Router (config-if) # cable upstream port <n> timing-adjust threshold 2
Router (config-if) # cable upstream port <n> timing-adjust continue 3
```

Note <n> = 0-5 is the upstream port number.

- CSCds25179

The Cisco ubr7200-boot-mz image is too big to fit bootflash in Cisco IOS Release 12.0(11)SC and Release 12.0(12)SC.

Workaround: Use the ubr7200-boot-mz image in a release prior to Cisco IOS Release 12.0(11)SC.

Closed or Resolved Caveats for Release 12.0(12)SC

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(12)SC. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdr59883

A Cisco uBR7200 series router might reload due to a watchdog timeout. This problem is independent of the workload and has been found on all images of Cisco IOS Release 12.0(8)SC1, 12.0(10)SC, and 12.0(11)SC.

Workaround: Turn off the **ip route-cache** command and turn on the **ip cef** command.

This is resolved in Cisco IOS Release 12.0(12)SC.

- CSCdr71669

When the CMTS comes up, it will pick the first cable line card to provide the clock source regardless of the state of the line card. If that line card is in an “admin down” state, no clock will be provided to the system. If the CMTS has not found a cable line card to provide the clock source, it will pick a newly inserted cable line card to be the clock source.

If the CMTS tries to use an “admin down” line card to provide the clock source, the cable modem does not come up online and the **show controller** command indicates that the clock source is coming from an “admin down” line card.

Workaround: Bring up the cable interface by using the **no shut** command.

This is resolved in Cisco IOS Release 12.0(12)SC.

- CSCdr80563

Cisco uBR7246 VXR universal broadband router equipped with an NPE-300, Cisco uBR-MC16C or Cisco uBR-MC16E cable modem card, and a Cisco PA-FE-TX Fast Ethernet port adapter might not boot correctly from flash after a power cycle. This is a timing issue. Port adapter hardware lacked sufficient time to stabilize after a reset, while the driver code started.

This is resolved in Cisco IOS Release 12.0(12)SC.

To ensure the router boots correctly with all supported port adapters, current software increases the reset delay from 400 ms to 600 ms to negate this timing issue.

- CSCdr83019

A Cisco uBR7200 series router does not allow “ip” as a match criteria when a route-map is configured, due to CLI inconsistencies caused by the “ifIndex” persistence feature.

This is resolved in Cisco IOS Release 12.0(12)SC, while “ifIndex” will not be persistent after an online insertion and removal (OIR).

- CSCdr96037

When a user advances the system clock (using the **clock set EXEC** command) on a Cisco uBR720 series router to pass the BPI key expiration period, the system expects the cable modem (CM) to renew BPI keys. Since the CM does not know about the system time change, it does not renew its BPI keys.

As a result, the CM stays in an online (pk) or reject (pk) state until it renews its BPI keys. The CM cannot pass traffic in these states.

The time stamp is used as an index to BPI key tables. The granularity of the time stamp is 4-msecs. If two or more CMs obtain or renew their BPI keys within the same 4-msecs interval, only the first BPI key information will be kept. The CM stays in the online (pk) or reject (pk) state until it renews its BPI key.

Workaround: Set the system clock before enabling the cable interface.

This is resolved in Cisco IOS Release 12.0(12)SC.

- CSCds02764

When a Cisco uBR7200 series router sends a LEASEQUERY packet to a Cisco Network Registrar (CNR), the Cisco uBR7200 router might misinterpret the LEASEQUERY reply from the CNR. There is no workaround. This is resolved in Cisco IOS Release 12.0(12)SC.

No Open Caveats for Release 12.0(11)SC

There are no new caveats listed as open in Cisco IOS Release 12.0(11)SC. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(11)SC.

Closed or Resolved Caveats for Release 12.0(11)SC

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(11)SC. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdr03335

On a Cisco router, 50 percent of pings might fail to receive replies when you use the **ip cef** global configuration command, so the router drops the majority of traffic directly addressed to an interface.

Workaround: Enter the **no shutdown** command again on the affected interface.

- CSCdr19087

In bundling, if the IP address on the master interface is configured with certain values, modems on all cable interfaces within the bundle will not be able to pass init(i).

Workaround: Do not use an IP address pool that has a hex value of "e" in the upper nibble of the third byte (bits 12-15) in any of the IP addresses in the pool.

This is resolved in Cisco IOS Release 12.0(11)SC.

- CSCdr23835

If at least three cable interface are configured in a bundle and the master is not the lowest numbered cable interface, removing one of the slave interfaces from the bundle followed by removing another slave may cause a crash.

Workaround was to use the lowest-number cable interface in the bundle as the master.

This is resolved in Cisco IOS Release 12.0(11)SC.

- CSCdr27073

When setting “docsIfUpChannelFrequency”, take care of the spectrum group management. Determine how CLI entries change upstream frequency. Do not print any error message when SNMP sets “docsIfUpChannelFrequency”. That is, “errmsg()” should not be called.

This is resolved in Cisco IOS Release 12.0(11)SC.
- CSCdr01633

Vendor types were incorrect for linecards and missing information of the Us and Ds from the entity physical table.

Workaround was to modify “pa_cmts__get_snmp_info” function in “if_pas_cmts.c” to update “entPhysicalVendor” type according to the card type. Also, modified “cr7200_snmp.c” to discover Ds and Us and added them into the entity physical table accordingly.

This is resolved in Cisco IOS Release 12.0(11)SC.
- CSCdr12887

Support required for “docsIfDownChannelAnnex” and “taps12Increment” for EuroDOCSIS compliance. EuroDOCSIS flag must be turned on.

This is resolved in Cisco IOS Release 12.0(11)SC.
- CSCdr07327

Before fix, if a linecard was pulled out and then pushed back in, the “ifIndex” for linecard MAC layer, upstream/downstream, would be a new one. After fix, if a linecard is pulled and then pushed back in, the “ifIndex” for linecard MAC layer, upstream/downstream, will be the same as before. The “ifIndex” will be reused if the “ifDescr” is the same as before.

This is resolved in Cisco IOS Release 12.0(11)SC.
- CSCdr11907

The “sysORTable” is required by DOCSIS1.0/1.1, but was not yet supported in Cisco IOS. The “sysORTable” is now supported and user can query via **snmp get**.

