

Cisco uBR7223: Universal Broadband Router

We are in the middle of a revolution in the way we access information and entertainment, powered by the explosive growth of the Internet. Cisco is partnering with cable operators to leverage that growth by constructing an advanced digital broadband network. And the centerpiece of that network is the Universal Broadband Router.

The Universal Broadband Router brings tremendous value to the digital broadband network by:

- Enabling the cost-effective deployment of advanced routing capabilities deep into the cable network
- Providing a universal platform for deployment of both current and future modem technologies via modular upgrades while protecting the operator's invested capital
- Leveraging Cisco's industry-standard routing hardware and Cisco IOS® software to deliver advanced network services and applications

New Horizons for the Smaller Cable Operator

The Cisco uBR7200 family consists of the Cisco uBR7246 and the Cisco uBR7223. The Cisco uBR7223 is derived from the industry leading Cisco uBR7246 which itself combines the power of a Cisco 7200 series router with the high-speed network access of a cable modem termination system (CMTS), all in one package, hence the name: Universal Broadband Router. By combining these two essential functions, the uBR conserves valuable headend rack space and allows cable operators to deploy routing capability in every CMTS location, which improves network performance. And there's no cost penalty for adding this advanced capability, because the uBR is priced competitively with other vendors' CMTS-only solutions.

Figure 1: The Cisco Universal Broadband Router uBR7223



While the Cisco uBR7246 was the first system to enable large cable operators to have cost-effective standards-based scalable solutions, operators of small to medium-sized cable systems have been left with solutions that were either too expensive or were based on proprietary and closed architectures or, most often, both.

Cisco has always prided itself in listening to its customers and the Cisco uBR7223 is a prime example of attention to customer needs. For the first time, the Cisco uBR7223 brings the cost effectiveness of a Cisco uBR7246 to much smaller network installations, in a compact, integrated, MCNS Data-over-Cable Service Interface Specifications (DOCSIS)-compliant package, while still keeping most of the higher-end features of its bigger brother.

The Cisco uBR7223 provides cable operators with a cost-effective, scalable, and feature-rich interface between subscriber cable modems and the backbone data network, particularly for smaller installations or for installations in areas where penetration is not expected to be very high.

The Cisco uBR7223 enables smaller cable operators, municipalities, as well as any other operator who may have access to cable network infrastructure, to offer high-speed data services to their customers while maximizing the efficiency of their network bandwidth utilization. This, in turn, allows the operators to derive higher profits from the same scarce network resources.

In addition, Cisco's partnerships with consumer electronics manufacturers ensure that low-cost cable modems are readily available from multiple sources and are guaranteed to be interoperable right from the start.

The Cisco uBR7223 is also offered with all-inclusive packs that enhance its cost-effectiveness even more.

Cisco uBR7223 Applications

Cisco listens to its customers and the Cisco uBR7223 is a prime example of this attention to customer needs. It is a product specifically built in order to respond to the needs of the smaller system. In addition to sharing all the features of the Cisco uBR7246 at a lower initial cost, the Cisco uBR7223 breaks new ground by incorporating everything needed in order to run data services over cable in one solution bundle.

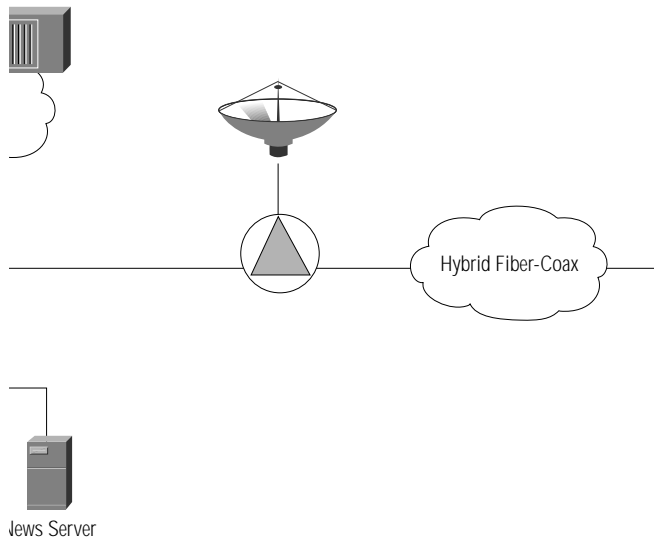
In addition to traditional small to medium-size public cable operators, this product, with its one-box solution for providing high-speed Internet connectivity through cable modems, can enable entirely new markets for a variety of industries.

