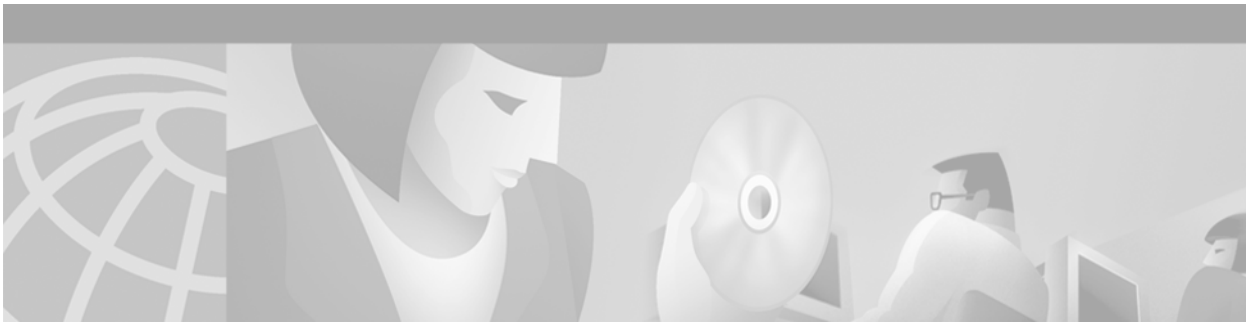

Release Notes for Cisco uBR7100 Series for Cisco IOS Release 12.2 XF

December 26, 2001
Cisco IOS Release 12.2(4)XF1
OL-2112-01

These release notes for the Cisco uBR7100 series universal broadband routers document the cable-specific, early deployment 12.2 XF train, describing the enhancements and caveats provided in Cisco IOS Release 12.2(4)XF1. These release notes are updated with each release in the train. For a list of the software caveats that apply to Cisco IOS Release 12.2(4)XF1, see the "Caveats" section on page 26.

The 12.2 XF train is an interim release train that provides a migration path for DOCSIS 1.1 features from the previous DOCSIS 1.0 and DOCSIS 1.0+ releases. Cisco IOS Release 12.2(4)XF1 includes a selected subset of the features supported for the Cisco uBR7100 series routers in Cisco IOS Release 12.1 EC and adds support for DOCSIS 1.1 operation.

Note Cisco IOS Release 12.2(4)XF1 does not include support for telco-return images.

Contents

These release notes describe the following topics:

CISCO SYSTEMS

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Introduction

For information on new features and Cisco IOS commands supported by Cisco IOS Release 12.2(4)XF1, see the "New and Changed Information" section on page 14 and the "Related Documentation" section on page 27.

Overview of Cisco Universal Broadband Routers

The Cisco uBR7100 series universal broadband routers—the Cisco uBR7111, Cisco uBR7111E, Cisco uBR7114, and Cisco uBR7114E—are based on the Data-over-Cable Service Interface Specification (DOCSIS) standards and designed to be installed at small cable operators and multiple dwelling unit (MDU) operators to enable them to offer services such as e-mail, high-speed Internet access, voice, and digital video over a bidirectional cable television and IP backbone network. The universal broadband routers function as the cable modem termination system (CMTS) for subscriber-end devices such as Cisco uBR905, Cisco uBR924, and Cisco uBR925 cable access routers, and other DOCSIS-compliant cable modems (CMs) and set-top boxes (STBs).

Both the Cisco uBR7100 series and 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. The Cisco uBR7100 series routers support IP routing with a wide variety of protocols and WAN interfaces selections.

Cisco IOS Release 12.2(4)XF1 supports the Cisco uBR7111, Cisco uBR7111E, Cisco uBR7114, and Cisco uBR7114E universal broadband routers.

Cisco uBR7100 Series Universal Broadband Routers

The Cisco uBR7100 series routers provide a fixed set of WAN and LAN interfaces with a combination of fixed and modular interfaces, allowing both flexibility and simplicity in configuration. Each Cisco uBR7100 series router includes one modular single-width port adapter, one integrated cable interface with an internal upconverter, and two integrated Fast Ethernet ports. The cable interface is based on the Cisco uBR-MC14C cable interface line card and is not field-replaceable.

The Cisco uBR7100 series routers support IP routing through the following optional WAN and LAN port adapters: Ethernet, Fast Ethernet, serial, High-Speed Serial Interface (HSSI), Packet over SONET (POS) OC-3c, and Asynchronous Transfer Mode (ATM) media. For more information, see Table 5 on page 9.

Depending on the model, the Cisco uBR7100 series routers support the following two standards:

- Data Over Cable Service Interface Specifications (DOCSIS), which supports the 6 MHz North American channel plans using the ITU J.83 Annex B RF standard. The downstream uses a 6 MHz channel width in the 85 to 860 MHz frequency range, and the upstream supports the 5 to 42 MHz frequency range.