This was resolved in Cisco IOS Release 12.0(11)SC.

Open Caveats for Release 12.0(10)SC1

This section documents possible unexpected behavior by Cisco IOS Release 12.0(10)SC1, and describes only severity 1 and 2 caveats and select severity 3 caveats. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(10)SC1.

Cisco IOS Release 12.0(10)SC1 includes caveat fixes to Release 12.0(10)SC. Those caveats from Release 12.0(10)SC not closed or resolved in Release 12.0(10)SC1 are still open. See the “Open Caveats for Release 12.0(10)SC” section on page 45 for details on those caveats not closed or resolved in Release 12.0(10)SC1.

- CSCds36201

A Cisco uBR7200 series router running Cisco IOS Release 12.0(10)SC1 or later might display the following message in its log:

```
%UBR7200-3-SPIERRRBS: SPI BUS READ 0x01 BYTES SHORT(Cable4/0):
spistat=0x60042002, chid=0x05, cmd=0x20, regaddr=0x24
%UBR7200-3-SPIERRNRD: SPI PENDING NO READ DATA(Cable3/0):
spist at=0x60042002, chid=0x05, cmd=0x20, regaddr=0x24
```

There is no workaround.

Closed or Resolved Caveats for Release 12.0(10)SC1

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(10)SC1. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdr49817

Use of the **clear cable flap-list** command can cause the router to hang in certain instances. This occurred when a previous **show cable flap-list** command found the flap list to be empty. Entering a subsequent **clear cable flap-list all** command hung the router when output of the **show cable flap-list** paused due to displaying additional info - the “more” processing. When “more” was displayed and an administrator attempted to **clear cable flap-list all**, the router hung until the **show cable flap-list** command completed. The workaround in earlier releases was to avoid using **clear cable flap-list all**. This is resolved in Cisco IOS Release 12.0(10)SC1.

- CSCdr37121

A problem appeared if interface bundling was enabled, and there was at least one multicast stream that at least one subscriber belonged to on two or more of the bundled interfaces, and certain timing sequences were met. New cable modems were not able to pass initialization state, and a new host was not able to obtain an IP address, until one of the existing devices had timed out in the bundle forwarding table. This is resolved in Cisco IOS Release 12.0(10)SC1.

- CSCdr32867

Mobile host feature did not work properly if a host was moved from one interface to another within a bundle; moving within the same interface worked. Workaround was to wait at least one hour before connecting the host to the new interface. This is resolved in Cisco IOS Release 12.0(10)SC1.

- CSCdr38877

The following scenario would cause a failure using Cisco IOS Release 12.0(10)SC: If a CM was flapping and was on the flapping list for a length of time, the CM would shut down. A DHCP reply for the CM was received after the SID for the CM was placed in timeout.

A problem in the code caused the CM entry to be added to SID 0 because the CMTS believed the CM had come back online. Later, the CM was aged out in the flapping list. The call to “cmts_remove_cm()” removed the CM entry, but the pointer to it remained in SID 0. When the cable reset vector was invoked, it caused a failure when the stale pointer was used during the creation of the NULL SID instance. This is resolved in Cisco IOS Release 12.0(10)SC1.

- CSCdr36952

A defect in multiple versions of Cisco IOS software caused the router or switch to stop and reload if the Cisco IOS HTTP service was enabled and an attempt was made to browse to “http://<router-ip””. This defect can be exploited to produce a denial of service (DoS) attack.

This vulnerability affected virtually all mainstream Cisco routers and switches running Cisco IOS Release 11.1 through Release 12.1. This vulnerability has been corrected and Cisco is making new software available to replace all affected Cisco IOS releases. Customers are urged to upgrade to releases that are not vulnerable to this defect.

Please see <http://www.cisco.com/warp/public/707/ioshttpserver-pub.shtml> for the latest complete version of this security advisory.

This is resolved in Cisco IOS Release 12.0(10)SC1.

- CSCdp97855

The upstream was not getting reset properly and was appearing on MC16Es. This was observed with Cisco IOS Release 12.0(9)SC.

A similar caveat was closed when another DDTS that changed the SPI timing appeared to fix the problem, but on some occasions the upstream would still lock up. This bug did NOT appear on standard non-EuroDOCSIS linecards because the Local lock running on the MC16E is 33 MHz, while the MC16X DOCSIS cards run 25 MHz. The symptom of this caveat was that the upstream did not hear the modem after an IOR.

Further investigation finds that doing an IOR could potentially lock up the upstream Phy parameters.

Workaround is to perform a **shut/no shut** command on the interface.

This is resolved in Cisco IOS Release 12.0(10)SC1.

Open Caveats for Release 12.0(10)SC

This section documents possible unexpected behavior by Cisco IOS Release 12.0(10)SC, and describes only severity 1 and 2 caveats and select severity 3 caveats. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(10)SC.

- CSCdk81103

During configuration of confederations in a router running Border Gateway Protocol (BGP), it is possible to include the local sub-AS number in the **bgp confederation peers** statement. This configuration should not be allowed.

Closed or Resolved Caveats for Release 12.0(10)SC

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(10)SC. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdp97715

If you are doing bundling, the **cable dhcp-giaddr policy** command is broken on non-master interfaces. This is resolved in Cisco IOS Release 12.0(10)SC.

- CSCdp85836

This bug caused the Spectrum Management task to use a lot of CPU cycle and caused CPU utilization to increase. This is resolved in Cisco IOS Release 12.0(10)SC.

- CSCdp98512

Prior to this fix, the CMTS was not protected against rogue cable modems that exhibit non-DOCSIS compliant behavior at Initial Ranging. It has been found that there can be some modems on any upstream port that can range with a negative timing offset. Such rogue modems can deceive the CMTS MAP building code into using a large map-advance when the dynamic map-advance algorithm (default) is active on each upstream port.

The end result is that all the other modems on that upstream port will be unable to send data upstream to the CMTS and will go offline.

This fix protects the CMTS from such buggy/rogue modems. In addition to the protection, a new warning log message will be generated every time a modem with such a bad timing offset problem is detected by the CMTS. A sample message is included below:

```
%UBR7200-5-BADTXOFFSET: Bad timing offset -10 detected for cable modem
0010.9500.0a6a
```

Workaround: Configure static map-advance on each cable interface of the Cisco uBR7200 series router. The CLI for this is:

```
cmts (config-if) # cable map-advance static
```

The static map-advance algorithm does not use the timing offset of the cable modem and is thus protected against such bad cable modems. The only implication of using a static map-advance as opposed to dynamic, is that optimal upstream pps performance rendered by dynamic algorithm will not be available for data traffic until the image with fix is used.