The Cisco uBR7223 will be ready to support new services like VoIP, and as soon as the supporting cable modems arrive in the marketplace.

- **Master Antenna Television/Multiple Dwelling Units (MATV/MDU's):** Small private cable network operators could add high-speed data services to the apartment complexes or other MDU's they are serving. They could thus help the complexes differentiate themselves from others in the surrounding area, while getting additional revenue streams from the new service opportunities.
- **Lodging:** Business travelers today are in dire need of high-speed connections to the Internet in general and to their company's intranet in particular. Enterprises with a large number of itinerant users would be willing to spend a lot of money in order to provide them with LAN-like performance. For the first time, they will be able to extend high-speed telecommuting in a flexible, affordable and transparent manner. These services could be offered by hotels themselves or, more commonly, by the operators who own the hotel cable television franchise today. Conceivably, such services could also be offered by ISP's who offer their networking expertise to owners of cable networks.
- **Institutional users (Municipalities, Hospitals and other non-profit organizations):** Such users could leverage the existence of cable in their area in order to:
 - Utilize it for all their internal communications
 - Use it to further the technological capabilities of their infrastructure and thus
 - Help their community develop and
 - Attract new businesses because of its progressive and highly advanced infrastructure



Figure 2: Sample Network Configuration, Small Cable System



The Cisco uBR7223 Universal Broadband Router provides the following key benefits to cable operators:

Integrated Routing

The Universal Broadband Router combines the functions of a traditional high-end router and cable modem shelf into one cost-effective package. Routing provides the cable operator with several critical advantages over alternative bridging architectures, including true network privacy, more efficient use of scarce network bandwidth, and centralized network intelligence and control. By incorporating routing into its headend modem package, the Cisco uBR7223 eliminates the need for a separate colocated router, thereby reducing space requirements and capital investment.

Universal Product Design

Cisco's multiple plug-in modem card design enables cable operators to install equipment today with the assurance that future technological improvements will be accommodated. The design also allows maximum flexibility in network architectures, by simultaneously supporting multiple configurations such as two-way and telephone return.

Assured Interoperability

Cisco offers one of the only Multimedia Cable Network System (MCNS)-compliant cable headend products on the market. Cisco is also working with a large number of high-volume consumer electronics manufacturers with proven brand names to ensure the wide-scale availability of low-cost, interoperable cable modems. Cisco ensures the interoperability of partner

modems with the Cisco uBR7223 by cooperating in the design and compliance testing of all partner modems. Unlike other vendors who offer cable headend products, Cisco does not have a vested interest in any particular cable modem.

Networking Expertise

Cisco is bringing all its networking expertise and reputation to bear to ensure the commercial success of the cable data networking market.

Cisco uBR7223: Two Products in One Chassis

The Cisco uBR7200 Universal Broadband Router family is unique in that it provides the functions of a network router and a cable modem shelf in one universal chassis. The products can be divided into three primary elements, each of which is represented in the product name:

Universal	Modular Chassis
Broadband	Cable
Router	Router Subsystem

Each of these three elements is discussed independently, but it should be noted that the Cisco uBR7223 has been designed and tested as a complete system.