- European Data Over Cable Service Interface Specifications (EuroDOCSIS), which supports the 8 MHz Phase Alternating Line (PAL) and Systeme Electronique Couleur Avec Memoire (SECAM) channel plans using the ITU J.112 Annex A RF standard. The downstream uses an 8 MHz channel width in the 85 to 860 MHz frequency range, and the upstream supports multiple channel widths in the 5 to 65 MHz frequency range.

The Cisco uBR7100 series offers the following models:

- The Cisco uBR7111 and Cisco uBR7111E universal broadband routers provide a cable interface with one downstream port and one upstream port. The downstream port can be output either as an RF signal through the integrated upconverter or as an IF signal for processing by an external upconverter. The Cisco uBR7111 router supports DOCSIS cable plants, and the Cisco uBR7111E supports EuroDOCSIS cable plants.
- The Cisco uBR7114 and Cisco uBR7114E universal broadband routers provide a cable interface with one downstream port and four upstream ports. The downstream port can be output either as an RF signal through the integrated upconverter or as an IF signal for processing by an external upconverter. The Cisco uBR7114 router supports DOCSIS cable plants, and the Cisco uBR7114E supports EuroDOCSIS cable plants.

Cisco uBR7111 and Cisco uBR7111E Universal Broadband Routers

The Cisco uBR7111 and Cisco uBR7111E provide the following major hardware features:

- Integrated network processing engine
- 1 upstream cable modem interface
- 1 downstream cable modem interface
- 2 Fast Ethernet ports
- 1 port adapter slot
- 1 service adapter slot
- 1 AC power supply
- 1 Personal Computer Memory Card International Association (PCMCIA) slot that allows for software upgrades through the use of Flash memory cards

Cisco uBR7114 and Cisco uBR7114E Universal Broadband Routers

The Cisco uBR7114 and Cisco uBR7114E provide the following major hardware features:

- Integrated network processing engine
- 1 downstream cable modem interface
- 4 upstream cable modem interfaces
- 2 Fast Ethernet ports
- 1 port adapter slot
- 1 service adapter slot
- 1 AC power supply
- 1 Personal Computer Memory Card International Association (PCMCIA) slot that allows for software upgrades through the use of Flash memory cards

Universal Broadband Router Overview

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

Table 1 Universal Broadband Router Overview

Supported Hardware	Cisco uBR7111, Cisco uBR7111E	Cisco uBR7114, Cisco uBR7114E
Upstream Cable Modem Interfaces	1	4
Downstream Cable Modem Interfaces	1	1
Fast Ethernet Ports	2	2
Port Adapter Slots	1	1
Service Adapter Slots	1	1
Power Supplies	1	1
PCMCIA Slots	1	1

Early Deployment Releases

These release notes describe the Cisco uBR7100 series universal broadband routers for Cisco IOS Release 12.2(4)XF1. Release 12.2 XF is an early deployment (ED) release based that contains 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.

Cisco IOS Release 12.2(4)XF1 supports a selected subset of the hardware and software features that were released in Cisco IOS Release 12.1 EC for the Cisco uBR7100 series universal broadband routers. Table 2 lists the features supported by the Cisco uBR7100 series in Cisco IOS Release 12.2(4)XF1.

Table 2 Early Deployment (ED) Releases for the Cisco uBR7100 Series

ED Release	Software Features[1] and MIBs[2]	Hardware Availability
Cisco IOS Release 12.2(4)XF1	• DOCSIS 1.0 Support • DOCSIS 1.0+ Support • DOCSIS 1.1 Support, including: – TLV[3] Parser Support – BE[4], UGS[5], UGS-AD[6], rtPS[7] Service Flows – DSC[8] Service Flow, Classifier, and PHS[9] – Fragmentation – Concatenation – PHS – DS[10] Classification and Queuing • Cable Intercept Command • Cable Interface Setup Facility • DHCP/TOD/TFTP[11] Server Support • Cable Subinterface Support • Access Lists • Spectrum Management and Dynamic Upstream Modulation • Cable Source Verification Feature • MPLS[12] VPN[13] Support for Subinterfaces • Dynamic Mobile Hosts Feature • IP NAT/PAT[14] Translation • Internal Modem Configuration File Editor • Cable Flap List • Cable ARP[15] and Proxy ARP Support • Cable Downstream Frequency Override CLI[16] • MAX-CPE CLI override	Now

1. Only major features are listed.
2. MIB = Management Information Base
3. TLV = Type/Length/Value
4. BE = Best Effort
5. UGS = Unsolicited Grant Service
6. UGS-AD = Unsolicited Grant Service with Activity Detection
7. rtPS = Real-Time Polling Service
8. DSC = Dynamic Service Change
9. PHS = Payload Header Suppression
10. DS = Downstream
11. DHCP = Dynamic Host Configuration Protocol, TOD = Time of Day, TFTP = Trivial File Transfer Protocol
12. MPLS = Multiprotocol Label Switching

13. VPN = Virtual Private Network
14. NAT/PAT = Network Address Translation/Port Address Translation
15. ARP = Address Resolution Protocol
16. CLI = command line interface

Unsupported Features

Table 3 lists the features that are not supported in Cisco IOS Release 12.2(4)XF1, along with the most recent, recommended Cisco IOS Release that does support that particular feature for the Cisco uBR7200 series routers.

