



Release Notes for Cisco uBR7200 Series for Cisco IOS Release 12.1 CX

September 17, 2001



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 document the new, cable-specific, leading-edge, CX train, and describe the enhancements and caveats provided in Cisco IOS Release 12.1(7)CX. These release notes are updated with each release in the train. For a list of the software caveats that apply to Release 12.1(7)CX, see the [“Caveats” section on page 34](#).

Release 12.1 CX is based on Release 12.1 EC: in addition to the features inherited from Release 12.1(4)EC, Release 12.1 CX provides support for the new DOCSIS 1.1 standard.



Note

Cable modem cards are now referred to as cable interface line cards.

Contents

These release notes describe the following topics:

- [Introduction, page 2](#)
- [Early Deployment Releases, page 4](#)
- [System Requirements, page 5](#)
- [New and Changed Information, page 17](#)
- [Important Notes, page 29](#)
- [MIBs, page 31](#)
- [Caveats, page 34](#)
- [Related Documentation, page 37](#)



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

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

78-12481-02

- [Obtaining Documentation, page 42](#)
- [Obtaining Technical Assistance, page 43](#)

Introduction

For information on new features and Cisco IOS commands supported by Cisco IOS Release 12.1(7)CX, see the [“New and Changed Information”](#) section on page 17 and the [“Related Documentation”](#) section on page 37.

Cisco uBR7200 Series Universal Broadband Routers

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 uBR905 and Cisco uBR924 cable access routers, and other DOCSIS-compliant 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 uBR7200 series routers do not support telco return in Cisco IOS Release 12.1(7)CX.

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.

Cisco IOS Release 12.1(7)CX 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 interface line 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 interface line 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 interface line 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 interface line 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

Cisco uBR7200 Series Universal Broadband Router Overview

[Table 1](#) provides a quick overview of the major hardware features of the Cisco uBR7200 series universal broadband routers.

Table 1 Cisco uBR7200 Series 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 Interface Line Cards	up to 4	up to 4	up to 2

Table 1 Cisco uBR7200 Series Universal Broadband Router Overview (continued)

Hardware Supported	Cisco uBR7246 VXR	Cisco uBR7246	Cisco uBR7223
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 universal broadband series routers for Cisco IOS Release 12.1(7)CX. Release 12.1 CX is an early deployment (ED) release based on Release 12.1 EC, which serves as the train’s starting point. Early deployment releases contain fixes to software caveats as well as support for new Cisco hardware and software features. Feature support is cumulative from release to release, unless otherwise noted.

Table 2 lists the features supported by the Cisco uBR7200 series in Cisco IOS Release 12.1(7)CX.

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

ED Release	Additional Software Features ¹ and MIBs ²	Additional Hardware Features	Hardware Availability
Cisco IOS Release 12.1(7)CX	New in Release 12.1(7)CX: <ul style="list-style-type: none"> • Additional DOCSIS 1.1 SNMP³ Support • Advanced Spectrum Management Support for the Cisco uBR-MC16S cable interface line card 		

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

ED Release	Additional Software Features ¹ and MIBs ²	Additional Hardware Features	Hardware Availability
Cisco IOS Release 12.1(4)CX	New in Release 12.1(4)CX: <ul style="list-style-type: none"> • DOCSIS 1.1 Support, including BPI+⁴ 		
Cisco IOS Release 12.1(4)EC	Inherited from 12.1(4)EC and earlier 12.1 EC releases: <ul style="list-style-type: none"> • Cable Downstream Frequency Override CLI⁵ • Cable Interface Setup Facility • Cable Monitor • Dynamic Ranging Support • Dynamic Upstream Modulation • Enhanced Per-Modem Error Counter • Internal Modem Configuration File Editor • Hot-Standby 1+1 Redundancy⁶ • “MAX-CPE” CLI override • MPLS⁷ VPN⁸ Support for Subinterfaces and Interface Bundles • Overlapping Subinterface IP Addresses • SNMP Warm Start Trap 		

1. Only major features are listed.
2. MIB = Management Information Base
3. SNMP = Simple Network Management Protocol
4. BPI+ = Baseline Privacy Interface Plus
5. CLI = command line interface
6. In Cisco IOS Release 12.1(4)CX and subsequent releases, Hot-Standby 1+1 Redundancy is not supported when the CMTS is operating in DOCSIS 1.1 mode.
7. MPLS = Multiprotocol Label Switching
8. VPN = Virtual Private Network

System Requirements

This section describes the system requirements for Release 12.1(7)CX and includes the following sections:

- [Memory Recommendations, page 6](#)
- [System Interoperability, page 6](#)
- [Supported Hardware, page 8](#)
- [Determining Your Software Release, page 12](#)
- [Upgrading to a New Software Release, page 13](#)
- [Feature Set Tables, page 13](#)

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 12.1(7)CX. Cisco uBR7200 series universal broadband 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 12.1(7)CX Feature Sets*

Feature Set	Software Image	Recommended Flash Memory	Recommended DRAM Memory	Runs From
Two-Way Data/VoIP Image				
DOCSIS Two-Way with BPI	ubr7200-k1p-mz	16 MB Flash	64 MB DRAM	RAM

The image subset legend for Table 3 is as follows:

- k1 = DOCSIS Baseline Privacy Interface (BPI), BPI+, and MPLS-VPN support
- p = IP routing with Intermediate System-to-Intermediate System (IS-IS) and Border Gateway Protocol (BGP); MPLS-VPN support; no bridging and no NAT



Note

For the Cisco IOS Release 12.1(7)CX image, 64 MB of DRAM is recommended. However, on a Cisco uBR7200 series router configured with one or more Cisco uBR-MC28C cable interface line cards, 128 MB of DRAM is required.

System Interoperability

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

- DOCSIS 1.0 Baseline Privacy

DOCSIS baseline privacy interface BPI gives subscribers data privacy across the RF network, encrypting traffic flows between the CMTS and CM. BPI ensures that a CM, uniquely identified by its Media Access Control (MAC) address, can obtain keying material for services only it is authorized to access.

BPI+ is supported in DOCSIS 1.1 to provide a set of extended services within the MAC sublayer that increase performance and system security. BPI+ is supported only when the cable modem is DOCSIS 1.1-capable and contains the digital certificates that are required by BPI+.

To enable BPI, choose software at both the CMTS and CM that support the mode of operation. For the Cisco uBR7200 series software, choose an image with “k1” in its file name or BPI in the feature set description.

The CM must also support BPI. CMs must have factory-installed RSA private/public key pairs to support internal algorithms to generate key pairs prior to first BPI establishment. BPI must be enabled via the DOCSIS configuration file.



Note

RSA stands for Rivest, Shamir, and Adelman, inventors of a public-key cryptographic system.

- DOCSIS 1.0 Extensions

The Cisco uBR7200 series supports the following DOCSIS 1.0 quality of service (QoS) extensions:

- Multi-Service ID (SID) support, allowing the definition of multiple SIDs on the upstream—Voice traffic can be designated on a higher QoS committed information rate (CIR) secondary SID, while data traffic can be forwarded on a best-effort basis on a primary SID. Secondary SIDs are higher QoS CIR-type classes that have a nonzero minimum reserved rate (CIR-type service). These SIDs receive preferential treatment at the CMTS for grants over any tiered best-effort type data SID of that upstream. Reliable operation with voice requires multiple SIDs—at least two per CM to separate voice from data. In DOCSIS 1.0, SIDs are set up statically. When supporting DOCSIS 1.0 extensions, SIDs can be set up statically or dynamically. Both the CMTS and CM must support this capability.
- CM-initiated dynamic MAC messages—Dynamic Service Addition (DSA) and Dynamic Service Deletion (DSD). These messages allow dynamic SIDs to be created and deleted at run-time on a per-VoIP call basis.
- Unsolicited grant service (constant bit rate [CBR]-scheduling) on the upstream—This helps provide a higher-quality channel for upstream VoIP packets from an Integrated Telephony Cable Modem (ITCM) such as the Cisco uBR924 cable access router.
- Ability to provide separate downstream rates for any given ITCM, based on the IP-precedence value in the packet—This helps separate voice signaling and data traffic that goes to the same ITCM to address rate-shaping purposes.
- Concatenation—To increase the per-CM upstream throughput in certain releases of software, Cisco uBR7200 series software supports a concatenated burst of multiple MAC frames from a CM that supports concatenation.



Note All DOCSIS 1.0 extensions are activated only when a CM or Cisco uBR924 that supports these extensions solicits services via dynamic MAC messages or the feature set. If the CMs in your network are pure DOCSIS 1.0-based, they will receive regular DOCSIS 1.0 treatment from the CMTS.

- DOCSIS 1.0, 1.0+, and 1.1 Interoperability

The Cisco uBR7200 series can transparently interoperate with cable modems running DOCSIS 1.0, the DOCSIS 1.0+ extensions, or DOCSIS 1.1. If a cable modem indicates at system initialization that it is DOCSIS 1.1-capable, the Cisco uBR7200 series uses the DOCSIS 1.1 features. If the cable modem is not DOCSIS 1.1-capable, but does support the DOCSIS 1.0+ QoS extensions—for example, a Cisco uBR924 cable access router running Cisco IOS Release 12.1(1)T or higher—the Cisco uBR7200 series automatically supports the cable modem's requests for dynamic services. Otherwise, the cable modem is treated as a DOCSIS 1.0 device.

