Cisco uBR-MC3GX60V Broadband Processing Engine with Full DOCSIS 3.0 Support for the Cisco uBR10012 Universal Broadband Router

Product Overview

The Cisco® uBR-MC3GX60V Broadband Processing Engine (BPE) (Figure 1) is a high-capacity, DOCSIS® 3.0-capable line card for the Cisco uBR10012 Universal Broadband Router. With 72 DOCSIS downstream and 60 upstream channels per card, the Cisco uBR-MC3GX60V BPE sets a new benchmark for scalable, faster, and cost-effective DOCSIS 3.0 Cable Modem Termination System (CMTS) solutions. With the addition of the uBR-MC3GX60V BPE, the Cisco uBR10012 platform scales to an unprecedented **576 modular DOCSIS downstream channels and 480 upstream channels**, or approximately 24 Gbps of downstream throughput and 14.4 Gbps of upstream throughput, in a single, carrier-class chassis.

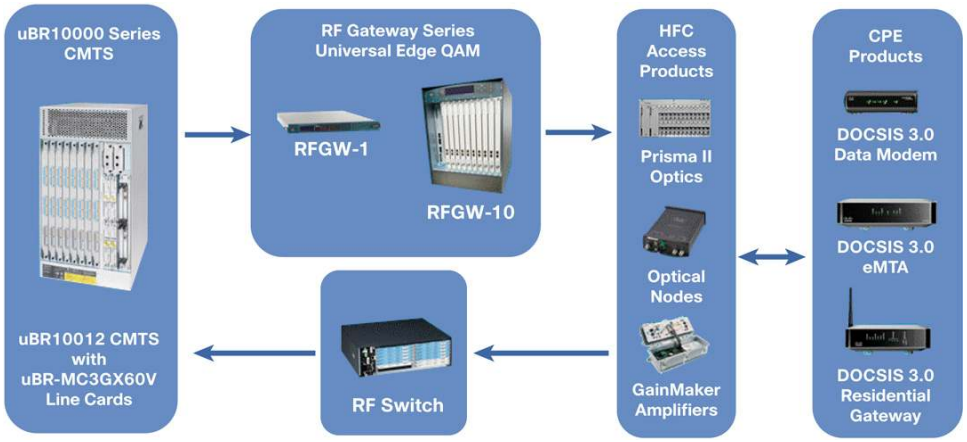
Figure 1. Cisco uBR-MC3GX60V Broadband Processing Engine

The Cisco uBR10012 CMTS with the uBR-MC3GX60V BPE delivers 10 times the capacity and 20 times the speed of DOCSIS 2.0 solutions at only a fraction of the cost. Because it bonds 24 DOCSIS channels (or 18 EuroDOCSIS channels) per bonding group, the solution allows cable operators to deliver ultra-broadband services with maximum downstream speeds approaching 1.0 Gbps per subscriber. A fully loaded Cisco uBR10012 CMTS with the Cisco uBR-MC3GX60V BPE can deliver 500 HDTV channels, video-on-demand (VoD), and ultra-broadband services to 20,000 homes.

Extending the Cisco DOCSIS 3.0 Solution

Figure 2 illustrates the Cisco DOCSIS 3.0 solution.

Figure 2. Cisco DOCSIS 3.0 Solution with Cisco uBR-MC3GX60V BPE



The Cisco uBR10012 CMTS and uBR-MC3GX60V BPE are part of the Cisco DOCSIS 3.0 solution portfolio. As the first and only CMTS product that supports both of the CableLabs-specified CMTS architectures – integrated and modular – in the same chassis, the Cisco uBR10012 provides a broad range of configuration options so cable operators can select the CMTS design that best meets their specific requirements. The addition of the Cisco uBR-MC3GX60V BPE to the solution portfolio adds unparalled scalability while significantly reducing the per-channel cost of the CMTS.

The combination of the Cisco uBR-MC3GX60V and Cisco RF Gateway 10 (RFGW-10) platforms provides a new level of capacity while maintaining the highest standards of reliability and availability through comprehensive line card and supervisor redundancy on both carrier-class platforms. The resulting benefits are **faster time to market, dramatically lower total cost of ownership, and higher revenues than previously possible**, thus helping cable operators prepare their networks for the exponential growth of IP video traffic.

The Cisco uBR10012 CMTS with the uBR-MC3GX60V BPE, when used together with the Cisco RF Gateway Series Universal Edge QAM, provides the following critical benefits to cable operators:

- Exporting the downstream physical layer (PHY) functions to the Cisco RF Gateway Series provides dramatic scalability improvements on the Cisco uBR10012 CMTS. This enormous increase in scalability lowers the cost per bit of the CMTS, which is crucial for cable operators planning to deliver IP video services.
- Integrating the downstream PHY functions for both DOCSIS and traditional digital video services into a single Universal Edge QAM product allows cable operators to take advantage of continuing innovation in quadrature amplitude modulation (QAM) channel density while protecting their investment in CMTS downstream capacity.
- Converging the DOCSIS and traditional digital video services on a single RF port per service group enables cable operators to use more QAM channels per physical port, thereby reducing the cost per channel for all services as well as reducing the rack space, power, cooling, and other environment requirements for delivering the full suite of data, voice, and video services.