This is resolved in Cisco IOS Release 12.0(10)SC.

No Open Caveats for Release 12.0(9)SC

There are no new caveats listed as open in Cisco IOS Release 12.0(9)SC. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(9)SC.

Closed or Resolved Caveats for Release 12.0(9)SC

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(9)SC. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdm63101

When an existing cable modem is swapped with a new one, such as a field replacement, the MAC address for the PC is still associated with the old cable modem. This can also happen if a subscriber replaces an existing PC or changes its network interface card (NIC) to one that has a different MAC address.

The workaround is to enter the **clear cable host mac address** command on the Cisco uBR7200 series router to remove the PC's MAC address from the router's ARP table. The PC's MAC address will be rediscovered and associated with the correct cable modem during the next DHCP lease cycle.

If a second PC is connected to a cable modem, replacing the previous PC, the cable modem might also have to be rebooted to recognize the new MAC address (unless its DOCSIS configuration file allows multiple CPE devices).

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp18962

When using **snmp get** to poll MC16C line card, it returns as "ubr-mc16a". This is a MIB agent error. This problem was reported by a Beta user of Cable Manager. After the fix, a new set of "cardType" is assigned and each card has its own card type, as below:

- MC16S: ubr-mc16s(1001)
- MC11: ubr-mc11(1002)—FPGA
- MC11C: ubr-mc11c(1003)
- MC12C: ubr-mc12c(1004) MC14C: ubr-mc14c(1005)
- MC16B: ubr-mc16b(1007)
- MC16C: ubr-mc16c(1008)
- MC16E: ubr-mc16e(1009)

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp62546

Packets from the input interface to the output interface do not get Cisco express forwarding (CEF) switched while the input interface is configured with CEF switching and the output interface is configured with non-CEF switching. This happens with all encapsulated interfaces of the Cisco uBR7200 series universal broadband routers.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp36562

CLI **clear counters** *cx/y* will now clear the SID connectivity statistic. Upon clearing, the “1st time online” field in the **show interface** *cx/y* **sid connectivity** will be reset to the time the counters were cleared. It will be the new time the connectivity statistic will be based upon. All SNMP connectivity statistics will not be affected by the counters clearing.

The SNMP counters for “Corr TEC Errors” and “Uncorr TEC Errors” will be unaffected by clearing counter CLI.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp40204

The current MAP generation code assumed the “worst case” DOCSIS distance when computing the lookahead time in MAPs (static map-advance). This enhancement enables the map-advance to be dynamic and self-adjusting and improves the upstream throughput for the cable modems. This performance improvement is visible when the upstream load from other cable modems on that upstream channel is low and the main throughput limitation for the cable modems is the roundtrip request grant latency of the CMTS.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp43915

For both the Cisco uBR7246 VXR and the Cisco uBR7223 chassis, the MIB values of “sysObjectID” and “entPhysicalVendorType” were wrong. Now, the MIB values report the correct chassis type for both the Cisco uBR7246 VXR and the Cisco uBR7223.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp48233

It appears the Clock inversion patch to make 256QAM work, does not work on a low-voltage high-temp corner. It also appears that the original value that the clock output was set to (0x40) is more stable than (x60).

The recommendation is to switch back to the original value of 0x40.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp48247

This caveat occurs when ranging bursts do not make it upstream on the MC16E Cable Modem Card and when downstream modulation is changed. This caveat does not occur on the MC16B Cable Modem Card, MC16C Cable Modem Card, or the MC16S Cable Modem Card. The workaround is to perform a **shut** or **no shut** command on the interface.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp50928

There was an inconsistent loss of UCD buffers in the Cisco uBR7200 series routers when the Cisco uBR7200 series routers and the cable modems did not receive the UCDs.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp53536

When the downstream channel ID was changed on a Cisco uBR7200 series router using the **cable downstream channel-id** command, cable modems on that downstream would not respond to the MAP messages that assigned them to a particular downstream channel. The cable modems would then continuously reboot until the interface for that downstream was cleared with the *shutdown* and **no shutdown interface configuration** commands.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp53871

The admission reject counter was not increased. Now the admission reject counter gets increased when the cable modem admission is rejected.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp56855

Even though “docsIfCmtsUcdInterval” can be set by the user via SNMP set, it is never actually set on the CMTS internally. Therefore, the implementation of this object has been changed to read-only.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp58341

The upstream frequency could not be set to a frequency greater than 42 MHz. The MC16E Cable Modem Card has a maximum frequency of 65 MHz. This caveat fixes this discrepancy. On the MC 16E Cable Modem Card, the upstream frequency can now be set from 5 MHz to 65 MHz. For all other line cards, the upstream frequency can be set from 5 MHz to 42 MHz. If the upstream frequency is unknown, the frequency is 0 MHz.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp59443

Previously, getting the next entry of the “cdxBWQueueTable” might not get the correct entry. Now, getting the next entry of the “cdxBWQueueTable” gets the correct entry.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp64454

Users cannot use object “cdxQosIfRateLimitAlgm” to set upstream or downstream rate limit algorithm to “token bucket algorithm with shaping”.

The CISCO-DOCS-EXT-MIB “cdxQosIfRateLimitTable” and “cdxCmtsCmStatusValue” were enhanced as below:

- Users can use object “cdxQosIfRateLimitAlgm” to set upstream or downstream rate limit algorithm to “token bucket algorithm with shaping”. Also, two more objects were added for the algorithm “token bucket algorithm with shaping”: “cdxQosIfRateLimitShpMaxDelay” and “cdxQosIfRateLimitShpGranularity”.

- Two more CM status messages are added:

- initTftpPacketRcvd(13): tftp packet received and option file transfer started.

- initTodRequestRcvd(14): Time of the Day (TOD) request received.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp65478

Various Cisco IOS software images would crash under certain non standard upstream configuration and timing state conditions:

- `cmts (config-if) # cable upstream <n> channel-width 200000`
- `cmts(config-if) # cable upstream <n> minislotsize 32`

Additional timing conditions could trigger the crash such as adding several configuration commands back-to-back using a script or performing a **shut/no shut** command on the cable interface.