Table 3 Features Not Supported in Cisco IOS Release 12.2(4)XF1

Software or Hardware Feature	Supported Cisco IOS Release
Baseline Privacy Interface Plus (BPI+)	Not Supported for the Cisco uBR7100 series
MxU Bridging over the Cable Interface	Release 12.1(10)EC
Cable Downstream Frequency Command	Release 12.1(10)EC
Cable Monitor command	Release 12.1(10)EC
Cisco IOS Network-Based Application Recognition (NBAR)	Release 12.1(10)EC
Multicast Support	Release 12.1(10)EC
Point-to-Point Protocol over Ethernet (PPPoE)	Not Supported for the Cisco uBR7100 series
Secure Shell (SSH)	Not Supported for the Cisco uBR7100 series
Telco-Return Support	Release 12.1(10)EC
Turbo Access List (Turbo ACL) Support	Release 12.1(10)EC
Web Cache Communication Protocol	Not Supported for the Cisco uBR7100 series

System Requirements

This section describes the system requirements for Cisco IOS Release 12.2(4)XF1 and includes the following sections:

Memory Recommendations

Table 4 displays the memory recommendations of the Cisco IOS feature sets for the Cisco uBR7100 series universal broadband routers for Cisco IOS Release 12.2(4)XF1. Cisco uBR7100 series routers are available with a 16-MB or 20-MB Type II PCMCIA Flash memory card.

Table 4 Memory Recommendations for the Cisco uBR7100 Series Routers, Cisco IOS Release 12.2(4)XF1 Feature Sets

Feature Set	Software Image	Recommended Flash Memory	Recommended DRAM Memory	Runs From
Two-Way Data/VoIP Images				
DOCSIS Two-Way	ubr7100-p-mz	16 MB Flash	64 MB DRAM	RAM
DOCSIS Two-Way IP Plus	ubr7100-is-mz	16 MB Flash	64 MB DRAM	RAM
DOCSIS Two-Way with BPI	ubr7100-k8p-mz	16 MB Flash	64 MB DRAM	RAM
DOCSIS Two-Way IP Plus with BPI	ubr7100-ik8s-mz	16 MB Flash	64 MB DRAM	RAM

The image subset legend for Table 4 is as follows:

- i = IP routing, MPLS-VPN support, and noncable interface bridging, including Network Address Translation (NAT)
- k8 = DOCSIS Baseline Privacy and MPLS-VPN support
- p = IP routing with Intermediate System-to-Intermediate System (IS-IS) and Border Gateway Protocol (BGP); MPLS-VPN support; no NAT
- s = "Plus" features: NAT and Inter-Switch Link (ISL)

Note All images support all of the hardware listed in the "Supported Hardware" section on page 8, unless otherwise indicated.

System Interoperability

This section clarifies the operation of certain features in the Cisco uBR7100 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 only those services to which it has authorized access.

  To enable BPI, choose software at both the CMTS and CM that support the mode of operation. For the Cisco uBR7100 series software, choose an image with "k8" 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 using the DOCSIS configuration file.

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

- CM Interoperability

  The Cisco uBR7100 series interoperates with DOCSIS (Cisco uBR7111 and Cisco uBR7114) or Euro-DOCSIS (Cisco uBR7111E and Cisco uBR7114E) two-way CMs that support basic Internet access, VoIP, or Virtual Private Networks (VPNs). Cisco IOS Release 12.2(4)XF1 does not support telco-return CMs/STBs.

- DOCSIS 1.0 Extensions

  The Cisco uBR7100 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 uBR7100 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.

Supported Hardware

Cisco IOS Release 12.2(4)XF1 supports the following Cisco uBR7100 series routers:

- Cisco uBR7111
- Cisco uBR7114
- Cisco uBR7111E
- Cisco uBR7114E

Port Adapter Cards

Table 5 lists and describes the port adapters supported by Cisco uBR7100 series routers in Cisco IOS Release 12.2(4)XF1.