A Flexible Platform Based on Industry Standards

The Cisco uBR7223 is designed from the ground up to provide a standards-based platform upon which to grow. The router subsystem consists of the industry-leading networking capability of the Cisco 7200, along with Cisco's powerful IOS software package. This setup enables cable operators to benefit from the continual growth and enhancement of Cisco's flagship hardware and software platforms. The Cisco uBR7223 chassis contains one slot for standard Cisco 7200 series port adapter. There are currently over 25 types of port adapters in the Cisco 7200 lineup including Ethernet, Fast Ethernet, FDDI, HSSI, and ATM-OC3.

The broadband subsystem contains four slots for interchangeable modem cards. Any type of available modem card can be placed in any slot, in any combination. Various densities of upstream and downstream modems per card are offered to maximize operator flexibility in matching system cost to capacity requirements. As technology changes and markets evolve, Cisco will continue to develop new standards-based modem cards in response to customer needs.

Feature	Benefits
Integrated routing technology is in the cable headend modem platform	Robust routing provides the cable operator with several critical advantages including true network privacy, more efficient use of scarce network bandwidth, and centralized network intelligence and control. By incorporating routing into its headend modem package, the Cisco uBR7200-series eliminates the need for a separate co-located router, thereby reducing space requirements and capital investment.
Support for Multiple Plug-In Modem Cards	Various densities of upstream and downstream modems per card are offered to maximize operator flexibility in matching system cost to capacity requirements. As technology changes and markets evolve, Cisco will continue to develop new standards-based modem cards in response to customer needs.
DOCSIS Compliance	Cisco offers one of the only DOCSIS-compliant cable headend products on the market. Cisco is working with a large number of high-volume consumer electronics manufacturers with proven brand names to ensure the wide-scale availability of low-cost, interoperable cable modems.

Router Subsystem

The Router subsystem of the uBR7223 is built on the Cisco 7200 platform. The Cisco 7200 provides high-performance, density, and availability with industry-leading serviceability and manageability features. Cable operators can now gain the advantages of high-performance network-layer switching and services, including security, quality of service, and traffic management.

The Cisco uBR7223 series delivers the full suite of Cisco IOS software services, which is capable of managing access to network resources, allocating quality of service among applications, and providing value-added functions such as NetFlow™ switching.

The Cisco uBR7223 sets new standards in price/performance, meeting requirements for high-throughput at an affordable price. With a choice of 150-MHz and 200 MHz RISC processors with SRAM, the Cisco uBR7223 provides over 600 Mbps of bandwidth capacity and switching performance at up to 140,000 packets per second (pps).

NetFlow switching, a Cisco IOS switching mechanism, allows the Cisco uBR7200 series to combine high-performance network-layer switching with the connection-oriented- application of network services, such as security, quality of service, and traffic management. It also enables detailed traffic statistics by protocol and IP address.

The Cisco uBR7200 Series uses the same port adapters as the Cisco 7200 series and the 7500-Versatile Interface Processor (VIP), thus protecting customer investment in interfaces and simplifying sparing.

New Levels of Reliability, Availability, Serviceability, and Manageability

The Cisco uBR7223 offers exceptional reliability, availability, and serviceability designed to handle mission-critical applications. To ensure high system availability, the Cisco uBR7223 supports online insertion and removal of port adapters so that interfaces can be added, removed, or replaced with minimal service interruption. A PCMCIA Flash memory card enhances reliability by storing backup software images and configuration files.

For maximum uptime, the Cisco uBR7223 supports Cisco IOS Hot Standby Router Protocol (HSRP), which provides fast cutover to a backup router in the event of a system or link failure. Environmental monitors have levels of escalation so that the operator may take corrective action prior to any system shutdown. To enhance serviceability, each component of the Cisco uBR7223, including the backplane, is field-replaceable.

The Cisco uBR7223 offers a hypertext markup language (HTML)-based management tool to simplify router configuration and management. Customers can use a Web browser to navigate through Command Line Interface (CLI) with hot links. With a logical view of the hardware configuration, customers can simply point and click on interfaces to check status or modify configurations. In addition, through hot links, customers can perform basic trouble shooting operations such as verifying software versions.