The workaround is to avoid these non standard upstream configuration and timing state conditions by using default values for all upstream parameters.

This is resolved in Cisco IOS Release 12.0(9)SC.

- CSCdp71360

One obsolete object “docsIfCmtsInsertionInterval” is still in the RFC 2670 support.

Obsolete object “docsIfCmtsInsertionInterval” is now excluded from the implementation of RFC 2670.

This is resolved in Cisco IOS Release 12.0(9)SC.

Open Caveats for Release 12.0(8)SC1

This section documents possible unexpected behavior by Cisco IOS Release 12.0(8)SC1, and describes only severity 1 and 2 caveats and select severity 3 caveats. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(8)SC1.

Cisco IOS Release 12.0(8)SC1 includes bug fixes to Release 12.0(8)SC. Those caveats from Release 12.0(8)SC not closed or resolved in Release 12.0(8)SC1 are still open. Please refer to the “Open Caveats for Release 12.0(8)SC” section on page 51 for details on those caveats not closed or resolved in Release 12.0(8)SC1.

Closed or Resolved Caveats for Release 12.0(8)SC1

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(8)SC1. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdp56831

When the MAX_CPE field in a cable modem's DOCSIS configuration file was increased and the cable modem rebooted to load the new value, the new value was not recognized by the Cisco uBR7200 series router unless the cable interface servicing that cable modem was cleared by giving the **shutdown** and **no shutdown** interface commands.

Possible workarounds were to:

- Initially provision cable modems with a higher value for MAX_CPE.
- Set the MAX_CPE field to 0 (zero), re register the cable modem by giving the clear cable modem reset command, reset the MAX_CPE field to the new higher value, and re register the modem again.
- Clear the cable interface after increasing the MAX_CPE value.

For DOCS-IF-MIB for that cable modem card and all cable modems below it, no workaround existed.

This is resolved in Cisco IOS Release 12.0(8)SC1.

- CSCdp57826

When a cable modem was moved from one cable interface within a bundle to another interface within the same bundle, it failed to come up. The earlier workaround was to wait at least one hour before bringing up the cable modem on the new interface.

This is resolved in Cisco IOS Release 12.0(8)SC1.

- CSCdp61912

Issuing the **show cable flap-list** command at the CLI caused the Cisco uBR7200 series router to crash. A workaround was to avoid the **show cable flap-list** command. You could reduce the probability of the crash (but not completely eliminate it) by setting the flap-list aging time to a high value—this can be any value between its default value of 10,080 minutes (7 days) and its maximum value of 86,400 minutes (60 days). You can also use the **cable flap-list aging 86400** command to set the aging time.

This is resolved in Cisco IOS Release 12.0(8)SC1.

- CSCdp71987

Previous releases enforced the setting of MAX-CPE in the Cisco uBR7200 series router. This prevented security-breach attempts, where a single user could consume all available IP addresses. This feature, however, was seen as problematic in the field, since customers could not, for example, change the NIC card in their PC and connect. Therefore, the MAX-CPE checking in the Cisco uBR7200 series router has been removed.

This is resolved in Cisco IOS Release 12.0(8)SC1.

Note There is now the possibility for security breaches. You need to override the command for the MAX-CPE setting in the config file.

- CSCdp73826

Bus error at "cmts_delete_sid_state"

The Cisco uBR7200 series router occasionally rebooted itself. A sample error message for a reboot is shown below:

```
router1 uptime is 3 days, 8 hours, 34 minutes System returned to ROM by bus error at PC
0x60276FFC, address 0x80000D at 20:19:54 GMT Thu Jan 20 2000 System restarted at
20:21:27 GMT Thu Jan 20 2000 System image file is "slot0:ubr7200-k1ps-mz.120-8.SC.bin"
```

```
0x60276FFC:cmts_delete_sid_state(0x60276fa8)+0x54
```

For earlier releases, it was necessary to issue the **show context** command. The output of this command reveals the context of the most recent crash.

Note This caveat was the cause of the Cisco IOS Release 12.0(8)SC deferral.

This is resolved in Cisco IOS Release 12.0(8)SC1.

- CSCdp74378

Cable modems can exist on multiple interfaces. Under certain circumstances, when a cable modem supporting bundling is moved from one interface to another, conditions in timing sometimes resulted in a loss of connectivity.

Workaround was to disconnect the cable from the cable modem, and clear the cable modem status using a **clear cable modem mac-address** reset before moving it to another interface.

This is resolved in Cisco IOS Release 12.0(8)SC1.

Open Caveats for Release 12.0(8)SC

This section documents possible unexpected behavior by Cisco IOS Release 12.0(8)SC, and describes only severity 1 and 2 caveats and select severity 3 caveats. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(8)SC.

- CSCdp73826

The Cisco uBR7200 series router occasionally rebooted itself. A sample error message for a reboot is shown below:

```
router1 uptime is 3 days, 8 hours, 34 minutes System returned to ROM by bus error at PC
0x60276FFC, address 0x80000D at 20:19:54 GMT Thu Jan 20 2000 System restarted at
20:21:27 GMT Thu Jan 20 2000 System image file is "slot0:ubr7200-k1ps-mz.120-8.SC.bin"
```

```
0x60276FFC:cmts_delete_sid_state(0x60276fa8)+0x54
```

For earlier releases, it was necessary to issue the **show context** command. The output of this command reveals the context of the most recent crash.

Closed or Resolved Caveats for Release 12.0(8)SC

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.0(8)SC. This section describes only severity 1 and 2 caveats and select severity 3 caveats.

- CSCdp01356

The problem is “holdq_enqueue()” does not like being called without interrupts disabled. The system did not explicitly check before the current problem; now it does. It will still perform every function, and now an error message also appears.

This was resolved in Cisco IOS Release 12.0(6)SC, but appeared in Release 12.0(7)SC. The earlier bug fix was not integrated into the 12.0(7)SC code.

This is again resolved in Cisco IOS Release 12.0(8)SC.

- CSCdm47012

Using earlier SC software releases, later versions of Smart Modular and Sharp Flash memory cards used to store Diagnostics and Cisco IOS software images reported unrecoverable write errors in some instances. The affected Flash cards used a Sharp (LH28F016SCT) chip set.