Table 5 Cisco uBR7100 Series Port Adapter Releases

WAN Technology	Product Number and Description	Introduced in Release[1]
Ethernet	PA-4E—4-port Ethernet 10BASE-T port adapter	12.2(4)XF1
	PA-8E—8-port Ethernet 10BASE-T port adapter	12.2(4)XF1
Fast Ethernet	PA-FE-TX—1-port 100BASE-TX Fast Ethernet port adapter	12.2(4)XF1
	PA-FE-FX—1-port 100BASE-FX Fast Ethernet port adapter	12.2(4)XF1
	PA-2FE-TX—2-port 100BASE-TX Fast Ethernet port adapter	12.2(4)XF1
	PA-2FE-FX—2-port 100BASE-FX Fast Ethernet port adapter	12.2(4)XF1
Serial	PA-E3—1-port high-speed serial E3 interface port adapter	12.2(4)XF1
	PA-T3—1-port T3 serial interface port adapter	12.2(4)XF1
	PA-T3+—1-port T3 serial interface port adapter enhanced	12.2(4)XF1
	PA-2E3—2-port high-speed serial E3 interface port adapter	12.2(4)XF1
	PA-2T3—2-port T3 serial interface port adapter	12.2(4)XF1
	PA-2T3+—2-port T3 serial interface port adapter enhanced	12.2(4)XF1
	PA-4T+—4-port synchronous serial port adapter	12.2(4)XF1
	PA-4E1G-75—4-port unbalanced (75-ohm) E1-G.703/G.704 synchronous serial port adapter	12.2(4)XF1
	PA-4E1G-120—4-port balanced (120-ohm) E1-G.703/G.704 synchronous serial port adapter	12.2(4)XF1
	PA-8T-232—8-port EIA/TIA-232 synchronous serial port adapter	12.2(4)XF1
	PA-8T-V35—8-port V.35 synchronous serial port adapter	12.2(4)XF1
	PA-8T-X21—8-port X.21 synchronous serial port adapter	12.2(4)XF1
	PA-MC-2T1—2-port multichannel DS1 Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) single-wide port adapter	12.2(4)XF1
Serial (continued)	PA-MC-4T1—4-port multichannel DS1 ISDN PRI single-wide port adapter	12.2(4)XF1

Table 5 Cisco uBR7100 Series Port Adapter Releases (continued)

WAN Technology	Product Number and Description	Introduced in Release[1]
HSSI	PA-H—1-port HSSI port adapter	12.2(4)XF1
	PA-2H—2-port HSSI port adapter	12.2(4)XF1
ATM	PA-A3-OC3MM—1-port OC-3c ATM, PCI-based multimode port adapter	12.2(4)XF1
	PA-A3-OC3SMI—1-port OC-3c ATM, PCI-based single-mode intermediate reach port adapter	12.2(4)XF1
	PA-A3-OC3SML—1-port OC-3c ATM, PCI-based single-mode long reach port adapter	12.2(4)XF1
	PA-A3-8T1/IMA—ATM inverse multiplexer over ATM port adapter with 8 T1 ports	12.2(4)XF1
Packet over SONET	PA-POS-OC3SMI—1-port OC3 single-mode, intermediate reach port adapter	12.2(4)XF1

1. The number in this column indicates the Cisco IOS release in which the interface was introduced in this train.

Determining Your Software Release

To determine the version of Cisco IOS software running on the Cisco uBR7100 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) 12.2 XF Software (ubr7100-k1p-mz), Version 12.2(4)XF1, 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/pd/iosw/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 uBR7100 series in Cisco IOS Release 12.2(4)XF1 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 12.2(4)XF1 is the base release; all features, unless otherwise noted, were introduced in this release.

Note Table 6 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 12.2(4)XF1 by using the Feature Navigator tool at http://www.cisco.com/go/fn.

Table 6 Feature List by Feature Sets for Cisco uBR7100 Series Universal Broadband Routers

	Feature Set		
Feature	**In**[1]	**DOCSIS Two-way with BPI**	**DOCSIS Two-way IP Plus with BPI**
IP Routing			
DHCP[2] Server		Yes	Yes
DRP[3] Server Agent		Yes	Yes
Easy IP (Phase 1)		Yes	Yes
Hot-Standby 1+1 Redundancy		No	No
HSRP[4] over ISL[5] in Virtual LAN Configurations		No	No
IP Type of Service and Precedence for GRE[6] Tunnels		Yes	Yes
IP Enhanced IGRP[7] Route Authentication		Yes	Yes
MxU Bridging		No	No
Per-Modem Filters		Yes	Yes
Management			
Cable Interface Setup Facility		Yes	Yes
Cable Monitor		No	No
Cisco Call History MIB Command Line Interface		Yes	Yes
DOCSIS Ethernet MIB Objects Support (RFC 2665)		Yes	Yes
DOCSIS OSSI[8] Objects Support (RFC 2233)		Yes	Yes
Dynamic Ranging Support		Yes	Yes
Enhanced Modem Status Display		Yes	Yes
Enhanced Per-Modem Error Counter		Yes	Yes
Internal Modem Configuration File Editor		Yes	Yes
LinkUp/Down Traps Support (RFC 2233)		Yes	Yes
RF Interface MIB		Yes	Yes
SNMPv2C[9] and SNMPv3[10]		Yes	Yes
SNMP Cable Modem Remote Query		Yes	Yes
Multimedia			
Bidirectional PIM[11]		No	No
IP Multicast Load Splitting Across Equal-Cost Paths		No	No

Table 6 Feature List by Feature Sets for Cisco uBR7100 Series Universal Broadband Routers (continued)