Cisco uBR7223 Router Subsystem Features and Benefits

Feature	Benefit
High Performance	<ul style="list-style-type: none"> • Supports high-density configurations • Supports today's high-speed media
High Density	<ul style="list-style-type: none"> • Offers scalable solution with many media options
Common Port Adapters with Cisco 7200 and 7500 VIPs	<ul style="list-style-type: none"> • Simplifies sparing • Protects customer investment in interfaces • Conserves port adapter slots
Fast Ethernet Port on I/O Controller	<ul style="list-style-type: none"> • Reduces Fast Ethernet price per port
Online Insertion and Removal of Port Adapters	<ul style="list-style-type: none"> • Allows fast upgrades to higher density and new port adapters without rebooting the system and with the minimal downtime • Reduces operation intervention since like port adapters are automatically reconfigured
Fast Boot	<ul style="list-style-type: none"> • Enables servicing to be performed within seconds, minimizing downtime and impact on network availability

Feature	Benefit
Environmental Monitoring	<ul style="list-style-type: none"> Alerts operator of fluctuations before critical conditions occur, allowing proactive resolution while the system stays on line
Status and Health LEDs	<ul style="list-style-type: none"> Provides at-a-glance determination of status

Feature	Benefit
Easy Access to all Components	<ul style="list-style-type: none"> Enables servicing to be performed within seconds, minimizing downtime and impact to the network
Field-Replaceable Components	<ul style="list-style-type: none"> Allows components to be serviced locally without return to factory
System Flash Memory	<ul style="list-style-type: none"> Enables fast, reliable software and microcode upgrades Allows single, centralized point of administration, obviating the need to visit each router site when upgrading software or microcode
Cisco Web Browser Interface	<ul style="list-style-type: none"> Provides navigational tool through the CLI and allows user to check status or modify configuration through point-and-click operation

Broadband Subsystem

The Cisco uBR7223 Series Broadband cable subsystem consists of up to 2 modem cards which plug in to the Universal chassis. Each modem card is entirely independent, from a radio frequency (RF) standpoint, while all modem cards in the chassis share the Router subsystem. This provides maximum cost-effectiveness and flexibility to the cable operator by amortizing the cost of the routing across all the modems in each chassis, while allowing each modem card to independently serve a dedicated group of subscriber modems. This flexibility further enables the use of different types of subscriber devices if desired.

Modem Card Types

Cisco will ultimately offer a wide variety of modem cards, depending on the types of subscriber modems that are needed. Cisco's initial product deployment is focused on ensuring interoperability with subscriber modems from the widest possible range of modem manufacturers, and therefore the first set of modem cards Cisco offers are all fully compliant with the MCNS DOCSIS specification.

MCNS Modem Cards

MC-11: 1 Downstream and 1 Upstream

The MC-11 Modem Card contains one 64-QAM downstream modulator and one QPSK upstream demodulator on a single card. The MC-11 modem supports both two-way and telephone-return modems simultaneously. The MC-11 offers cable operators the lowest capital cost for an initial entry point into a market, and is therefore ideal for smaller cable systems or nodal areas with low penetration of cable data service.

MC-16: 1 Downstream and 6 Upstream

The MC-16 Modem Card contains one 64/256-QAM downstream modulator and six QPSK/16-QAM upstream demodulators on a single card. The MC-16 Modem supports both two-way and telephone-return modems simultaneously. The MC-16 provides a very favorable overall cost per subscriber modem, and is well-suited for deployment in medium to large cable systems with good penetration of cable data service.

MC-26: 2 Downstream and 6 Upstream

The MC-26 Modem Card contains two 64/256-QAM downstream modulators and six QPSK/16-QAM upstream demodulators on a single card. The MC-26 supports both two-way and telephone-return modems simultaneously. The MC-26 provides the most cost-effective solution on the market on a per-subscriber basis, and is designed to be the workhorse product for medium to large cable systems as their cable data service grows beyond the initial rollout to full-scale market deployment.