Note The original Smart Modular and Intel Flash cards were not affected.

Using Cisco IOS Release 12.0(8)SC, flash code has been updated so as not to access status registers that are not supported with later versions of flash cards. This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdm60156

Release Notes for Cisco IOS Release 12.0(7)SC reported that CPU load on a Cisco uBR7200 series router was thought to be too high, especially when compared to a Cisco 7200 series router in a similar configuration. The difference in CPU utilization was thought to be due to the overhead of maintaining the cable interface, as required by DOCSIS specifications.

This caveat is closed in Cisco IOS Release 12.0(8)SC. Comparison tests revealed the actual throughput between the Cisco uBR7200 series router and the Cisco 7200 series router is not very different.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdm73358

Using earlier releases, a cable modem transmitting data with an odd MAC header length had its DHCP requests filtered out, causing the cable modem to be stuck in an initialization state. Cable modems from at least two different vendors were known to be affected by this problem.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdm79478

In Cisco IOS Release 12.0(6)SC, the following error messages were reported on the console when an SNMP query was made for the “docsIfSigQSignalNoise” attribute for an MC16C cable modem card:

```
%UBR7200-3-SPIERRNRD: SPI PENDING NO READ DATA
%UBR7200-3-SPIERRRBS: SPI BUS READ 0x02 BYTES SHORT
%UBR7200-3-SPIERRW: SPI PENDING WRITE ERROR
```

You can disregard these messages since they do not denote a real problem. The messages no longer appear using Cisco IOS Release 12.0(8)SC.

- CSCdm84222

This caveat included the following issues:

- The Cisco uBR7200 series universal broadband router did not police duplicate class IDs in the class-of-service encodings of a modem registration request. A configuration file with duplicate class IDs could result in the Cisco uBR7200 series router and cable modem associating different SIDs with the same class ID handle during the registration message handshake. The outcome of this ambiguous class ID/SID association depended on the registration code at the cable modem. Sometimes, the cable modem could use only one of the SIDs assigned with the duplicate class ID.
- Registration Response—displayed as part of registration debug output—was not terminated at the correct last byte of the response. Thus, it was possible for the displayed Registration Response output to be truncated or extended beyond its actual last byte.

Using Cisco IOS Release 12.0(8)SC, code was updated to add protection against bad class of service information and protect the cable modem from misconfiguration scenarios.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdm93891

The DOCS-IF-MIB has been updated to the RFC2670 DOCS-IF-MIB. Changes were made to the “docsIfBaseObjects”, “docsIfCmObjects”, “docsIfCmStatusTable”, “docsIfCmServiceTable”, “docsIfCmtsObjects”, “docsIfCmtsServiceTable”, and the “docsIfCmtsQosProfilePermissions”. A new “docsIfCmtsMacToCmTable” was added in Cisco IOS Release 12.0(8)SC. This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp06530

In earlier releases, error messages neglected to isolate problems to specific cable modem cards and slots in certain scenarios. This is corrected in Cisco IOS Release 12.0(8)SC per the example below:

```
%UBR7200-3-SPIERRW (Cable5/0): SPI PENDING WRITE ERROR:
```

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp14853

The **show int cx/0 sid connectivity** command now shows the correct time or date in the online field. This command shows the hour the cable modem came online (if it came online less than 24 hours after starting the system) or the date the cable modem came online (if it came online more than 24 hours after starting the system).

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp19254

In earlier releases, when multiple DHCP servers with different IP addresses were configured on a cable interface, the **show cable modem** command sometimes showed a different IP address than the one used for that particular cable modem. The workaround in earlier releases was to use a single DHCP server to address that cable modem.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp20246

When the G.729 or G.711 QoS profile was modified in earlier releases, the profile could be deleted when not in use. These profiles now remain regardless of whether they are in use.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp23461

If a modulation profile did not have all the bursts configured (Request, Initial, Station, Short, Long) in earlier releases, the cable modem might not come up after the upstream was reinitialized.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp26231

In the Release Note for Cisco IOS Release 12.0(7)SC, it was mentioned that dual-port Fast Ethernet port adapters reported a high input error rate when the traffic reached 90 kpps or greater on a Cisco uBR7200 series router. It was noted that this did not occur on single-port Fast Ethernet port adapters.

This caveat was rejected and is closed.

- CSCdp27958

When acting as the ToD server, the Cisco uBR7200 series router replies to a cable modem's ToD request by creating a packet with a source address that equals the IP address of the cable modem card providing the downstream interface for that cable modem. In earlier releases, this IP address might not have matched the source address specified by the cable modem in its original request packet (as could be the case in a unicast or forwarded packet). In this instance, certain cable modems rejected the ToD reply.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp31986

The following attributes in the CISCO-CABLE-SPECTRUM-MIB enterprise MIB did not operate as described in the MIB file:

- `ccsFlapListMaxSize` cannot be set using SNMP
- `ccsFlapListCurrentSize` can be queried using SNMP but doing so returns the value of the `ccsFlapListMaxSize` attribute, which is usually not the same as the current size
- `ccsFlapAging` can be set, but doing so resets the `ccsFlapInsertionTime` attribute to 0
- `ccsFlapInsertionTime` can be set, but doing so resets the `ccsFlapAging` attribute to 0

The workaround in earlier releases was to set these attributes using CLI commands.

Using Cisco IOS Release 12.0(8)SC:

- `ccsFlapListMaxSize` can be set.
- `ccsFlapListCurrentSize` returns the right value which is the current CM in flap list.
- Setting `ccsFlapAging` or `ccsFlapInsertionTime` will not cause others to be reset.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp34179

Using earlier releases, the **show controller** *cx/y* command identified the hardware component—for example BCM3210 ASIC, BCM3210 FPGA—instead of the cable modem card version. Using Cisco IOS Release 12.0(8)SC, the **show controller** *cx/y* command identifies the specific card version as follows:

```
Hardware is MC11-FPGA
Hardware is MC11C
Hardware is MC12C
Hardware is MC14C
Hardware is MC16B
Hardware is MC16C
Hardware is MC16E
```

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp36459

In earlier releases, if a cable modem was switched between cable interfaces on the Cisco uBR7200 series router, an SNMP query during the switch for a SID on that modem could, in rare situations, generate a “spurious memory access” error message. The workaround in earlier releases was to query the entire “docsIfCmtsServiceTable” after “cdxCmCpeTable”, instead of a specific instance.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp41625

In earlier releases, when a cable modem card was replaced using online insertion and removal (OIR), an SNMP GET request on the “docsIfCmtsObjects” attribute might be missing certain MIB information such as upstream and downstream channel information for that card, and all other modem cards beneath its slot. Issuing an **snmpwalk** command on “docsIfMibObjects” might appear to pause indefinitely. The workaround in earlier releases was to reload the router after replacing a modem card using OIR.