- CM Interoperability

The Cisco uBR7200 series interoperates with the following cable modems:

- DOCSIS-based two-way CMs that support basic Internet access, VoIP, or Virtual Private Networks (VPNs).
- EuroDOCSIS CMs or STBs with integrated EuroDOCSIS CMs using Cisco MC16E cable interface line cards and Cisco IOS Release 12.1(4)CX or subsequent releases. EuroDOCSIS operation support includes 8-MHz Phase Alternating Line (PAL) or Systeme Electronique Couleur Avec Memoire (SECAM) channel plans.

- Clock Synchronization

The Cisco uBR7200 series support clock hardware and software to enable high-quality delivery of IP telephony services through synchronized data transmissions. To support the clock feature set, a Cisco uBR7246 VXR chassis must be used. The Cisco uBR7246 VXR must contain a clock card and an MC16S, MC16E, or MC28C cable interface line card. Only the MC16S, MC16E, and MC28C cable interface line cards support the external clock reference from the clock card to distribute that signal to CMs or STBs attached to the specific network segments.

Each cable modem must also support VoIP applications and the clock reference feature set to enable synchronized timing. The Cisco uBR924 cable access router, running Cisco IOS Release 12.0(7)T or later, supports the clock reference feature set automatically.

Supported Hardware

Cisco IOS Release 12.1(7)CX supports the following Cisco uBR7200 series universal broadband routers:

- Cisco uBR7223
- Cisco uBR7246
- Cisco uBR7246 VXR

For detailed descriptions of the new hardware features, see the [“New and Changed Information” section on page 17](#).

Network Processing Engines

The Cisco uBR7223 and the Cisco uBR7246 support the following Network Processing Engines (NPE) in Cisco IOS Release 12.1(7)CX:

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

The Cisco uBR7246 VXR supports the following Network Processing Engines (NPE) in Cisco IOS Release 12.1(7)CX:

- 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 Interface Line Cards

Cisco IOS Release 12.1(7)CX supports the following cable interface line cards, all of which provide connection to the HFC network:

- MC11C cable interface line cards (which replace the original MC11-FPGA cable interface line cards that are also supported for existing installations) offer the following ports:
 - One upstream port

- One downstream port
- MC12C cable interface line cards (which replace the original MC12 cable interface line cards) offer the following ports:
 - Two upstream ports
 - One downstream port
- MC14C cable interface line cards (which replace the original MC14 cable interface line cards) offer the following ports:
 - Four upstream ports
 - One downstream port
- MC16C cable interface line cards (which replace the MC16B cable interface line cards that are also supported for existing installations) offer the following ports:
 - Six upstream ports
 - One downstream port
- MC16E cable interface line 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
- MC16S spectrum management cable interface line cards offer the following ports:
 - Six upstream ports, with dedicated hardware support for enhanced hardware-based spectrum management
 - One downstream port
- MC28C cable interface line cards offer the following ports:
 - Eight upstream ports
 - Two downstream ports

Table 4 provides a quick overview of the cable interface line cards supported in Cisco IOS Release 12.1(7)CX.

Table 4 Cisco uBR7200 Cable Interface Line Cards

Cable Interface Line 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
MC16S	6	1	Enhanced software- and hardware-based Spectrum Management Support
MC28C	8	2	

Port Adapter Cards

Table 5 lists and describes the port adapters supported by Cisco uBR7200 series routers in Cisco IOS Release 12.1(7)CX.


Note

Not all Cisco uBR7200 series routers support all port adapters. Some port adapters must be at certain revision levels to be used in the Cisco uBR7246 VXR router.

Table 5 Cisco uBR7200 Series Port Adapter Releases

Product Number	Cisco uBR7223	Cisco uBR7246	Cisco uBR7246 VXR
Ethernet			
PA-4E—4-port Ethernet 10BASE-T port adapter	12.1(4)CX ¹	12.1(4)CX ¹	12.1(4)CX ¹
PA-8E—8-port Ethernet 10BASE-T port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-FE-TX—1-port 100BASE-TX Fast Ethernet port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-FE-FX—1-port 100BASE-FX Fast Ethernet port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-2FEISL-TX—2-port 100BASE-TX Fast Ethernet port adapter with Inter-Switch Link (ISL) support	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-2FEISL-FX—2-port 100BASE-FX Fast Ethernet port adapter with Inter-Switch Link (ISL) support	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-12E/2FE—12-port 10BASE-T and 2-port 10/100BASE-TX port adapter	Not applicable	12.1(4)CX	Not applicable
Gigabit Ethernet			
PA-GE—1-port, full-duplex, IEEE 802.3z-compliant Gigabit Ethernet (GE) port adapter ²	Not applicable	Not applicable	12.1(4)CX
Serial			
PA-4T+—4-port synchronous serial port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-8T-232—8-port EIA/TIA-232 synchronous serial port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-8T-V35—8-port V.35 synchronous serial port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-8T-X21—8-port X.21 synchronous serial port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-4E1G-75—4-port unbalanced (75-ohm) E1-G.703/G.704 synchronous serial port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-4E1G-120—4-port balanced (120-ohm) E1-G.703/G.704 synchronous serial port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-E3—1-port high-speed serial E3 interface port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX

Table 5 Cisco uBR7200 Series Port Adapter Releases (continued)

Product Number	Cisco uBR7223	Cisco uBR7246	Cisco uBR7246 VXR
PA-T3—1-port T3 serial interface port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-2E3—2-port high-speed serial E3 interface port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-2T3—2-port T3 serial interface port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-MC-E3—1-port multi-channel E3, medium-speed serial interface port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-MC-T3—1-port T3 (channelized into 28 independent T1 data lines) port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-MC-2T1—2-port multichannel DS1 Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) single-wide port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-MC-4T1—4-port multichannel DS1 Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) single-wide port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-MC-8E1/120—8-port multichannel E1 Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) single-wide port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-MC-8T1—8-port multichannel DS1 Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) single-wide port adapter	12.1(4)CX	12.1(4)CX	Not applicable
HSSI			
PA-H—1-port HSSI port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX ³
PA-2H—2-port HSSI port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX ⁴
ATM			
PA-A1-OC3SMI—1-port ATM OC-3c/STM-1 single-mode intermediate reach port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-A1-OC3MM—1-port ATM OC-3c/STM-1 multimode port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-A2-4E1XC-OC3SM—5-port ATM CES ⁵ (4 E1 120-ohm CBR ⁶ ports and 1 OC-3 ATM single-mode port) port adapter	Not applicable	12.1(4)CX	Not applicable
PA-A2-4E1XC-E3ATM—5-port ATM CES ⁵ (4 E1 120-ohm CBR ⁶ ports and 1 E3 ATM port) port adapter	Not applicable	12.1(4)CX	Not applicable
PA-A2-4T1C-OC3SM—5-port ATM CES ⁵ (4 T1 CBR ⁶ ports and 1 OC-3 ATM single-mode port) port adapter	Not applicable	12.1(4)CX	Not applicable
PA-A2-4T1C-T3ATM—5-port ATM CES ⁵ (4 T1 CBR ⁶ ports and 1 T3 ATM port) port adapter	Not applicable	12.1(4)CX	Not applicable

Table 5 Cisco uBR7200 Series Port Adapter Releases (continued)

Product Number	Cisco uBR7223	Cisco uBR7246	Cisco uBR7246 VXR
PA-A3-E3—1-port E3 ATM, PCI-based port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-A3-T3—1-port T3 ATM, PCI-based port adapter	12.1(4)CX	12.1(4)CX	Not applicable
PA-A3-OC3MM—1-port OC-3c ATM, PCI-based multimode port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-A3-OC3SMI—1-port OC-3c ATM, PCI-based single-mode intermediate reach port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-A3-OC3SML—1-port OC-3c ATM, PCI-based single-mode long reach port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
Packet-Over-SONET (POS)			
PA-POS-OC3SML—1-port POS OC-3 single-mode, long reach port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-POS-OC3SMI—1-port OC3 single-mode, intermediate reach port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
PA-POS-OC3MM—1-port POS OC3 multimode port adapter	12.1(4)CX	12.1(4)CX	12.1(4)CX
Dynamic Packet Transport (DPT)			
PA-SRP-OC12SML—2-port OC-12c (STM4c) single-mode fiber, long reach DPT port adapter	Not applicable	12.1(4)CX	Not applicable
PA-SRP-OC12SMI—2-port OC-12c (STM4c) single-mode fiber, intermediate reach DPT port adapter	Not applicable	12.1(4)CX	Not applicable
PA-SRP-OC12SMX—2-port OC-12c (STM4c) single-mode fiber, extended reach DPT port adapter	Not applicable	12.1(4)CX	Not applicable
PA-SRP-OC12MM—2-port OC-12c (STM4c) multimode fiber DPT port adapter	Not applicable	12.1(4)CX	Not applicable

1. The number in this column indicates the Cisco IOS release in which the interface was introduced. For example, 12.1(4)CX means that an interface was introduced in Cisco IOS Release 12.1(4)CX.
2. The Gigabit Ethernet port adapter must be combined with the appropriate optical fiber cable and a Gigabit Interface Converter (GBIC).
3. To use a PA-H 1-port HSSI port adapter in a Cisco uBR7246 VXR, be sure you have the minimum required hardware revision (version 1.17, part number 800-02747-06) or a more recent version of the port adapter.
4. To use a PA-2H 2-port HSSI port adapter in a Cisco uBR7246 VXR, be sure you have the minimum required hardware revision (version 1.3, part number 800-03306-02) or a more recent version of the port adapter.
5. CES = circuit emulation services.
6. CBR = constant bit rate.