Feature	Feature Set		
	In[1]	DOCSIS Two-way with BPI	DOCSIS Two-way IP Plus with BPI
IP Multicast over ATM[12] Point-to-Multipoint Virtual Circuits		No	No
IP Multicast over Token Ring LANs		No	No
Stub IP Multicast Routing		No	No
Quality of Service			
Dynamic Upstream Modulation		Yes	Yes
DOCSIS 1.0+[13] QoS Enhancements		Yes	Yes
Downstream QoS Handling		Yes	Yes
Downstream Traffic Shaping		Yes	Yes
Dynamic SID Support		Yes	Yes
Dynamic Map-Advance		Yes	Yes
Improved Upstream QoS		Yes	Yes
Multiple SID Support (static only)		Yes	Yes
Network-Based Application Recognition		No	No
QoS Configuration		Yes	Yes
QoS Profile Enforcement		Yes	Yes
Read/Create Implementation of QoS		Yes	Yes
RTP[14] Header Compression		Yes	Yes
Telco Return		No	No
Time of Day (ToD) Server		Yes	Yes
Upstream Address Verification		Yes	Yes
Upstream Traffic Shaping		Yes	Yes
Security			
Automated Double Authentication		Yes	Yes
BPI Encryption		Yes	Yes
Cable Modem and Multicast Authentication using RADIUS[15]		No	No
Cisco IOS Firewall Enhancements		Yes	Yes
Dynamic Mobile Hosts		Yes	Yes
HTTP[16] Security		Yes	Yes
Named Method Lists for AAA[17] Authorization & Accounting		Yes	Yes
Per-Modem and Per-Host Access List Support		Yes	Yes
Per-User Configuration		Yes	Yes
Reflexive Access Lists		Yes	Yes
Turbo Access Control Lists		No	No

Table 6 Feature List by Feature Sets for Cisco uBR7100 Series Universal Broadband Routers (continued)

Feature	Feature Set		
	In[1]	DOCSIS Two-way with BPI	DOCSIS Two-way IP Plus with BPI
Vendor-Proprietary RADIUS Attributes		No	No
Switching			
Fast-Switched Policy Routing		Yes	Yes
VPN			
MPLS VPN Support for Subinterfaces		Yes	Yes
WAN Optimization			
PAD[18] Subaddressing		Yes	Yes
WAN Services			
Bandwidth Allocation Control Protocol (BACP)		Yes	Yes
Enhanced Local Management Interface (ELMI)		Yes	Yes
Frame Relay Enhancements		Yes	Yes
Frame Relay MIB Extensions		Yes	Yes
Frame Relay Router ForeSight		Yes	Yes
ISDN[19] Advice of Charge		Yes	Yes
ISDN Caller ID Callback		Yes	Yes
ISDN Multiple Switch Type		Yes	Yes
ISDN NFAS[20]		Yes	Yes
Microsoft Point-to-Point Compression (MPPC)		Yes	Yes
National ISDN Switch Types for BRI[21] and PRI[22]		Yes	Yes
VPDN[23] MIB and Syslog Facility		Yes	Yes
X.25 Enhancements		Yes	Yes
X.25 Switching Between PVCs[24] and SVCs[25]		Yes	Yes

1. The number in the “In” column indicates the Cisco IOS release in which the feature was introduced in this release train. 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. HSRP = Hot-Standby Routing Protocol
5. ISL = Inter-Switch Link
6. GRE = generic routing encapsulation
7. IGRP = Interior Gateway Routing Protocol
8. OSSI = Operations Support System Interface
9. SNMPv2 = Simple Network Management Protocol version 2
10. SNMPv3 = Simple Network Management Protocol version 3
11. PIM = Protocol Independent Multicast
12. ATM = Asynchronous Transfer Mode

13. 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 unsolicited grant service (UGS) slot scheduling mechanism for voice slots, and per IP-precedence rate shaping on the downstream.
14. RTP = Real-Time Transport Protocol
15. RADIUS = Remote Access Dial-In User Service
16. HTTP = Hypertext Transfer Protocol
17. AAA =authentication, authorization, and accounting
18. PAD = packet assembler/disassembler
19. ISDN = Integrated Services Digital Network
20. NFAS = non-facility-associated signaling
21. BRI = Basic Rate Interface
22. PRI = Primary Rate Interface
23. VPDN = virtual private dial-up network
24. PVC = permanent virtual circuit
25. SVC = switched virtual circuit

New and Changed Information

The following sections list the new hardware and software features supported by the Cisco uBR7100 series routers for Cisco IOS Release 12.2 XF.

No New Hardware Features in Release 12.2(4)XF1

There are no new hardware features supported by the Cisco uBR7100 series routers in Cisco IOS Release 12.2(4)XF1.

New Software Features in Release 12.2(4)XF1

The following new software features are supported by the Cisco uBR7100 series routers in Cisco IOS Release 12.2(4)XF1.