This is resolved in Cisco IOS Release 12.0(8)SC.

- CSCdp41749
In earlier releases, issuing the **show cable flap-list** command while baseline privacy was active could result in a crash.
This is resolved in Cisco IOS Release 12.0(8)SC.
- CSCdp42484
In earlier releases, problems existed when baseline privacy interface (BPI) was active. The **cable source-verify dhcp** command did not function properly when BPI was active.
This is resolved in Cisco IOS Release 12.0(8)SC.
- CSCdp48106
In earlier releases if the **no cable QoS permission modems** command was used to disable QoS profile creation by cable modems, all cable modems that had modem-created profiles were reset. Cable modems could not register successfully until the create permissions were re-enabled.
This is resolved in Cisco IOS Release 12.0(8)SC.
- CSCdp52269
In earlier releases, the system would sometimes receive a bus error exception when a non supported cable modem card was swapped with a supported cable modem card. The system would crash during the routine to add sub interface entry in “ifTable”.
This is resolved in Cisco IOS Release 12.0(8)SC.
- CSCdp52364
In earlier releases involving BPI, the encrypted multicast stopped working when the old key expired and the CMTS switched to use the new key. The traffic was interrupted until another key request came from the cable modem.
This is resolved in Cisco IOS Release 12.0(8)SC.

Open Caveats for Release 12.0(7)SC

This section documents possible unexpected behavior by Cisco IOS Release 12.0(7)SC, and describes only severity 1 and 2 caveats and select severity 3 caveats. All open caveats from previous releases that were not closed or resolved are still open in Cisco IOS Release 12.0(7)SC.

- CSCdp01356
Problem is “holdq_enqueue()” does not like being called without interrupts disabled. System did not explicitly check before the current problem; now it does. It will still perform every function. Error message appears now as well.
This was resolved in Cisco IOS Release 12.0(6)SC, but appeared in Release 12.0(7)SC. The earlier bug fix was not integrated into the 12.0(7)SC code.
- CSCdm63101
When an existing cable modem is swapped with a new one, such as a field replacement, the MAC address for the PC is still associated with the old cable modem. This can also happen if a subscriber replaces an existing PC or changes its network interface card (NIC) to one that has a different MAC address.

The workaround is to enter the **clear cable host mac address** command on the Cisco uBR7200 series router to remove the PC's MAC address from the router's ARP table. The PC's MAC address will be rediscovered and associated with the correct cable modem during the next DHCP lease cycle.

If a second PC is connected to a cable modem, replacing the previous PC, the cable modem might also have to be rebooted to recognize the new MAC address (unless its DOCSIS configuration file allows multiple CPE devices).



Caution Do not use the **clear arp** command on the Cisco uBR7200 series router for this purpose as it will terminate connectivity for all PCs serviced by that router until the PC performs a DHCP release/renew request or reboots. (The router must be in source-verify mode; see the **cable source-verify dhcp** command.)

- CSCdm68144 and CSCdm71310

A uBR7246 XVR can crash when IP packets being sent over a Packet Over SONET (POS) interface contain a bad IP checksum. The only current workaround is to find the source of the incorrectly sent IP packets and correct the problem at the source.

- CSCdm68421

If a POS interface starts receiving incoming traffic while a Cisco uBR7246 or Cisco uBR7246 VXR router is still booting, the router stops booting until the incoming traffic stops. The workaround is to prevent any incoming traffic from coming into a POS interface until the router finishes its bootup process. (This problem can also occur on a Cisco 7200 series router.)

- CSCdm92017 and CSCdp20117

If the **show controller** command is issued during online insertion and removal (OIR) of a cable modem line card or port adapter, the uBR7200 series router can crash and must be reloaded to recover. The workaround is to avoid issuing CLI commands while physically removing and inserting a cable modem line card or port adapter. (This problem can also occur on other routers.)

- CSCdp17521

When a Cisco uBR7200 series router (as well as a Cisco 7200 series router) is first being configured or being reloaded, an installed POS port adapter can display the following error message:

```
Error in encaps setup. Encapsulation not changed.
```

This error message is cosmetic and can be disregarded.

- CSCdp17526

If a POS port adapter has fair-queuing enabled, it cannot be replaced via online insertion and removal (OIR). If such a POS port adapter is replaced by online removal and insertion, it can no longer transmit packets. The router must be reloaded to recover from this error; the only workaround is to disable fair-queuing before replacing a POS port adapter.

- CSCdp19254

When multiple DHCP servers with different IP addresses are available on a cable interface, the **show cable modem** command may show a different IP address than the one used for that particular cable modem. The workaround is to use a single DHCP server.

- CSCdp26231

Dual-port Fast Ethernet port adapters report a high input error rate when the traffic reaches 90 kpps or greater on a Cisco uBR7200 series router. This problem does not occur on single-port Fast Ethernet port adapters. There is no workaround.

- CSCdp27958

When acting as the ToD server, the Cisco uBR7200 series router replies to a cable modem's ToD request by creating a packet with a source address that equals the IP address of the cable modem line card providing the downstream interface for that cable modem. This IP address might not match the source address specified by the cable modem in its original request packet (as might be the case in a unicast or forwarded packet), and certain cable modems will reject the ToD reply as a security measure.

The workaround is to specify the cable modem line card's IP address as the ToD server's IP address in the cable modem's DOCSIS configuration file.