Determining Your Software Release

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) 12.1 CX Software (ubr7200-klp-mz), Version 12.1(7)CX, RELEASE SOFTWARE
```

Upgrading to a New Software Release

For general information about upgrading to a new software release, see *Cisco IOS Upgrade Ordering Instructions* located at http://www.cisco.com/warp/public/cc/cisco/mkt/ios/prodlit/957_pp.htm

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 the features and feature sets supported by the Cisco uBR7200 series in Cisco IOS Release 12.1(7)CX and uses the following conventions:

- Yes—The feature is supported in the software image.
- No—The feature is not supported in the software image.
- In—The number in the “In” column indicates the Cisco IOS release in which the feature was introduced (excluding deferred images). Cisco IOS Release 12.1(4)EC was the base release; all features, unless otherwise noted, were introduced in this release.



Note

This table might not be cumulative or list all the features in each image. You can find the most current Cisco IOS documentation on Cisco.com. These 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 12.1(7)CX by using the Feature Navigator tool at <http://www.cisco.com/go/fn>.

Table 6 Feature List by Feature Sets for Cisco uBR7200 Series Routers

Feature	DOCSIS Two-Way with BPI
	In ¹
IP Routing	
DHCP ² Server	
DRP ³ Server Agent	
Easy IP (Phase 1)	
Hot-Standby 1+1 Redundancy ⁴	
IP Type of Service and Precedence for GRE ⁵ Tunnels	
IP Enhanced IGRP ⁶ Route Authentication	
Per-Modem Filters	
Management	
Cable Interface Setup Facility	
Cable Monitor	

Table 6 Feature List by Feature Sets for Cisco uBR7200 Series Routers (continued)

Feature	DOCSIS Two-Way with BPI In¹
Cisco Call History MIB Command Line Interface	
Cisco IOS Internationalization	
DOCSIS Ethernet MIB Objects Support (RFC 2665)	
DOCSIS OSSI ⁷ Objects Support (RFC 2233)	
Dynamic Ranging Support	
Enhanced Modem Status Display	
Enhanced Per-Modem Error Counter	
Entity MIB, Phase 1	
Interface Command Enhancements	
Internal Modem Configuration File Editor	
MIB Enhancements	
Multicast BPI MIB	
LinkUp/Down Traps Support (RFC 2233)	
RF Interface MIB	
SNMPv2C ⁸ and SNMPv3 ⁹	
SNMP Cable Modem Remote Query	
Multimedia	
Bidirectional PIM ¹⁰	
IP Multicast Load Splitting across Equal-Cost Paths	
IP Multicast over ATM ¹¹ Point-to-Multipoint Virtual Circuits	
IP Multicast over Token Ring LANs	
Stub IP Multicast Routing	
Quality of Service	
Dynamic Upstream Modulation	
DOCSIS 1.0+ ¹² QoS Enhancements	
DOCSIS 1.1 Support	12.1(4)CX
Additional DOCSIS 1.1 SNMP Support	12.1(7)CX
Advanced Spectrum Management Features for uBR-MC16S	12.1(7)CX
Downstream QoS Handling	
Downstream Traffic Shaping	
Dynamic SID support	
Dynamic Map-Advance	
Improved Upstream QoS	
Multiple SID Support (static only)	
QoS Configuration	

Table 6 Feature List by Feature Sets for Cisco uBR7200 Series Routers (continued)

Feature	DOCSIS Two-Way with BPI In¹
QoS Profile Enforcement	
Read/Create Implementation of QoS	
RTP ¹³ Header Compression	
Time of Day (ToD) Server	
Upstream Address Verification	
Upstream Traffic Shaping	
Security	
Automated Double Authentication	
BPI Encryption and Authentication	
BPI+ Encryption and Authentication	12.(4)CX
Cable Modem and Multicast Authentication Using RADIUS ¹⁴	
Cisco IOS Firewall Enhancements	
Dynamic Mobile Hosts	
HTTP ¹⁵ Security	
Named Method Lists for AAA ¹⁶ Authorization & Accounting	
Per-Modem and Per-Host Access List Support	
Per-User Configuration	
Reflexive Access Lists	
Vendor-Proprietary RADIUS Attributes	
Switching	
Fast-Switched Policy Routing	
VPN	
MPLS VPN Support for Subinterfaces and Interface Bundles	
WAN Optimization	
PAD ¹⁷ Subaddressing	
WAN Services	
Bandwidth Allocation Control Protocol (BACP)	
Enhanced Local Management Interface (ELMI)	
Frame Relay Enhancements	
Frame Relay MIB Extensions	
Frame Relay Router ForeSight	
ISDN ¹⁸ Advice of Charge	
ISDN Caller ID Callback	
ISDN Multiple Switch Type	
ISDN NFAS ¹⁹	

Table 6 Feature List by Feature Sets for Cisco uBR7200 Series Routers (continued)

Feature	DOCSIS Two-Way with BPI
	In ¹
Microsoft Point-to-Point Compression (MPPC)	
National ISDN Switch Types for BRI ²⁰ and PRI ²¹	
VPDN ²² MIB and Syslog Facility	
X.25 Enhancements	
X.25 Switching Between PVCs ²³ and SVCs ²⁴	

1. The number in the “In” column indicates the Cisco IOS release in which the feature was introduced. For example, 12.1(4)CX means that a feature was introduced in Cisco IOS Release 12.1(4)CX. If a cell in this column is empty, the feature was included in the initial base release.
2. DHCP = Dynamic Host Configuration Protocol
3. DRP = Director Response Protocol
4. In Cisco IOS Release 12.1(7)CX, Hot-Standby 1+1 Redundancy is not supported when the CMTS is operating in DOCSIS 1.1 mode.
5. GRE = generic routing encapsulation
6. IGRP = Interior Gateway Routing Protocol
7. OSSI = Operations Support System Interface
8. SNMPv2 = Simple Network Management Protocol version 2
9. SNMPv3 = Simple Network Management Protocol version 3
10. PIM = Protocol Independent Multicast
11. ATM = Asynchronous Transfer Mode
12. The DOCSIS 1.0+ QoS Enhancements is a set of Cisco's Quality of Service extensions to DOCSIS 1.0 to enable basic VoIP service over the DOCSIS link before DOCSIS 1.1 becomes available. The main enhancements include support for dynamic creation and teardown of flows during voice calls, support for one new slot scheduling mechanism (UGS) for voice slots, and per IP-precedence rate shaping on the downstream.
13. RTP = Real-Time Transport Protocol
14. RADIUS = Remote Access Dial-In User Service
15. HTTP = Hypertext Transfer Protocol
16. AAA =authentication, authorization, and accounting
17. PAD = packet assembler/disassembler
18. ISDN = Integrated Services Digital Network
19. NFAS = non-facility-associated signaling
20. BRI = Basic Rate Interface
21. PRI = Primary Rate Interface
22. VPDN = virtual private dial-up network
23. PVC = permanent virtual circuit
24. SVC = switched virtual circuit

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 12.1 CX.

No New Hardware Features in Release 12.1(7)CX

There are no new hardware features introduced in Cisco IOS Release 12.1(7)CX.

New Software Features in Release 12.1(7)CX

The following new software features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.1(7)CX.

Additional DOCSIS 1.1 SNMP Support

Release 12.1(7)CX adds support for the following new or changed MIBs:

- DOCS-QOS-MIB—Describes the quality of service (QoS) attributes. This is revision 04 of the MIB.



Note Release 12.1(4)CX implemented revision 02 of this MIB. Revision 04 includes substantial changes to the tables and attributes.

- DOCS-SUBMGT-MIB—Describes the subscriber management attributes. This is revision 02 of the MIB.
- RFC2933—Describes the IGMP protocol attributes, as defined in RFC2933.
- DOCS-CABLE-DEVICE-MIB—Describes the operation of the CM and CMTS. Only the syslog and Event tables are supported by this MIB, which was released as RFC2669.
- DOCS-CABLE-DEVICE-TRAP-MIB—Defines the traps supported by CMs and the CMTS and is the extension of the RFC2669 (DOCS-CABLE-DEVICE-MIB).
- DOCS-IF-EXT-MIB—Extends the RFC2670 (DOCS-IF-MIB) to provide information about whether CMs and CMTS support DOCSIS 1.0 or DOCSIS 1.1.

In addition, the CLI supports a new command (**cable submgt default**) to set the default value of attributes in DOCS-SUBMGT-MIB. This command can be included in the Cisco IOS configuration file so that the new values are automatically set after a reboot or reload of the Cisco uBR7200 series router.

Advanced Spectrum Management Features for the Cisco uBR-MC16S Spectrum Management Card

The Cisco uBR-MC16S cable interface line card has a DOCSIS-based cable interface that supports one downstream and six upstreams. It incorporates a daughterboard with hardware-based spectrum management features that provide the following features:

- Integrates a DOCSIS cable interface line card with an onboard spectrum analyzer that continuously analyzes the upstream spectrum quality in the DOCSIS frequency range of 5 to 42 MHz
- Includes hardware-assisted frequency hopping, providing for more intelligent and faster frequency selection than software-only solutions

- Reduces the response time to ingress noise that could cause modems to drop offline
- Eliminates blind frequency hopping by initiating frequency hops to known clean channels
- Improves frequency agility to help eliminate dropped packets and thereby maintain full upstream data rates
- Supports frequency agility in dense-mode combining environments across a shared spectrum
- Restricts frequency hopping to a set of discrete frequencies or to a range of frequencies, as desired
- Allows frequency hop conditions to be customized for specific plant environments and requirements
- Optionally schedules frequency hops to take advantage of known usage patterns or plant conditions
- Optionally dynamically reduces channel width to allow cable modems to remain online, even in noisy upstream conditions
- The Cisco uBR-MC16S line card can be installed in existing deployments of the Cisco uBR7223, uBR7246, and uBR7246 VXR universal broadband routers
- As is the case with the other cable interface line cards, the Cisco uBR-MC16S line card supports Online Insertion and Removal (OIR), allowing for hotswappable upgrades and maintenance

The Advanced Spectrum Management Features for the Cisco uBR-MC16S cable interface line card, available in Cisco IOS Release 12.1(7)CX, are a software-only upgrade that provides the following additional features:

- Supports proactive channel management to avoid the impacts of ingress and keep subscribers online and connected.