DOCSIS 1.0 and 1.0+ Support

Cisco IOS Release 12.2(4)XF1 provides support for the original DOCSIS 1.0 standard that provides for basic best-effort data traffic and Internet access over the coaxial cable network. The DOCSIS 1.0+ extensions provided Quality of Service (QoS) enhancements for real-time traffic, such as voice calls, in anticipation of full DOCSIS 1.1 support.

Cisco IOS Release 12.2(4)XF1 interoperates seamlessly with both DOCSIS 1.0 and 1.0+ cable modems and set-top boxes.

DOCSIS 1.1 Support

Cisco IOS Release 12.2(4)XF1 provides support for the new DOCSIS 1.1 standard for the Cisco Release 12.2(4)XF1 series routers. DOCSIS 1.1 modifies the DOCSIS 1.0 specification to provide better performance, in particular for real-time traffic such as voice calls.

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.
- DOCSIS 1.1 cable modems can coexist with DOCSIS 1.0 and 1.0+ cable modems in the same network—the Cisco Release 12.2(4)XF1 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 12.2(4)XF1, the following new or enhanced software features are implemented for DOCSIS 1.1 functionality. (For more information, see the feature module *DOCSIS 1.1 for Cisco Release 12.2(4)XF1 Series Universal Broadband Routers*).

Cable ARP and Proxy ARP

The **cable arp** and **cable proxy-arp** commands control whether the Cisco Release 12.2(4)XF1 series router allows ARP requests on the cable interfaces and whether the router serves as a proxy ARP server for cable modems, so that cable modems on the same subnet can communicate with each other, without having to send the traffic through the Cisco Release 12.2(4)XF1 series router.

Cable Flap List

The cable flap list is a patented tool that is incorporated in the Cisco IOS software for the Cisco Release 12.2(4)XF1 series universal broadband routers for troubleshooting cable modem connectivity problems. The flap list tracks cable modems that have intermittent connectivity problems (known as “flapping”) that could indicate a problem with the cable modem or with the upstream or downstream portion of the cable plant.

The flap-list feature does not require any special polling or data transmissions but instead monitors the registration and station maintenance activity that is already performed over any network that conforms to Data-over-Cable Service Interface Specifications (DOCSIS). The router, therefore, collects its flap-list data without creating additional packet overhead and without impacting network throughput and performance.

The flap-list feature tracks reinsertions (a cable modem re-registers more frequently than a user-specified insertion time, hits and misses (a cable modem responds or does not respond to the DOCSIS MAC-layer "keepalive" messages that the router sends out), and the cable modem's upstream transmission power level adjustments.

Cable Intercept Command

The **cable intercept** command forwards all traffic to and from a particular CM to a data collector located at particular User Datagram Protocol (UDP) port. This command can be used to comply with the United States Federal Communications Assistance for Law Enforcement Act (CALEA) and other law enforcement wiretap requirements for voice communications.

Note The **cable monitor** command, which performs a similar function, is not supported in Cisco IOS Release 12.2(4)XF1.

Cable Interface Setup Facility

The Cable Interface Setup Facility is an alternative mechanism to enable or configure Cisco Release 12.2(4)XF1 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 Source Verification Feature

The **cable source-verify** command helps to prevent the spoofing of IP addresses by CMs or their CPE devices by verifying that the upstream packets coming from each CM are known to be associated with the IP address in that packet. Packets with IP addresses that do not match those associated with the CM are dropped.

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.

DHCP/TOD/TFTP Server Support

The Cisco uBR7100 series routers support onboard Dynamic Host Configuration Protocol (DHCP), Time-of-Day (ToD), and TFTP servers that are compliant with the DOCSIS requirements. This allows the Cisco uBR7100 series routers to provide cable modems with IP address information, to supply an RFC 868-compliant time-of-day timestamp, and to download a DOCSIS configuration file, without requiring separate, external servers.

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 uBR7100 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 **clear cable modem** <mac-address> **reset** command sends a "Ranging Abort" message instead of just removing the SID. To indicate this, the 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.

The **cable upstream** <n> **modulation-profile** cable interface command configures the cable interface for the desired modulation profiles.

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 **cable upstream hop-priority frequency bandwidth modulation** command.

For more information on the Dynamic Upstream Module feature, including information on creating modulation profiles using the **cable modulation-profile** command, see the *Cisco Release 12.2(4)XF1 Dynamic Upstream Modulation* feature module. For more information on the above commands, see the documents listed in the "Related Documentation" section on page 27.

Internal Modem Configuration File Editor

This feature adds support for internal DOCSIS cable modem configuration file storage and generation. The cable modem configuration file is generated and stored as part of the Cisco IOS configuration file. The DOCSIS configuration files are not stored in Flash memory but are automatically generated when requested for TFTP downloads to cable modems.

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.