Transitioning from digital video to IP video services in a cost-effective manner is made possible by independently scaling the CMTS downstream channels and repurposing the Universal Edge QAM channels.

The standards-based modular solution also allows cable operators to use third-party Edge QAM products that comply with the CableLabs M-CMTS specifications.

Flexibility with Cisco Software Licensing

The Cisco uBR-MC3GX60V BRE provides true cost flexibility for operators with licensing options that offer a pay-as-you-grow model. The software licensing capability combined with the adaptability of the modular CMTS architecture allows customers to turn up and move ports and bandwidth to different service groups as needed, without fear of stranding downstream or upstream ports.

- Base hardware and 16 upstream and 16 downstream channel licenses constitute the minimum configuration supported.
- Additional optional licenses are available for purchase up to the full capacity of 72 DOCSIS downstream (or 54 EuroDOCSIS downstream) and 60 upstream channels.
- Cisco Software Licensing (CSL) infrastructure provides an operationally simple licensing experience.

The ability to purchase and activate downstream and upstream channels as needed through software licensing allows cable operators to closely match their capital expenditures to their growth requirements. Cable operators can also reduce their operational expenses by designing their DOCSIS networks to accommodate future growth by simply installing upgrade licenses to add channels when needed, thus avoiding complex and costly hardware upgrades and plant redesigns. These CapEx and OpEx benefits for growing DOCSIS networks makes the Cisco uBR10012 CMTS with the uBR-MC3GX60V BPE the ideal solution for transitioning to IP video.

Delivering Video over DOCSIS (VDOC)

To enable the transition to an all-IP network, including managed and unmanaged IP video services, the Cisco DOCSIS 3.0 solution provides a highly scalable, highly available converged network optimized for video. Cisco IOS® Software offers a comprehensive feature set for efficient IP video delivery over the DOCSIS network.

- High quality: Advanced quality of service (QoS) features such as dynamic bandwidth sharing and admission control for bandwidth reservation help ensure video quality and enable convergence with high-speed data services.
- Cost effectiveness: IP multicast and RF spanning support scalable and cost-effective delivery of linear TV services.
- Efficiency: IP Statistical multiplexing with variable bit rate (VBR) video allows better utilization of CMTS resources to deliver more video streams in less bandwidth and spectrum.

Features and Benefits

- DOCSIS line-rate operation for all downstream channels (72 at 256QAM Annex B or 54 at 256QAM Annex A) and all 60 upstream channels (up to 64QAM at 6.4 MHz) in bonded and nonbonded modes
- From 4-channel to more than 32-channel downstream bonding capable; 4-channel upstream bonding capable
- Six Small Form-Factor Pluggable (SFP) ports (three active and three standby)
- 20 upstream ports (identical to MC20X20V), providing up to 12-frequency stacking per port
- Flexibility in assigning upstream channels to upstream ports; upstream frequency of up to 85 MHz
- Full DOCSIS 3.0 CMTS and downstream external PHY interface (DEPI) capability

- Superior RF performance with enhanced full-feature tap (FFT), ingress cancellation, and impulse noise detection capability
- Time Division Multiple Access (TDMA), Advanced Time Division Multiple Access (A-TDMA), and Synchronous Code Division Multiple Access (S-CDMA) supported
- Simultaneous operation of Cisco uBR-MC3GX60V, with Cisco 5x20H, Cisco 5x20U, Cisco MC20X20V, and Cisco DOCSIS 3.0 Wideband shared port adapter (SPA) in the same uBR10012 chassis