- Offers flexible configuration choices, allowing users to determine the priority of the actions to be taken when ingress noise on the upstream exceeds the allowable thresholds. The configurable actions are frequency hopping, switching the modulation profile, and reducing the channel width.
- Performs CNR calculations using DSP algorithms in real-time on a per-interface and per-modem basis.
- Intelligently determines when to modify the frequency, channel width, or modulation scheme based on CNR calculations in the active channel. Previously, frequency and channel width changes occurred when the number of missed station maintenance polls exceeded a user-defined threshold.
- Enhances the Dynamic Upstream Modulation feature for the Cisco uBR-MC16S line card. This feature supports dynamic modulation using two upstream profiles. The primary profile (typically using 16 QAM modulation) remains in effect at low noise conditions, but if upstream conditions worsen, the cable modems switch to the secondary profile (typically using QPSK modulation) to avoid going offline. When the noise conditions improve, the modems are moved back to the primary profile.

When using a Cisco uBR-MC16S line card on a Cisco uBR7200 series router running Cisco IOS Release 12.1(7)CX, the spectrum management hardware uses the real-time CNR readings from the DSPs on the MC16S daughtercard instead of the signal-to-noise ratio (SNR) values from the Broadcom 3137 chip to determine the signal quality of the upstream channel. The CNR value is a more accurate description of noise conditions on the upstream.



Note The Dynamic Upstream Modulation feature was introduced in Cisco IOS Release 12.1(3a)EC1. The above enhancements to this feature currently exist only in 12.1(7)CX; they do not exist in any 12.1 EC release.

- Provides an SNMP interface so that a network management workstation or other graphical tool can obtain spectrum information for either a particular cable modem or for an entire upstream. The frequency resolution can be as fine as 12 KHz.



Note The CISCO-CABLE-SPECTRUM MIB has been enhanced to provide this support.

- Supported management tools include the Cisco Broadband Troubleshooter Version 3.0, which provides graphical spectrum analyzer capability for an individual upstream port or an individual cable modem. Spectrum data is extracted from the Cisco uBR-MC16S cable interface line card using SNMP, allowing for live troubleshooting of an upstream port or individual cable modem.

No New Hardware Features in Release 12.1(4)CX

There are no new hardware features introduced in Cisco IOS Release 12.1(4)CX.

New Software Features in Release 12.1(4)CX

The following new software features are supported by the Cisco uBR7200 series routers in Cisco IOS Release 12.1(4)CX.

DOCSIS 1.1 Support

Cisco IOS Release 12.1(4)CX introduces support for the new DOCSIS 1.1 standard. DOCSIS 1.1 modifies the DOCSIS 1.0 specification to provide better performance, in particular for real-time traffic such as voice calls. It also provides more secure encryption and authentication between the CMTS and cable modems.

The DOCSIS 1.1 specification provides the following functional enhancements over DOCSIS 1.0 coaxial cable networks:

- Enhanced Quality of Service (QoS) to give priority for real-time traffic such as voice and video
 - The DOCSIS 1.0 QoS model (a Service IDs (SID) associated with a QoS profile) has been replaced with a service flow model that allows greater flexibility in assigning QoS parameters to different types of traffic and in responding to changing bandwidth conditions
 - Multiple service flows per CM in either direction due to packet classifiers
 - Support for multiple service flows per cable modem allows a single cable modem to support a combination of data, voice, and video traffic
 - Greater granularity in QoS per cable modem in either direction, using unidirectional service flows
 - Dynamic MAC messages that can create, modify, and tear-down QoS service flows dynamically when requested by a DOCSIS 1.1 cable modem
- Supported QoS models for the upstream are:
 - Best effort-Data traffic sent on a non-guaranteed best-effort basis
 - Committed Information Rate (CIR)-Guaranteed minimum bandwidth for data traffic
 - Unsolicited Grants (UGS)-Constant bit rate (CBR) traffic, such as voice, that is characterized by fixed size packets at fixed intervals

- Real Time Polling (RTPS)-Real Time service flows, such as video, that produce unicast, variable size packets at fixed intervals
- Unsolicited Grants with Activity Detection (USG-AD)-Combination of UGS and RTPS, to accommodate real time traffic that might have periods of inactivity (such as voice using silence suppression). The service flow uses UGS fixed grants while active, but switches to RTPS polling during periods of inactivity to avoid wasting unused bandwidth.
- Enhanced time-slot scheduling mechanisms to support guaranteed delay/jitter sensitive traffic on the shared multiple access upstream link
- Payload Header Suppression (PHS) conserves link-layer bandwidth by suppressing unnecessary packet headers on both upstream and downstream traffic flows
- Layer 2 fragmentation on the upstream prevents large data packets from affecting real-time traffic, such as voice and video. Large data packets are fragmented and then transmitted in the timeslots that are available between the timeslots used for the real-time traffic.
- Concatenation allows a cable modem to send multiple MAC frames in the same timeslot, as opposed to making an individual grant request for each frame. This avoids wasting upstream bandwidth when sending a number of very small packets, such as TCP acknowledgement packets.
- Advanced authentication and security through X.509 digital certificates and Triple Data Encryption Standard (3DES) key encryption
- Secure software download allows a service provider to remotely upgrade a cable modem's software, without risk of interception or alteration
- DOCSIS 1.1 cable modems can coexist with DOCSIS 1.0 and 1.0+ cable modems in the same network—the Cisco uBR7200 series provides the levels of service that are appropriate for each cable modem

DOCSIS 1.1 Quality of Service

The DOCSIS 1.1 QoS framework is based on the following objects:

- Service class: A collection of settings maintained by the CMTS that provide a specific QoS service tier to a cable modem that has been assigned a service flow within a particular service class
- Service flow: a unidirectional sequence of packets receiving a service class on the DOCSIS link
- Packet classifier: A set of packet header fields used to classify packets onto a service flow to which the classifier belongs
- PHS rule: A set of packet header fields that are suppressed by the sending entity before transmitting on the link, and are restored by receiving entity after receiving a header-suppressed frame transmission. Payload Header Suppression increases the bandwidth efficiency by removing repeated packet headers before transmission

In DOCSIS 1.1, the basic unit of QoS is the service flow, which is a unidirectional sequence of packets transported across the RF interface between the cable modem and CMTS. A service flow is characterized by a set of QoS parameters such as latency, jitter, and throughput assurances.

Every cable modem establishes a primary service flow in both the upstream and downstream directions. The primary flows maintain connectivity between the cable modem and CMTS at all times.

In addition, a DOCSIS 1.1 cable modem can establish multiple secondary service flows. The secondary service flows can either be permanently created (they persist until the cable modem is reset or powered off) or they can be created dynamically to meet the needs of the on demand traffic being transmitted.

Each service flow has a set of QoS attributes associated with it. These QoS attributes define a particular class of service and determine characteristics such as the maximum bandwidth for the service flow and the priority of its traffic. The class of service attributes can be inherited from a preconfigured CMTS local service class (class-based flows), or they can be individually specified at the time of the creation of the service flow.

Each service flow has multiple packet classifiers associated with it, which determine the type of application traffic allowed to be sent on that service flow. Each service flow can also have a Payload Header Suppression (PHS) rule associated with it to determine which portion of the packet header will be suppressed when packets are transmitted on the flow.

In Cisco IOS Release 12.1(4)CX, the following new or enhanced software features are implemented for DOCSIS 1.1 functionality. (For more information, see the feature module *Migrating to DOCSIS 1.1 with Cisco Cable Products*).

Software Features Inherited from Release 12.1(4)EC

The following software features have been inherited from Cisco IOS Release 12.1(4)EC and earlier 12.1 EC releases and are supported by the Cisco uBR7200 series routers in Release 12.1(4)CX.

Cable Downstream Frequency Override CLI

The following 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.

Cable Interface Setup Facility

The Cable Interface Setup Facility is an alternative mechanism to enable or configure Cisco uBR7200 series parameters. The setup facility supports automated configuration of upstream parameters.

In earlier releases, upstream ports were put in a default shut-down state after the setup facility was run. You had to use the CLI to configure a fixed frequency or create a spectrum group, assign an interface to it, and enable each upstream port on a cable interface line card. The setup facility now supports configuring and enabling upstream parameters.

In the following example, the upstream parameters for a cable interface line card in slot 5 are configured and enabled. Press **Return** to accept the default.