"MAX-CPE" CLI Override

The following cable-specific configuration command provides a way to override the MAX-CPE parameter in the cable modem's DOCSIS configuration file:

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

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

Note The **cable max-hosts** and **cable modem max-hosts** commands can also be used to set this value for all cable modems on a particular cable interface or for a particular cable modem.

MPLS VPN Support for Subinterfaces

Cisco IOS Release 12.2(4)XF1 includes MPLS support as part of its VPN offerings for cable subinterfaces. 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. One subinterface is required for each ISP. The subinterfaces are tied to VPN Routing Forwarding (VRF) tables for respective ISPs.

For more feature information, see the *Cisco Release 12.2(4)XF1 Series MPLS VPN Cable Enhancements* feature module. For information on feature modules, see the "Feature Modules" section on page 29.

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 Release 12.2(4)XF1 to configure an MPLS VPN. See also the "MPLS VPN Support for Subinterfaces" section on page 20.

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>

Spectrum Management and Dynamic Upstream Modulation

Spectrum management allows the Cisco Release 12.2(4)XF1 series router to sense downstream and upstream plant impairments, report them to a management entity, and automatically mitigate them by changing to a different frequency using a blind hopping algorithm.

The Dynamic Upstream Modulation feature creates two modulation profiles for and upstream. The feature monitors the upstream channel signal quality and determines if the channel can support the primary modulation scheme. If noise or other impairments occur, the feature automatically adjusts to the most robust modulation scheme when necessary. When return path conditions improve, this feature returns the upstream channel to the higher modulation scheme that includes the modulation profile.

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.

The following CLI command has been implemented for turning on the trap:

snmp-server enable cable cm-remote-query

Important Notes

The following sections contain important notes about Cisco IOS Release 12.2(4)XF1 that apply to Cisco uBR7100 series universal broadband routers.

Limitation on Vendor-Specific Information in the DOCSIS Configuration File

DOCSIS requires that when the cable modem sends its Registration Request (REG-REQ) message to the CMTS, it must include the configuration information found in the DOCSIS configuration file. This configuration information must include all vendor-specific information fields (VSIF). Because MAC-layer management messages, such as REG-REQ, have a maximum data size of 1522 bytes, this limits the amount of VSIF information that can be included in the DOCSIS configuration file.

In particular, the maximum packet size imposes a limit on the number of Cisco IOS CLI commands you can include as VSIF fields in the DOCSIS configuration file. The exact number of commands that will fit depends on the other information included in the file, as well as the length of each command.

If the REG-REQ message is larger than 1522 bytes, the cable modem will likely report errors similar to the following errors that appears on Cisco uBR900 series cable access routers:

```
%LINK-4-TOOBIG: Interface cable-modem0, Output packet size of 1545 bytes too big
%LINEPROTO-5-UPDOWN: Line protocol on Interface cable-modem0, changed state to down
```

In addition, the CMTS will also report that the cable modem timed out during the registration process. If this occurs, you can try the following steps:

- Reduce the length of the commands by using the abbreviated form of the command. For example, you can specify the **int c0** instead of the full command **interface cable-modem0**.
- SNMP MIB objects are not included in the Registration Request message, so wherever possible, replace the CLI commands with the corresponding SNMP MIB object statements in the DOCSIS configuration file.
- If a large number of CLI commands must be given, use VSIF option 128 to download a Cisco IOS configuration file to the cable modem.

For complete details on what is included in the REG-REQ message, see Chapter 6 of the current DOCSIS 1.1 specification (SP-RFIv1.1-I07-010829 or later).

Note This limitation is being tracked by caveat CSCdv83892 but is not expected to be resolved unless the DOCSIS specification is changed to remove the maximum size limit for MAC-layer management messages.

Hot-Standby 1+1 Redundancy Not Supported

The hot-standby 1+1 redundancy feature is not supported on any model of the Cisco uBR7100 series universal broadband router. The HCCP protocol therefore should not be configured on the cable interface using the **hccp** interface configuration commands.

IS-IS Not Supported on Cable Interfaces

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

Configuring the Routing Protocol Causes a Reset of the Cable Modems

Be aware that when configuring a routing protocol on a Cisco uBR7100 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.

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 web site on Cisco.com at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

Supported MIBs

The Cisco uBR7100 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 Cisco 2600 series or Cisco 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 Cisco uBR7100 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 Cisco uBR7100 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 web site 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 uBR7100 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 (ftp://ftp.cisco.com/pub/mibs/ or http://www.cisco.com/public/mibs). Most MIBs are available in both SNMPv1 and SNMPv2 versions; the SNMPv1 versions have *V1SMI* as part of their filenames.