Cisco uBR7223 Broadband Subsystem Features and Benefits

Feature	Benefit
2 Modem Card slots	<ul style="list-style-type: none"> Minimizes rack space utilization Minimizes overall cost of deployment
Interchangeable Modem Cards	<ul style="list-style-type: none"> Supports wide variety of subscriber units Promotes interoperability Simplifies hardware configuration
MCNS Modem Cards	<ul style="list-style-type: none"> Supports industry standards effort Promotes interoperability
Two-Way and Telephone Return on a Single Card on the Same Downstream Channel	<ul style="list-style-type: none"> Enables deployment of both two-way and telephone return in the same area Reduces hardware cost by half Promotes interoperability
Semi-Automatic Spectrum Management	<ul style="list-style-type: none"> Maintains reliable service to end users when network problems occur

Cisco uBR7223 Broadband Subsystem Features and Benefits

Feature	Benefit
Advanced SNMP Network Management	<ul style="list-style-type: none"> Enables identification of trouble areas before impacting customer service Reduces response time in the event of a failure

Universal Chassis

The Cisco uBR7200 series Universal chassis houses two subsystems: the Broadband cable subsystem and the Router subsystem. The chassis is designed to accommodate all types of Broadband cable and Router elements, including modem cards, port adapters, network processing engines, and memories.

Cisco Universal Chassis Features and Benefits

Feature	Benefit
Accepts Standard 7200 Plug-Ins	<ul style="list-style-type: none"> Multiple network interfaces simplifies sparing
Two Interchangeable Modem Card Slots	<ul style="list-style-type: none"> Flexible configuration investment protection maximizes scalability
Easy Access to all Components	<ul style="list-style-type: none"> Enables servicing to be performed within seconds, minimizing downtime and impact to the network
Online Insertion and Removal	<ul style="list-style-type: none"> Allows the port adapter and modem cards to be removed & replaced while not disturbing the remaining operation of the uBR
Field-Replaceable Components	<ul style="list-style-type: none"> Allows components to be serviced locally without return to factory

Technical Specifications

Router Subsystem

Router Physical Configuration

System Processor	NPE-150 NPE-200	
Processor Type	NPE-150	MIPS R4700 <ul style="list-style-type: none"> 150 MHz CPU with 1MB static RAM
	NPE-200	MIPS R5000 <ul style="list-style-type: none"> 200 MHz CPU with 4MB static RAM
Bandwidth		600 Mbps

Router Network Interfaces

Port Adapter Slots	1
Port Adapter Types:	Ethernet (10BaseT) Fast Ethernet (TX) Fast Ethernet (FX) ATM-OC3 HSSI

Cisco 7000 Family Software Subsets and Options

Software requirement: Cisco IOS 11.3(6) NA or later

Router Software Feature Licenses

Category	Software Feature Licenses
WAN Packet Protocols	X.25, X.25 Switching, Frame Relay, SMDS, Frame Relay Switching, ATM DXI, SMDS over ATM
Interdomain Routing	BGP, EGP for Internet scale routing
NetFlow	NetFlow Switching and NetFlow Data Export
Network Address Translation	Network Address Translation

Broadband Subsystem

Modem Card Physical Configuration

Number of cards	2
Width	13.50 in (34.29 cm)
Height	1.35 in (3.43 cm)
Depth	10.56 in (26.82 cm)

Modem Card RF Specifications

Downstream Modulation	64 QAM / 256 QAM
Downstream Bit Rate	27 Mbps / 36 Mbps
Upstream Modulation	QPSK / 16 QAM
Upstream Bit Rate	5 Mbps / 10 Mbps
Output Frequency	44 MHz

Modem Card Power Requirements

Heat Dissipation	30W
AC-Input Voltage	120-240 VAC wide input with power factor correction
AC-Input Current Rating	0.25A maximum at 120 VAC 0.125A maximum at 240 VAC
AC-input cable	Three-wire cable, with a three-lead receptacle on the power supply end, and a country- dependent plug on the power source end 50/60 Hz