- CSCdp31986

The following attributes in the CISCO-CABLE-SPECTRUM-MIB enterprise MIB do not operate as described in the MIB file:

- “ccsFlapListMaxSize” cannot be set using SNMP
- “ccsFlapListCurrentSize” can be queried using SNMP but doing so returns the value of the “ccsFlapListMaxSize” attribute, which is usually not the same as the current size
- “ccsFlapAging” can be set, but doing so resets the “ccsFlapInsertionTime” attribute to 0
- “ccsFlapInsertionTime” can be set, but doing so resets the “ccsFlapAging” attribute to 0

The current workaround is to set these attributes using the following CLI commands:

- **cable flap-list insertion-time** sets the “ccsFlapInsertionTime” attribute
- **cable flap-list size** sets the “ccsFlapListMaxSize” attribute
- **cable flap-list aging** sets the “ccsFlapAging” attribute

Open Caveats for Release 12.0(6)SC

This section documents possible unexpected behavior by Cisco IOS Release 12.0(6)SC, and describes only severity 1 and 2 caveats and select severity 3 caveats. Unless otherwise noted, these caveats apply to all 12.0 releases up to and including Release 12.0(6)SC.

- CSCdm84222

This caveat includes two issues:

- The Cisco uBR7200 series universal broadband router does not police duplicate class IDs in class of service encodings of a modem registration request. A configuration file with duplicate class IDs could result in the Cisco uBR7200 series router and cable modem associating different SIDs with the same class ID handle during the registration message handshake. The outcome of this ambiguous class ID/SID association depends on the registration code at the cable modem. Sometimes, the cable modem could use only one of the SIDs assigned with the duplicate class ID.

The workaround is to avoid specifying duplicate class IDs in Trivial File Transfer Protocol (TFTP) configuration files.

- The Registration Response—displayed as part of registration debug output—is not terminated at the correct last byte of the response. Thus, it is possible that the displayed Registration Response output is truncated or extended beyond its actual last byte.

Related Documentation

The following sections describe the documentation available for the Cisco uBR7200 series universal broadband routers. These documents consist of hardware and software installation guides, Cisco IOS configuration guides and command references, system error messages, feature modules, and other documents.

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

Use these release notes with these documents:

- Release-Specific Documents, page 58
- Platform-Specific Documents, page 58
- Feature Modules, page 59
- Cisco IOS Software Documentation Set, page 59

Release-Specific Documents

The following documents are specific to Cisco IOS Release 12.0 and are located on Cisco.com and the Documentation CD-ROM:

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

On Cisco.com at:

Technical Documents

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: Cisco Bugtool Navigator II**. Another option is to go to <http://www.cisco.com/support/bugtools>.

Platform-Specific Documents

These documents are available for the Cisco uBR7200 series universal broadband routers on Cisco.com and the Documentation CD-ROM:

- *Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide*
- *Cisco uBR7200 Series Universal Broadband Router Software Configuration Guide*
- *Cisco uBR7200 Series Universal Broadband Router Configuration Notes*
- *Cisco uBR7200 Series Universal Broadband Router Cable Modem Card Hardware Installation*
- *Broadband Command Consolidation*

On Cisco.com at:

**Technical Documents: Documentation Home Page: Broadband/Cable Solutions:
Cisco uBR7200 Series Universal Broadband Routers**

Note The *Broadband Command Consolidation* is available on Cisco.com through the following path:

Technical Documents: Documentation Home Page: Broadband/Cable Solutions

On the Documentation CD-ROM at:

Cisco Product Documentation: Broadband/Cable Solutions: Cisco uBR7200 Series Universal Broadband Routers

Note The *Broadband Command Consolidation* is available on the Documentation CD-ROM through the following path:

Cisco Product Documentation: Broadband/Cable Solutions

Note Information about features of the uBR7200 series universal broadband router, as well as software release notes, are available on Cisco.com at:

http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_r_sw/index.htm

Feature Modules

Feature modules describe new software enhancements committed as features supported by Cisco IOS Release 12.0 SC 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

On the Documentation CD-ROM at:

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

Cisco IOS Software Documentation Set

The Cisco IOS software documentation set consists of the Cisco IOS configuration guides, Cisco IOS command references, and several other supporting documents. 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.

Related Documentation

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

On Cisco.com, beginning under the **Service & Support** heading:

Technical Documents: Documentation Home Page: Cisco IOS Software Configuration: Cisco IOS Release 12.1: Configuration Guides and Command References

On the Documentation CD-ROM:

Cisco IOS Software Configuration: Cisco IOS Release 12.1: Configuration Guides and Command References

Release 12.0 Documentation Set Contents

Table 10 lists the contents of the Cisco IOS Release 12.0 software documentation set, which is available in electronic form, and also in printed form upon request.