Table 7 Cable-Specific MIBs Supported on Cisco uBR7100 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 RFC 1902.	12.1(5)EC1
SNMPv2-TC.my SNMPv2-TC-V1SMI.my	This module defines the textual conventions as specified in RFC 1903.	12.1(5)EC1
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 RFC 1907.	12.1(5)EC1
CISCO-SMI.my CISCO-SMI-V1SMI.my	This module specifies the SMI for Cisco's enterprise MIBs.	12.1(5)EC1
CISCO-TC.my CISCO-TC-V1SMI.my	This module defines the textual conventions used in Cisco's enterprise MIBs.	12.1(5)EC1
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 *if* table and incorporates the extensions defined in RFC 2233.	12.1(5)EC1

Table 7 Cable-Specific MIBs Supported on Cisco uBR7100 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 cable modems and cable modem termination systems, as defined in RFC 2670.	12.1(5)EC1
DOCS-BPI-MIB.my	This module—available in an SNMPv2 version only—describes the attributes for the DOCSIS-specified Baseline Privacy Interface (BPI) on cable modems and the CMTS.	12.1(5)EC1
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(5)EC1
CISCO-DOCS-REMOTE-QUERY-MIB.my	This module facilitates SNMP polling of remote CMs on a CMTS.	12.1(5)EC1
CISCO-CABLE-SPECTRUM-MIB.my CISCO-CABLE-SPECTRUM-MIB-V1SMI.my	This module describes the spectrum management flap list attributes.	12.1(5)EC1

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

Table 8 Replacements for Deprecated MIBs (continued)

Deprecated MIB	Replacement
OLD-CISCO-APPLETALK-MIB	RFC1243-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 uBR7100 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 select severity 3 caveats are included in the caveats document.

This section only contains open and resolved caveats for the current Cisco IOS maintenance release.

For information on caveats in Cisco IOS Release 12.2, see *Caveats for Cisco IOS Release 12.2*, which lists severity 1 and 2 caveats and select severity 3 caveats for Cisco IOS Release 12.2 and is located on Cisco.com and the Documentation CD-ROM.

Caveat numbers and brief descriptions for Cisco IOS Release 12.2(4)XF1 are listed in this section. For details about a particular caveat, go to Bug Toolkit at:

http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl

To access this location, you must have an account on Cisco.com. For information about how to obtain an account, go to the "Feature Navigator" section on page 29.

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/cgi-bin/Support/Bugtool/launch_bugtool.pl.

Open Caveats for Release 12.2(4)XF1

No severity 1 or severity 2 caveats exist for Cisco IOS Release 12.2(4)XF1 for the Cisco uBR7100 series routers.

Closed and Resolved Caveats for Release 12.2(4)XF1

Cisco IOS Release 12.2(4)XF1 is the first release in the 12.2 XF train for the Cisco uBR7100 series routers but Table 9 shows the closed or resolved caveats that existed in previous releases that are also resolved in this release.

Table 9 Open Caveats for Release 12.2(4)XF1

Caveat ID Number	Description
CSCdw03863	Crash with watchdog timeout in IGMP Input process

Related Documentation

The following sections describe the documentation available for the Cisco uBR7100 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 27
- Platform-Specific Documents, page 28
- Feature Modules, page 29
- Feature Navigator, page 29
- Cisco IOS Software Documentation Set, page 29

Release-Specific Documents

The following documents are specific to Release 12.2 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 12.2*

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

  Technical Documents: Cisco IOS Software Configuration: Cisco IOS Release 12.1: Release Notes: Caveats: Caveats for Release 12.2

On the Documentation CD-ROM:

Cisco Product Documentation: Cisco IOS Software Configuration: **Cisco IOS Release 12.2**: **Caveats**

Note If you have an account with Cisco.com, you can use Bug Navigator II to find caveats of any severity for any release. To reach Bug Navigator II, log in to Cisco.com and click **Software Center: Cisco IOS Software: Cisco Bugtool Navigator II**. Another option is to go to http://www.cisco.com/support/bugtools/.

Platform-Specific Documents

The following documents are available for the Cisco uBR7100 series universal broadband routers on Cisco.com and the Documentation CD-ROM:

- *Cisco uBR7100 Series Hardware Installation Guide*
- *Cisco uBR7100 Series Software Configuration Guide*
- *Cisco uBR7100 Series Power Supply Installation*
- *Broadband Cable Command Reference Guide*
- *Cisco CMTS Feature Guide*

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

Technical Documents: Documentation Home Page: Broadband Access: Cable: **Cisco uBR7100 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 Access: Cable: **Cisco uBR7100 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 Cisco uBR7100 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/index.htm

Feature Modules

Feature modules describe new software enhancements, committed as features, supported by Cisco IOS Release 12.1(7)EC, 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: Cisco IOS Software Configuration: Cisco IOS Release 12.2: Configuration Guides and Command References

On the Documentation CD-ROM:

Cisco IOS Software Configuration: Cisco IOS Release 12.2: Configuration Guides and Command References

Release 12.2 Documentation Set

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: Cisco IOS Software Configuration: Cisco IOS Release 12.2: Configuration Guides and Command References

On the Documentation CD-ROM:

Cisco Product Documentation: Cisco IOS Software Configuration: **Cisco IOS Release 12.2**: **Configuration Guides and Command References**

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**.

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 27.