Frequency

Modem Card Environmental Specifications

Operating Temperature	23 to 113 F (-5 to 45 C)
Non-operating Temperature	-13 to 95 F (-25 to 70 C)
Relative Humidity	5 to 95% noncondensing
Noise Level	38 dBA maximum at desktop 43 dBA maximum in an office

Modem Card Software Requirements

Cisco IOS 11.3(6)NA, or later, running on the Cisco uBR7223 Universal Broadband Router, installed at the cable headend.

Universal Chassis

Universal Chassis Physical Configuration

Modem Card Slots	2
Port Adapter Slots	1

Universal Chassis Dimensions and Weight Specifications

Height	6.7in (17.02cm)
Width	17.0in (43.18cm)
Depth	22.0 in (55.88cm)
Weight	(max) 75 lb (34.09 kg)
Weight	(Installation/Minimum) 35 lb (15.9 kg)

Universal Chassis Power Requirements

Input, VA	475W max
Output, Watts	310W max
Heat Dissipation	475W (1262 Btu/hr)
AC Input Voltage	100-240 VAC
Frequency	50-60 Hz
AC Input Current	4.0A max @ 110 VAC 2.0A max @ 240 VAC
AC Input Cable	18 AWG three-wire cable, with a three-lead IEC-320 receptacle on the power supply end, and a country- dependent plug on the power source end
DC Input Voltage	-38 VDC min -48 VDC nominal -72 VDC max
DC Input Current	20A max @ -48VDC
DC Voltages	+3.5V @ 31A supplied +5.2V @ 44A +12.2V @ 1.0A -12.2V @ 1.5A +16V @ 4A -16V @ 0.5A

Universal Chassis Environmental Specifications

Operating Temperature	32 to 104 F (0 to 40 C)
Nonoperating Temperature	-4 to 149 F (-20 to 65 C)
Relative Humidity	10 to 90% noncondensing ~120 cfm

Universal Chassis Regulatory Compliance

Products in the Cisco uBR7200 Series conform to the following set of safety and regulatory standards:

Safety	<ul style="list-style-type: none">• UL 1950• CSA 22.2-No. 950• EN60950• EN41003• AUSTEL TS001• AS/NZS 3260
EMI	<ul style="list-style-type: none">• AS/NRZ 3548 Class A• CSA Class A• FCC Class A• EN60555-2• EN55022 Class B• VCCI (Class II)
Immunity	<ul style="list-style-type: none">• IEC-1000-4-2 (ESD)• IEC-1000-4-3 (radiated susceptibility)• IEC-1000-4-4 (electrical fast transients)• IEC-1000-4-5 (surge)• IEC-1000-4-6 (injected RF swept)



Corporate Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters

Cisco Systems Europe s.a.r.l.
Parc Evolic, Batiment L1/L2
16 Avenue du Quebec
Villebon, BP 706
91961 Courtaboeuf Cedex
France
<http://www-europe.cisco.com>
Tel: 33 1 69 18 61 00
Fax: 33 1 69 28 83 26

Americas Headquarters

Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-7660
Fax: 408 527-0883

Asia Headquarters

Nihon Cisco Systems K.K.
Fuji Building, 9th Floor
3-2-3 Marunouchi
Chiyoda-ku, Tokyo 100
Japan
<http://www.cisco.com>
Tel: 81 3 5219 6250
Fax: 81 3 5219 6001

Cisco Systems has more than 200 offices in the following countries. Addresses, phone numbers, and fax numbers are listed on the

Cisco Connection Online Web site at <http://www.cisco.com/offices>.

Argentina • Australia • Austria • Belgium • Brazil • Canada • Chile • China • Colombia • Costa Rica • Croatia • Czech Republic • Denmark • Dubai, UAE
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