```
Do you want to configure Cable 5/0 interface? [no]: yes
Downstream setting frequency: 531000000
For cable upstream [0]
Shut down this upstream? [yes/no]: no
Frequency: 33808000
Would you like to configure the DHCP server? [yes/no]: yes
IP address for the DHCP server [X.X.X.X]: 10.0.0.2
Configure IP on this interface? [yes]:
IP address for this interface [10.20.133.65]:
Subnet mask for this interface [255.0.0.0]: 255.255.255.248
Class A network is 10.0.0.0, 29 subnet bits; mask is /29
```

In this example, the input above generates the following command interface script:

```

interface Cable 5/0
no shutdown
cable downstream frequency 531000000
no shutdown
cable downstream modulation 64qam
cable downstream annex B
cable downstream interleave-depth 32
no cable upstream 0 shutdown
cable upstream 0 frequency 33808000
cable helper-address 10.0.0.2
ip address 10.20.133.65 255.255.255.248

```

**Note**

Cable modems or set-top boxes with integrated cable modems are brought online when the utility is run.

**Note**

For Dynamic Host Configuration Protocol (DHCP)/time of day (TOD)/Trivial File Transfer Protocol (TFTP), a static route must exist to the host.

Cable Monitor

The cable monitor feature allows administrators to filter a selection of MAC messages; map messages and data packets to access lists, MAC-address numbers, and upstream port numbers; enable time stamping of each packet; and permit the option of stripping away the DOCSIS header for data packets. This makes it easier to resolve interoperability issues, understand network issues that can affect application performance and functionality, and increase the ability to manage network variables.

The configuration CLI consists of the following sniffer commands (enter configuration commands, one per line, and end with **CNTL-Z**):

```

Router(config-if)# cable monitor [outbound | incoming] [timestamp] interface <interface>
{access-list <name | number> | sid <n> | mac-addr <address> | upstream <n>} [packet-type {mac
[type {map-req | map-grant | dsa | dsc | dsd ... }]} | data packet-header {ethernet | docsis}}]

```

For more information on the command line interface (CLI) and for syntax descriptions, see the *Broadband Command Consolidation*. The [“Platform-Specific Documents”](#) section on page 37 provides details on how to access that document.

“cdxCmtsCmOnOffTrapEnable” Enhancement

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.

DOCS-EXT-MIB Enhancements

DOCS-EXT-MIB has been modified to include the capability of counting the number of cable modems on an upstream as well as on each line card:

- “cdxIfUpChannelCmTotal”, “cdxIfUpChannelCmActive”, and “cdxIfUpChannelCmRegistered” have been added to “cdxIfUpstreamChannelExtTable” to report the total number of active, registered, cable modems connected on an upstream.
- “cdxCmtsCmTotal”, “cdxCmtsCmActive” and “cdxCmtsCmRegistered” have been added to “cdxCmtsMacExtTable” to report the total number of active, registered, cable modems on a cable MAC interface since boot-up.

DOCS-IF-MIB Enhancements

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

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

The following new CLI command allows the default-compliance mode (that is, actual frequency for EuroDOCSIS 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 interface line card)

- **test cable docs-if-mib 3** sets the compliancy-mode to EuroDOCSIS (independent from the cable interface line card)

DOCSIS Ethernet MIB Objects Support (RFC 2665)

Support for RFC 2665, the latest revision of the Ethernet MIB, is now mandatory for DOCSIS compliance.

The key changes are as follows:

- Two new objects in “dot3StatsTable” of RFC 2665 are supported
 - dot3StatsSymbolErrors
 - dot3StatsDuplexStatus
- Two new tables in RFC 2665 are not supported
 - dot3ControlTable
 - dot3PauseTable
- Also, “dot3CollTable” is not supported

DOCSIS OSSI Objects Support (RFC 2233)

Cisco uBR7200 series routers support the required objects in RFC 2233 for DOCSIS Operations Support System Interface (OSSI) compliance.

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

Dynamic Map-Advance

The Dynamic Map-Advance feature improves the upstream throughput for a cable modem. This feature enables the map-advance to be dynamic and self-adjusting to propagation delay, even for the furthest cable modem in the plant.

Dynamic Mobile Hosts

This feature addresses a security hole that occurs when the Cisco uBR7200 router supports mobile hosts. (Mobile host are hosts that can move from one modem to another modem.) Anyone who knows the MAC address of a mobile host can “fake” the mobile host, thereby causing denial of access for the real mobile host.

To avoid this security hole, the Dynamic Mobile Hosts feature pings the mobile host on the old SID to verify that the host has indeed been moved.

Dynamic Ranging Support

The functionality of the **clear cable modem <mac-address> reset** command is extended to send a “Ranging Abort” message instead of just removing the SID.

A new modem state—Reset (display: resetting)— has been introduced into the modem state list. A modem is deprovisioned when moving into this state as if going offline. Move the modem to the Continue Ranging list. If a ranging request is received from the modem, send a “Ranging Abort” message. Continue until an “Initial Ranging” message is received or until normal timeout (16 attempts). If the modem does not go back to initial ranging, set it to offline.

The Reset modem state may show as follows in the output of **show cable modem**:

```
Cable4/0/U1 80 resetting 3575 0.25 3 0 10.30.160.26 0050.7318.e965
```

This is an intermediate state. A modem will not be in this state for more than a few seconds; if the modem does not respond, it may be in this state for up to 30 seconds. The subsequent modem state is offline.

Dynamic Upstream Modulation

The Dynamic Upstream Modulation feature reduces the risks associated with transitioning to QAM16 modulation in the return path, and provides assurance that subscribers remain online and connected during periods of return-path impairments.

This new feature actively monitors the signal-to-noise-ratio (SNR) and forward error correction (FEC) counters in the active return path of each upstream port. The software tracks whether the current upstream channel signal quality can adequately support the higher modulation scheme configured, and proactively adjusts to the more robust Quadrature Phase-Shift Keying (QPSK) modulation scheme when necessary. When return-path spectrum conditions improve, the software proactively returns the upstream channel to the higher-modulation quadrature amplitude modulation (QAM) scheme. This is done through modulation profiles supported in Cisco IOS, which can be configured in a variety of ways to support the unique environment at each user’s facility.

The Dynamic Upstream Modulation feature can be configured on interfaces with fixed upstream frequencies or on interfaces with spectrum groups assigned. Cisco IOS provides one preconfigured modulation profile resident in memory, which defines a typical profile for QPSK modulation. In order to use the Dynamic Upstream Modulation feature, a second profile must be created that is unique from the first profile and typically provides a higher modulation scheme.

Whether the MC1xC modem cards are used or the enhanced MC16S spectrum management modem card is used, the following CLI is the only configuration required:

```
cable upstream <n> modulation-profile <primary profile-number> <secondary profile-number>.
```

Dynamic Upstream Modulation can be used along with spectrum groups. If a Cisco uBR-MC16S card is used and the Dynamic Upstream Modulation and spectrum groups are configured on the same interface, the modulation switchover is chosen as the first corrective action, followed by a frequency hop, and finally a reduction in channel width. The user can configure how the higher-modulation profile is selected by setting priorities with the following CLI:

```
cable upstream <n> <hop-priority frequency> <bandwidth> <modulation>
```

The order of the frequency, bandwidth, and modulation in the CLI determines the priority.

For more information on the Dynamic Upstream Module feature, including information on creating modulation profiles using the **cable modulation-profile** command, see the *Cisco uBR7200 Dynamic Upstream Modulation* feature module. For information on creating spectrum groups using the **cable spectrum-group** command, see the *Broadband Command Consolidation*. The “[Platform-Specific Documents](#)” section on page 37 provides details on how to access that document.

Enhanced Per-Modem Error Counter

The Cisco uBR7200 series supports display of per-modem error counters. A new command introduced is:

show cable modem [<ip-addr> | <mac-addr>] **error**

Sample display:

```
cmts#show cable modem errors
MAC Address      SID      I/F          CRC      HCS
00d0.ba26.eee7  1        Cable4/0/U0  0        0
```



Note

Both the Cyclic Redundancy Check (CRC) and Header Check Sum (HCS) are on a per-CM basis.

Hot-Standby 1+1 Redundancy



Note

In Cisco IOS Release 12.1(4)CX and subsequent releases, Hot-Standby 1+1 Redundancy is not supported when the CMTS is operating in DOCSIS 1.1 mode.

The Hot-Standby 1+1 Redundancy feature offers the ability to provide high system availability when configuring a Cisco uBR7200 series universal broadband router to wait in hot-standby mode to protect another Cisco uBR7200 series router in case of system failure.

The 1+1 redundancy feature is essential in a residential Voice over IP (VoIP) cable network, since it provides a three- to five-second automatic system recovery time, thus helping to eliminate “call drops” in the VoIP cable network. System failure in a nonredundancy (unprotected) deployment results in loss of all voice calls in progress as well as all voice calls in “setup” phase, because the CMTS requires human intervention to reconfigure and bring the CMTS back on line.

Configuration for 1+1 redundancy takes place at the cable interface line card interface level. That is, rather than assigning an entire Cisco uBR7200 series router to support another Cisco uBR7200 series router, individual interfaces on one Cisco uBR7200 series router are configured to protect individual interfaces installed in a different Cisco uBR7200 series router.



Note

1+1 redundancy protection takes place on an interchassis basis, only. That is, you cannot protect cable interfaces on a particular CMTS with cable interfaces installed in the same chassis.

The user can configure the system to switchover automatically when the interface state of a cable interface line card interface moves from “up” to “down.” Alternatively, the user can manually force a switchover.



Note

Make sure that the same channel ID is configured for both the active and the standby cable router.

For more information on the 1+1 redundancy feature, including information on configuration tasks and command reference, see the *Hot-Standby 1+1 Redundancy* feature module. For information on feature modules, see the “[Feature Modules](#)” section on page 38.

Internal Modem Configuration File Editor

This feature adds support for internal cable modem configuration file storage and generation. The cable modem configuration file will be generated and stored as part of CLI configuration. Configuration files will not be stored in Flash memory.

“MAX-CPE” CLI Override

A new cable-specific configuration command has been added:

[no] cable modem max-cpe [*n*] | unlimited]

When set to unlimited or if *n* is larger than the “MAX-CPE” value in the config file of a cable modem, it overrides the config file value.

MPLS VPN Support for Subinterfaces and Interface Bundles

Cisco IOS Release 12.1(4)CX and subsequent releases include MPLS support as part of its VPN offerings for cable subinterfaces and interface bundles. The software offers enhancements made to tags placed on the fronts of packets that contain forwarding information used to make switching decisions for cable interfaces and bundles. This tag switching infrastructure combines advanced routing protocol capabilities to define IP VPNs by selectively advertising IP reachability information to just those subscribers within the same VPN or extranet on a cable interface.

The MPLS-VPN approach of creating VPNs for individual Internet service providers (ISPs) requires subinterfaces to be configured on cable interfaces or bundles. One subinterface is required for each ISP. The subinterfaces are tied to VPN Routing Forwarding (VRF) tables for respective ISPs.

For more feature information, refer to the *Cisco uBR7200 Series MPLS VPN Cable Enhancements* feature module. For information on feature modules, see the [“Feature Modules” section on page 38](#).



Note

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.

Multicast BPI MIB Support

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

- docsBpiIpMulticastServiceId
 - 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

Link Up/Down Traps Support (RFC 2233)

The objects in the varbind list, based on 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 base the Link Up/Down trap varbind list on a Cisco-specific or IETF standard with a new 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.

Overlapping Subinterface IP Addresses

Multiprotocol Label Switching (MPLS)-based Virtual Private Networks (VPNs), which are created in layer 3, provide privacy and security by constraining the distribution of a VPN's routes to those routers that are members of the VPN only, and by using MPLS forwarding. Each ISP's VPN is insulated from all others sharing the HFC and IP-over-cable infrastructure. MPLS VPN enforces traffic separation by assigning a unique VPN Routing/Forwarding (VRF) instance to each VPN. A VRF instance consists of an IP routing table, a derived forwarding table, a set of interfaces that use the forwarding table, and a set of rules and routing protocols that determine what is in the forwarding table.

Earlier Cisco IOS releases assumed that IP addresses were unique, but it is possible with an MPLS VPN to configure overlapped IP addresses within a VRF. A configuration of overlapped IP addresses could have caused errors. Cisco IOS Release 12.1(4)CX and subsequent releases support a configuration of overlapping IP addresses for subinterfaces. The same IP subnet can be configured for CPEs on different VRFs using a Cisco uBR7200 to configure an MPLS VPN. See also the [“MPLS VPN Support for Subinterfaces and Interface Bundles” section on page 27](#).

The following CLI commands have been updated to support overlapping IP addresses on subinterfaces:

- Old CLI commands:

```
cable host <ipaddr> [no] access-group <acl>
cable device <ipaddr> [no] access-group <acl>
show cable host <ipaddr> access-group
show cable device <ipaddr> access-group
clear cable host <ipaddr>
```

- New CLI commands:

```
cable host [vrf <vrfname>] <ipaddr> [no] access-group <ac >
cable device [vrf <vrfname>] <ipaddr> [no] access-group <acl>
show cable host [vrf <vrfname>] <ipaddr> access-group
show cable device [vrf <vrfname>] <ipaddr> access-group
clear cable host [vrf <vrfname>] <ipaddr>
```

SNMP Cable Modem Remote Query

This feature provides a new MIB, CISCO-DOCS-REMOTE-QUERY-MIB, which, once implemented on a CMTS, facilitates SNMP polling of remote CMs. This MIB includes the configuration of the CMTS CM Poller, as well as status objects of remote CMs that are polled by the CMTS CM Poller.

A new CLI command has been implemented for turning on the trap:

```
snmp-server enable cable cm-remote-quer
```

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

Host or cable modems can be cleared via the “cdxCmCpeResetNow” MIB object. The number of current CPEs can be displayed via the “cdxCmtsCmCurrCpeNumber” MIB object.

SNMP-Specific Trap CLI Enhancements

The old CLI for SNMP-specific traps was the following command:

```
[no] snmp-server enable traps snmp [authentication]
```

Even though **authentication** was provided as an option, it did not behave as expected because entering the **snmp-server enable traps snmp authentication** command enabled not only the authentication traps, but also all other SNMP traps—viz, linkUp, linkDown and coldStart.

The CLI has been modified to allow all SNMP traps to be enabled or disabled separately. The modified CLI is the following command:

```
[no] snmp-server enable traps snmp [authentication | linkup | linkdown | coldstart]
```

To allow all SNMP traps to be enabled or disabled simultaneously, issue the following command:

```
[no] snmp-server enable traps snmp
```

SNMP Warm Start Trap

When two Cisco uBR7200 series routers are configured for failover and the active unit fails, the standby unit takes over and becomes the active unit. Whenever this occurs, a Failover Switchover SNMP trap is generated and will appear to the SNMP server as a “Warm Start” trap. This functionality is supported in Cisco IOS Release 12.1(4)CX and subsequent releases.



Note

When a Cisco uBR7200 series router is powered up, an SNMP trap is generated and will appear to the SNMP server as a “Cold Start” trap. This functionality is also supported in Cisco IOS Release 12.1(4)CX and subsequent releases.

Important Notes

The following sections contain important notes about Cisco IOS Release 12.1(7)CX that apply to Cisco uBR7200 series universal broadband routers.

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.

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.

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* and the *Cable Interface Bundling for the Cisco uBR7200 Series Cable Router* feature module. For information on feature modules, see the "Feature Modules" section on page 38.

IS-IS Not Supported on Cable Interfaces

The Intermediate System-to-Intermediate System (IS-IS) routing protocol is not supported on any cable interfaces.

Cisco IOS Software Release

The initial spectrum management enhancements to the Cisco uBR-MC16S line card were introduced in the 12.1 EC release train. The advanced features described in this document require Cisco IOS Release 12.1(7)CX.

Cisco uBR-MC16S Line Card

The following restrictions apply to the Cisco uBR-MC16S line card:

- The Cisco uBR-MC16S line card is not supported in any release of Cisco IOS Release 12.0 SC.
- Upstream channels must meet the CNR and carrier-to-ingress power ratio values given in the DOCSIS specifications. The minimum value for both parameters is 25 dB in the 5 to 42 MHz frequency range for 16 QAM transmission and 15 dB for QPSK transmission.
- When using a shared spectrum configuration, avoid overlapping frequency bands when combining multiple upstream ports to increase available bandwidth.
- HCCP 1+1 redundancy is not supported on any cable interface line card that has defined spectrum groups, which typically is the normal configuration for the Cisco uBR-MC16S line card.

Dynamic Upstream Modulation

The following restrictions apply to the Dynamic Upstream Modulation feature:

- This release note describes the Dynamic Upstream Modulation feature as it applies to the Cisco uBR-MC16S line card. This feature is available in a different form for other line cards; see the *Cisco uBR7100 Series Dynamic Upstream Modulation* feature module for details.
- Upstream modulation profiles are assigned to upstream ports and affect all cable modems on those upstream ports.
- Only trained technicians who are familiar with the DOCSIS specifications should create modulation profiles.
- When using the Dynamic Upstream Modulation feature with Voice over IP (VoIP) services, frequent changes to the upstream modulation or channel width could briefly impact the quality of voice calls.

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>.

Supported MIBs

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

- SNMP standard MIBs—These MIBs 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 are described in the following section. 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. 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 (<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>). 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 Cisco uBR7200 Series Routers

MIB Filename	Description	Introduced in Release
SNMPv2-SMI.my SNMPv2-SMI-V1SMI.my	This module specifies the Structure of Management Information (SMI) for SNMPv2, as defined in RFC1902.	12.1(4)CX
SNMPv2-TC.my SNMPv2-TC-V1SMI.my	This module defines the textual conventions as specified in RFC1903.	12.1(4)CX
SNMPv2-MIB.my SNMPv2-MIB-V1SMI.my	The management protocol, SNMPv2, provides for the exchange of messages that convey management information between the agents and the management stations, as defined in RFC1907.	12.1(4)CX
CISCO-SMI.my CISCO-SMI-V1SMI.my	This module specifies the SMI for Cisco's enterprise MIBs.	12.1(4)CX
CISCO-TC.my CISCO-TC-V1SMI.my	This module defines the textual conventions used in Cisco's enterprise MIBs.	12.1(4)CX
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 RFC2233.	12.1(4)CX

Table 7 Cable-Specific MIBs Supported on Cisco uBR7200 Series Routers (continued)

MIB Filename	Description	Introduced in Release
DOCS-IF-MIB.my DOCS-IF-MIB-V1SMI.my	This module describes the DOCSIS-compliant Radio Frequency (RF) interfaces in CMs and the CMTS. This MIB has been released as an RFC2670.	12.1(4)CX
DOCS-BPI-PLUS-MIB.my ¹ DOCS-BPI-PLUS-MIB-V1SMI.my	This module describes the attributes for the DOCSIS 1.1-specified Baseline Privacy Interface Plus (BPI+) on CMs and the CMTS. This is revision 05 of the MIB. Note This MIB replaces DOCS-BPI-MIB, which was used in the initial DOCSIS 1.0 releases.	12.1(4)CX
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.	12.1(4)CX
CISCO-DOCS-REMOTE-QUERY-MIB.my CISCO-DOCS-REMOTE-QUERY-MIB-V1SMI.my	This module facilitates SNMP polling of remote CMs on a CMTS.	12.1(4)CX
CISCO-CABLE-SPECTRUM-MIB.my CISCO-CABLE-SPECTRUM-MIB-V1SMI.my	This module describes the spectrum management and flap list attributes.	12.1(4)CX
DOCS-QOS-MIB.my ¹ DOCS-QOS-MIB-V1SMI.my	This module describes the quality of service (QoS) attributes. This is revision 04 of the MIB. Note Release 12.1(4)CX implemented revision 02 of this MIB. Revision 04 includes substantial changes to the tables and attributes.	12.1(7)CX
DOCS-SUBMGT-MIB.my ¹	This module describes the subscriber management attributes. This is revision 02 of the MIB.	12.1(7)CX
RFC2933 ¹	This module describes the IGMP protocol attributes, as defined in RFC2933.	12.1(7)CX
DOCS-CABLE-DEVICE-MIB.my ¹ DOCS-CABLE-DEVICE-MIB-V1SMI.my	This module describes the operation of cable modem and CMTS. Only the syslog and Event tables are supported by this MIB, which was released as RFC2669.	12.1(7)CX
DOCS-CABLE-DEVICE-TRAP-MIB.my ¹	This is the extension of the RFC2669 (DOCS-CABLE-DEVICE-MIB). It defines all the traps supported by a cable modem and CMTS.	12.1(7)CX
DOCS-IF-EXT-MIB.my ¹	This is the extension of module of the RFC2670 (DOCS-IF-MIB).	12.1(7)CX

1. These MIBs are in draft form. They have not yet been finalized by the DOCSIS committee and are subject to change with future releases.

Deprecated MIBs

Old Cisco MIBs will be replaced in a future release. Currently, OLD-CISCO-* MIBs are being converted into more scalable MIBs without affecting existing Cisco IOS products or network management system (NMS) applications. You can update from deprecated MIBs to the replacement MIBs as shown in [Table 8](#).

Table 8 Replacements for Deprecated MIBs

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



Note

Some of the MIBs listed in [Table 8](#) represent feature sets that are not supported on Cisco uBR7200 series universal broadband routers.



Note

Cisco Management Information Base (MIB) User Quick Reference is no longer published. If you have an account with Cisco.com, you can find the current list of MIBs supported by Cisco. To reach the *Cisco Network Management Toolkit*, go to Cisco.com, press **Login**, and then go to **Software Center: Network Mgmt Products: Cisco Network Management Toolkit: Cisco MIB**.

Caveats

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

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 12.1 are also in Cisco IOS Release 12.1(7)CX.

For information on caveats in Cisco IOS Release 12.1, see *Caveats for Cisco IOS Release 12.1*. This document lists severity 1 and 2 caveats and only selected severity 3 caveats, and 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, go to Cisco.com and press **Login**. Then go to **Software Center: Cisco IOS Software: Cisco Bugtool Navigator II**. Another option is to go to <http://www.cisco.com/support/bugtools/>.

Open Caveats for Release 12.1(7)CX

This section documents possible unexpected behavior by Cisco IOS Release 12.1(7)CX and describes only severity 1 and severity 2 caveats and select severity 3 caveats.

- CSCdu75429

Slave interface in cable bundle is shut down on reload. After a CMTS running 12.1(7)CX is reloaded, slave interfaces in a cable bundle will be placed in shutdown state.

- CSCdu86699

Under certain conditions in Cisco IOS Release 12.1(7)CX, the spectrum group configuration commands must appear in the startup configuration file to activate the proactive channel hopping feature for the Cisco uBR-MC16S cable interface line card. If these commands are configured using the CLI after the Cisco uBR7200 series router has reloaded, the router performs only blind frequency hopping.

The problem occurs only when a fixed frequency has been specified using the **cable upstream frequency** command and the spectrum group commands are not in the startup configuration file. For example, if a fixed frequency has been configured in the startup configuration file, but CLI commands are then used after the router comes up to create the spectrum group configuration, the router will use blind hopping instead of proactive channel hopping.



Note If a band of frequencies are specified instead of one or more fixed frequencies, the problem does not occur.

The workaround is to configure the spectrum group commands as desired, save the configuration to the NVRAM, and then reboot the router. The Cisco uBR-MC16S will then perform the proactive channel hopping among the frequencies that are in the spectrum groups assigned to the upstreams.

For example, after configuring the Cisco uBR7200 series router with the desired spectrum management commands, give the following commands in Privileged EXEC mode:

```
CMTS# copy running-config startup-config
CMTS# reload
```

Closed and Resolved Caveats for Release 12.1(7)CX

All the caveats listed in this section are closed or resolved in Cisco IOS Release 12.1(7)CX. This section describes only severity 1 and severity 2 caveats and select severity 3 caveats.

- CSCdt24253
On a Cisco uBR7200 series router with CEF enabled, duplicate IP addresses might be given to hosts. This problem can be monitored via the **show cable host access-group** command. There is no workaround.
- CSCdt35375
When spectrum groups have been configured and assigned to an upstream port, the **clear int cable x/y** command might cause an unexpected system reload.
Workaround: Initially boot with a configuration file that assigns a fixed frequency to the upstream. Then manually assign the spectrum group to the upstream.

Open Caveats for Release 12.1(4)CX

This section documents possible unexpected behavior for Cisco IOS Release 12.1(4)CX and describes only severity 1 and severity 2 caveats and select severity 3 caveats.

- CSCds62479 and CSCds52519
After a Cisco uBR7200 series router with an NPE-300 with 32 MB of processor memory installed (that is, 64 MB total memory) has reloaded and is generating the system-reload information, the software might read an invalid address, which causes the PCI bus to pause indefinitely and the watchdog to switch off. This will hide the real cause of the system reload.
Workaround: Disable the generation of system-reload information.
- CSCdt24253
On a Cisco uBR7200 series router with CEF enabled, duplicate IP addresses might be given to hosts. This problem can be monitored via the **show cable host access-group** command. There is no workaround.
- CSCdt35375
When spectrum groups have been configured and assigned to an upstream port, the **clear int cable x/y** command might cause an unexpected system reload.
Workaround: Initially boot with a configuration file that assigns a fixed frequency to the upstream. Then manually assign the spectrum group to the upstream.

Closed and Resolved Caveats for Release 12.1(4)CX

Because Cisco IOS Release 12.1(4)CX is the initial release for the Cisco uBR7200 series routers, there are no closed or resolved caveats that require documentation in the release notes.

Related Documentation

The following sections describe the documentation available for the Cisco uBR7200 series. 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 37](#)
- [Platform-Specific Documents, page 37](#)
- [Feature Modules, page 38](#)
- [Feature Navigator, page 38](#)
- [Cisco IOS Software Documentation Set, page 39](#)

Release-Specific Documents

The following documents are specific to Release 12.1 and are located on Cisco.com and the Documentation CD-ROM:

- Product bulletins, field notices, and other release-specific documents on Cisco.com beginning under the **Service & Support** heading:

Technical Documents

- *Caveats for Cisco IOS Release 12.1*

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

Technical Documents: Documentation Home Page: Cisco IOS Software Configuration: Cisco IOS Release 12.1: Release Notes: Caveats: Caveats for Release 12.1

On the Documentation CD-ROM:

Cisco Product Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.1: Caveats



Note

If you have an account with Cisco.com, you can use Bug Navigator Toolkit to find caveats of any severity for any release. You can reach Bug Navigator on Cisco.com at **Software Center: Tools: Software Bug Toolkit: Bug Navigator II** or at <http://www.cisco.com/support/bugtools/>.

Platform-Specific Documents

The following 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 Cable Modem Card Hardware Installation Guide*
- *Cisco uBR7200 Series Universal Broadband Router Configuration Notes*

- *Broadband Command Consolidation*

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

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:

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

**Tips**

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 12.1(7)CX and are updates to the Cisco IOS documentation set. A feature module consists of a brief overview of the feature, benefits, and 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, beginning under the **Service & Support** heading:

Technical Documents: Documentation Home Page: Cisco IOS Software Configuration: Cisco IOS Release 12.1: New Feature Documentation

On the Documentation CD-ROM:

Cisco Product Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.1: New Feature Documentation: New Features in Release 12.1 T

Feature Navigator

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a particular set of features and which features are supported in a particular Cisco IOS image.

Feature Navigator is available 24 hours a day, 7 days a week. To access Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, e-mail the Contact Database Administration group at cdbadmin@cisco.com. If you do not have an account on Cisco.com, go to <http://www.cisco.com/register> and follow the directions to establish an account.

To use Feature Navigator, you must have a JavaScript-enabled web browser such as Netscape 3.0 or later, or Internet Explorer 4.0 or later. Internet Explorer 4.0 always has JavaScript enabled. To enable JavaScript for Netscape 3.x or Netscape 4.x, follow the instructions provided with the web browser. For JavaScript support and enabling instructions for other browsers, check with the browser vendor.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. It contains feature information about mainline-, T-, S-, and P-trains. You can access Feature Navigator at the following URL:

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

Cisco IOS Software Documentation Set

The Cisco IOS software documentation set consists of the Cisco IOS configuration guides, Cisco IOS command 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.

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 12.1 Documentation Set Contents

[Table 9](#) lists the contents of the Cisco IOS Release 12.1 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 paper documents were printed.

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

Table 9 Cisco IOS Release 12.1 Documentation Set

Books	Major Topics
<ul style="list-style-type: none"> • <i>Cisco IOS Configuration Fundamentals Configuration Guide</i> • <i>Cisco IOS Configuration Fundamentals Command Reference</i> 	Configuration Fundamentals Overview Cisco IOS User Interfaces Cisco IOS File Management Cisco IOS System Management Cisco IOS User Interfaces Commands Cisco IOS File Management Commands Cisco IOS System Management Commands
<ul style="list-style-type: none"> • <i>Cisco IOS Bridging and IBM Networking Configuration Guide</i> • <i>Cisco IOS Bridging and IBM Networking Command Reference, Volume I</i> • <i>Cisco IOS Bridging and IBM Networking Command Reference, Volume II</i> 	Transparent Bridging Source-Route Bridging Token Ring Inter-Switch Link Remote Source-Route Bridging DLSw+ Serial Tunnel and Block Serial Tunnel Commands LLC2 and SDLC Commands IBM Network Media Translation Commands SNA Frame Relay Access Support Commands NCIA Client/Server Commands Airline Product Set Commands
<ul style="list-style-type: none"> • <i>Cisco IOS Dial Services Configuration Guide: Terminal Services</i> • <i>Cisco IOS Dial Services Configuration Guide: Network Services</i> • <i>Cisco IOS Dial Services Command Reference</i> 	Preparing for Dial Access Modem Configuration and Management ISDN and Signaling Configuration PPP Configuration Dial-on-Demand Routing Configuration Dial-Backup Configuration Terminal Service Configuration Large-Scale Dial Solutions Cost-Control Solutions Virtual Private Networks X.25 on ISDN Solutions Telco Solutions Dial-Related Addressing Services Dial Access Scenarios
<ul style="list-style-type: none"> • <i>Cisco IOS Interface Configuration Guide</i> • <i>Cisco IOS Interface Command Reference</i> 	Interface Configuration Overview Configuring LAN Interfaces Configuring Serial Interfaces Configuring Logical Interfaces
<ul style="list-style-type: none"> • <i>Cisco IOS IP and IP Routing Configuration Guide</i> • <i>Cisco IOS IP and IP Routing Command Reference</i> 	IP Overview IP Addressing and Services IP Routing Protocols IP Multicast
<ul style="list-style-type: none"> • <i>Cisco IOS AppleTalk and Novell IPX Configuration Guide</i> • <i>Cisco IOS AppleTalk and Novell IPX Command Reference</i> 	AppleTalk and Novell IPX Overview Configuring AppleTalk Configuring Novell IPX

Table 9 Cisco IOS Release 12.1 Documentation Set (continued)

Books	Major Topics
<ul style="list-style-type: none"> • <i>Cisco IOS Apollo Domain, Banyan VINES, DECnet, ISO CLNS, and XNS Configuration Guide</i> • <i>Cisco IOS Apollo Domain, Banyan VINES, DECnet, ISO CLNS, and XNS Command Reference</i> 	<ul style="list-style-type: none"> Overview Configuring Apollo Domain Configuring Banyan VINES Configuring DECnet Configuring ISO CLNS Configuring XNS
<ul style="list-style-type: none"> • <i>Cisco IOS Multiservice Applications Configuration Guide</i> • <i>Cisco IOS Multiservice Applications Command Reference</i> 	<ul style="list-style-type: none"> Multiservice Applications Overview Voice Video Broadband
<ul style="list-style-type: none"> • <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> • <i>Cisco IOS Quality of Service Solutions Command Reference</i> 	<ul style="list-style-type: none"> Quality of Service Overview Classification Congestion Management Congestion Avoidance Policing and Shaping Signaling Link Efficiency Mechanisms Quality of Service Solutions
<ul style="list-style-type: none"> • <i>Cisco IOS Security Configuration Guide</i> • <i>Cisco IOS Security Command Reference</i> 	<ul style="list-style-type: none"> Security Overview Authentication, Authorization, and Accounting (AAA) Security Server Protocols Traffic Filtering and Firewalls IP Security and Encryption Configuring Passwords and Privileges Neighbor Router Authentication Configuring IP Security Options
<ul style="list-style-type: none"> • <i>Cisco IOS Switching Services Configuration Guide</i> • <i>Cisco IOS Switching Services Command Reference</i> 	<ul style="list-style-type: none"> Cisco IOS Switching Services Overview Cisco IOS Switching Paths Cisco Express Forwarding NetFlow Switching Multiprotocol Label Switching Multilayer Switching Multicast Distributed Switching Virtual LANs LAN Emulation

Table 9 Cisco IOS Release 12.1 Documentation Set (continued)

Books	Major Topics
<ul style="list-style-type: none"> • <i>Cisco IOS Wide-Area Networking Configuration Guide</i> • <i>Cisco IOS Wide-Area Networking Command Reference</i> 	<ul style="list-style-type: none"> Introduction: Wide-Area Networking Overview Configuring ATM Configuring Frame Relay Configuring Frame Relay-ATM Interworking Configuring SMDS Configuring X.25 and LAPB
<ul style="list-style-type: none"> • <i>Cisco IOS Configuration Master Index</i> • <i>Cisco IOS Command Reference Master Index</i> • <i>Cisco IOS Debug Command Reference</i> • <i>Cisco IOS Dial Services Quick Configuration Guide</i> • <i>Cisco IOS Software System Error Messages</i> • <i>Cisco IOS Configuration Guide Master Index</i> • <i>New Features in 12.1-Based Limited Lifetime Releases</i> • <i>New Features in Release 12.1 T</i> • Release Notes (Release-note and caveat documentation for 12.1-based releases and various platforms) 	



Note

The *Cisco Management Information Base (MIB) User Quick Reference* publication is no longer published. For the latest list of MIBs supported by Cisco, see *Cisco Network Management Toolkit* on Cisco.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 web site.

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 web site:

<http://www.cisco.com>

Technical Assistance Center

The Cisco TAC web site 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 Web Site

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

<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 web site to quickly find answers to your questions.

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

<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 web site:

<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 web site:

<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 37](#).

AccessPath, AtmDirector, Browse with Me, CCIP, CCSI, CD-PAC, *CiscoLink*, 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*, 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, CCDA, CCDP, CCIE, CCNA, CCNP, 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, PIX, Post-Routing, Pre-Routing, Registrar, StrataView Plus, Stratm, SwitchProbe, TeleRouter, and VCO are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries.

All other trademarks mentioned in this document or Web site 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. (0106R)

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