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: 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

Table 10 Cisco IOS Documentation Set for Release 12.0

Books	Major 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> 	Bridging and IBM Networking Overview Bridging IBM Networking
<ul style="list-style-type: none"> • <i>Dial Solutions Configuration Guide</i> 	Overview of Interfaces, Controllers, and Lines Used for Dial Access Configuring Modem Support and Other Asynchronous Devices Managing Modems Configuring Terminal Operating Characteristics for Dial-In Sessions Setting Up ISDN Basic Rate Service Configuring Synchronous Serial Ports Configuring Channelized E1 and T1 Configuring ISDN Special Signaling Configuring X.25 on ISDN Using A0/D1 Configuring AppleTalk Remote Access Preparing for Asynchronous DDR Configuring Asynchronous PP and SLIP Configuring the Bandwidth Allocation Control Protocol Configuring PPP Callback for DDR Configuring ISDN Caller ID Callback Configuring Dial Backup for Dialer Profiles Configuring Dial Backup Using Dialer Watch Configuring Dial Backup for Serial Lines Configuring Peer-to-Peer DDR with Dialer Profiles Configuring DialOut Enterprise Dial Scenarios and Configurations Configuring Easy IP Deciding and Preparing to Configure DDR Configuring Legacy DDR Hubs Configuring Multichassis Multilink PPP Configuring Support For NASi Clients to Access Network Resources Dial Networking Business Applications Configuring the Cisco PAD Per-User Configuration

Table 10 Cisco IOS Documentation Set for Release 12.0 (continued)

Books	Major Topics
<ul style="list-style-type: none"> • <i>Dial Solutions Configuration Guide</i> (continued) 	Configuring Media-Independent PPP and Multilink PPP Configuring Protocol Translation and Virtual Asynchronous Devices Establishing a Reverse Telnet Session to a Modem Configuring Snapshot Routing Telco and ISP Dial Scenarios and Configurations Configuring Legacy DDR Spokes Configuring Dial-In Terminal Services Configuring V.120 Access Configuring Virtual Private Dialup Networks Configuring Virtual Profiles Configuring Virtual Template Interfaces Configuring X.25 on ISDN
<ul style="list-style-type: none"> • <i>Dial Solutions Command Reference</i> 	Dial-In Port Setup Dial-In Terminal Services and Remote Node Config Dial-on-Demand Routing Dial Backup Dial-Out Modem Pooling Large-Scale Dial Solutions Cost-Control Solutions Virtual Private Dialup Networks Other Network Traffic on ISDN Channels Dial-Related Addressing Services
<ul style="list-style-type: none"> • <i>Cisco IOS Interface Configuration Guide</i> • <i>Cisco IOS Interface Command Reference</i> 	Interface Configuration Overview LAN Interfaces Serial Interfaces Logical Interfaces
<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> 	Network Protocols Overview AppleTalk and Novell IPX Overview 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> 	Security Overview Authentication, Authorization, and Accounting (AAA) Security Server Protocols Traffic Filtering and Firewalls IP Security and Encryption Other Security Features

Table 10 Cisco IOS Documentation Set for Release 12.0 (continued)

Books	Major Topics
<ul style="list-style-type: none"> • <i>Cisco IOS Switching Services Configuration Guide</i> • <i>Cisco IOS Switching Services Command Reference</i> 	Cisco IOS Switching Services Overview Cisco IOS Switching Paths Cisco Express Forwarding NewFlow Switching Tag Switching Multilayer Switching Multicast Distributed Switching Virtual LANs MPOA Commands
<ul style="list-style-type: none"> • <i>Wide-Area Networking Configuration Guide</i> • <i>Wide-Area Networking Command Reference</i> 	Wide-Area Network Overview 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> 	Using Voice, Video, and Home Applications Voice Video Broadband
<ul style="list-style-type: none"> • <i>Quality of Service Solutions Configuration Guide</i> • <i>Quality of Service Solutions Command Reference</i> 	Quality of Service Overview Classification Congestion Management Congestion Avoidance Policy and Shaping Overview Signaling Link Efficiency Mechanisms
<ul style="list-style-type: none"> • <i>Caveats (Caveat documentation for Cisco IOS Releases 12.0 and 12.0T—includes open and resolved severity 1 and 2 caveats for all platform)</i> • <i>Cisco IOS Release 12.0 Configuration Guide Master Index</i> • <i>Cisco IOS Release 12.0 Command Reference Master Index</i> • <i>Cisco IOS Release 12.0 Master Indexes</i> • <i>Cisco IOS Software Command Summary</i> • <i>Cisco IOS Software System Error Messages</i> • <i>Debug Command Reference</i> • <i>Dial Solutions Quick Configuration Guide</i> • <i>New Features in 12.0-Based Limited Lifetime Releases</i> • <i>New Features in Early Deployment Release 12.0T</i> • <i>Release Notes (Release notes for 12.0-based releases and various platforms)</i> 	

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.com. 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 provide sources for obtaining documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at <http://www.cisco.com>. Translated documentation can be accessed at http://www.cisco.com/public/countries_languages.shtml.

Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships 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 as an annual subscription.

Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco Direct Customers can order Cisco Product documentation from the Networking Products MarketPlace:
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, in North America, by calling 800 553-NETS(6387).

Documentation Feedback

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

You can e-mail your comments to bug-doc@cisco.com.

To submit your comments by mail, for your convenience many documents contain a response card behind the front cover. Otherwise, you can mail your comments to the following address:

Cisco Systems, Inc.
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. For Cisco.com registered users, additional troubleshooting tools are available from the TAC website.

Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information and resources at anytime, from anywhere in the world. This highly integrated Internet application is a powerful, easy-to-use tool for doing business with Cisco.

Cisco.com provides a broad range of features and services to help customers and partners streamline business processes and improve productivity. Through Cisco.com, you can find information about Cisco and our networking solutions, services, and programs. In addition, you can resolve technical issues with online technical support, download and test software packages, and order Cisco learning materials and merchandise. Valuable online skill assessment, training, and certification programs are also available.

Customers and partners can self-register on Cisco.com to obtain additional personalized information and services. Registered users can order products, check on the status of an order, access technical support, and view benefits specific to their relationships with Cisco.

To access Cisco.com, go to the following website:

<http://www.cisco.com>

Technical Assistance Center

The Cisco TAC website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website:

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

P3 and P4 level problems are defined as follows:

- P3—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for Cisco.com, go to the following website:

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

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at the following website:

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

Contacting TAC by Telephone

If you have a priority level 1 (P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to the following website:

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

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.

This document is to be used in conjunction with the documents listed in the “Related Documentation” section on page 58

AccessPath, AtmDirector, Browse with Me, CCDA, CCDE, CCDP, CCIE, CCNA, CCNP, CCSI, CD-PAC, *CiscoLink*, the Cisco NetWorks logo, the Cisco *Powered* Network logo, Cisco Systems Networking Academy, the Cisco Systems Networking Academy logo, Fast Step, Follow Me Browsing, FormShare, FrameShare, GigaStack, IGX, Internet Quotient, IP/VC, iQ Breakthrough, iQ Expertise, iQ FastTrack, the iQ Logo, iQ Net Readiness Scorecard, MGX, the Networkers logo, *Packet*, PIX, RateMUX, ScriptBuilder, ScriptShare, SlideCast, SMARTnet, TransPath, Unity, Voice LAN, Wavelength Router, and WebViewer are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn, Discover All That’s Possible, and Empowering the Internet Generation, are service marks of Cisco Systems, Inc.; and Aironet, ASIST, BPX, Catalyst, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, the Cisco IOS logo, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Enterprise/Solver, EtherChannel, EtherSwitch, FastHub, FastSwitch, IOS, IP/TV, LightStream, MICA, Network Registrar, Post-Routing, Pre-Routing, Registrar, StrataView Plus, Stratm, SwitchProbe, TeleRouter, and VCO are registered trademarks of Cisco Systems, Inc. or its affiliates in the U.S. and certain other countries.

All other brands, names, or trademarks mentioned in this document or website are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0102R)

Copyright © 1999–2001, Cisco Systems, Inc.
All rights reserved.