Product Specifications

Table 1. Product Specifications

Description	Specification
Physical	• Occupies a single slot in the Cisco uBR10012 chassis • Interface: line card single mode with intermediate reach connector • Hot-swappable; no slot dependency • Weight: 11.6 lb (5.26 kg) • Dimensions (H x W x D): 21.5 x 1.38 x 17 in. (54.61 x 3.51 x 43.18 cm)
Power	• Max rated power: 246W
Reliability and availability	• Designed for five 9s of availability (99.999%)
Environmental	• Operating altitude: –197 to 13,123 ft (-60 to 4000 m) • Storage temperature: –4 to 149℉ (-20 to 65℃) • Operating temperature, nominal: 41 to 104℉ (5 to 4 0℃) • Storage relative humidity: 5 to 95% • Operating relative humidity: 10 to 90% • Maximum heat dissipation: 190W, or 648 BTU/hr
Software release	• Cisco IOS® Software Release 12.2(33)SCE or later
Supported SFP	• SFP-GE-T (1000BASE-T) • GLC-SX-MM (1000BASE-SX) • GLC-LH-SM (1000BASE-LX/LH) • GLC-ZX-SM (1000BASE-ZX)
Regulatory Compliance	
Safety	• CAN/CSA-C22.2 No. 60950-1 1st ed./UL 60950-1 1st ed. (Safety of Information Technology Equipment) • EN/IEC 60950-1 (Safety of Information Technology Equipment) • AS/NZS 60950.1 (Safety of Information Technology Equipment)
Electromagnetic emissions	• EN55022, Class B • CISPR 22, Class B • FCC 47CFR15, Class B • ICES-003, Class B • VCCI, Class B • AS/NZS CISPR 22, Class B • KN 22, Class B • IEC/EN61000-3-2 Power Line Harmonics • IEC/EN61000-3-3 Voltage Fluctuations and Flicker
Electromagnetic immunity	• IEC/EN61000-4-2 Electrostatic Discharge Immunity • IEC/EN61000-4-3 Radiated Immunity • IEC/EN61000-4-4 Electrical Fast Transient Immunity • IEC/EN61000-4-5 Surge • IEC/EN61000-4-6 Immunity to Conducted Disturbances • IEC/EN61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations

Description	Specification
ETSI/EN	• EN 300 386 Telecommunications Network Equipment (EMC) • EN55022 Information Technology Equipment (Emissions) • EN55024 Information Technology Equipment (Immunity) • EN61000-6-1 Generic Immunity Standard
Network Equipment Building Systems (NEBS): Level 3	Designed to meet requirements of: • GR-63-CORE, Issue 3, March 2006 • GR-1089-CORE, Issue 4, June 2006
Mechanical	• IEC 68-2-1, IEC 68-2-2, IEC 68-2-56: Operational temperature and humidity • IEC 68-2-27: Operating shock • IEC 68-2-64, IEC 68-2-6, IEC 68-2-47: Operating and non-operating vibration • IEC 68-2-32: Nonoperating freefall drop • IEC 68-2-40: Nonoperating altitude • IEC 68-2-27, IEC 68-2-32: Nonoperating mechanical shock • IEC 68-2-3: Nonoperating humidity • IEC 68-2-14, IEC 68-2-33: Nonoperating temperature shock
LEDs	• One power LED (green) • One status LED (green/yellow): solid green indicates the processor has booted and passed its diagnostics; LED blinks green on a protect card, yellow when in one of the booting states • Maintenance (yellow): indicates the line card can be removed • One upstream-enabled LED on each upstream port (green): upstream path is configured and able to pass traffic • One downstream-enabled LED on GE0 through GE5 (green): DEPI port is configured and able to pass traffic • LK/ACT0-LK/ACT5 LED (blinking green) indicates port enabled with DEPI traffic and LED (solid green) indicates port enabled with no DEPI traffic • Front panel display for licenses: First two digits signify downstream licenses and next two digits signify upstream licenses installed
Network Management Information	
Standard MIBs	• IF-MIB (RFC-2233) • IP-FORWARD-MIB (RFC-4292) • ENTITY-MIB (RFC-2737) • MIBII (RFC1213) • EtherLike-MIB (RFC-2665) • IGMP-MIB (RFC-2993) • RMON-MIB (RFC-1757) • IP-MIB • ENTITY-SENSOR-MIB
Expression MIBs	• Simple Network Management Protocol Version 2 Structure of Managed Information (SNMPv2 SMI) • SNMPv2-TC • SNMPv2-MIB • IANAifType-MIB
Simple Network Management Protocol Version 3 (SNMPv3) MIBs	• SNMP-FRAMEWORK-MIB (RFC-2571) • SNMP-MPD-MIB (RFC-2572) • SNMP-NOTIFICATION-MIB (RFC-2573) • SNMP-TARGET-MIB (RFC-2573) • SNMP-USM-MIB (RFC-2574) • SNMP-VACM-MIB (RFC-2575)

Description	Specification
DOCSIS and EuroDOCSIS MIB	• DOCS-IF-MIB (RFC 4546) • DOCS-CABLE-DEVICE-MIB (RFC-2669) • DOCS-BPI-PLUS-MIB (Rev 5) • DOCS-QOS-MIB (Rev 4) • DOCS-CABLE-DEVICE-TRAP-MIB • DOCS-SUBMGT-MIB (Rev 2) • DOCS-IF3-MIB • DOCS-QOS3-MIB • DOCS-DRF-MIB • DOCS-LOADBAL3-MIB • DOCS-DIAG-MIB • DOCS-SUBMGT3-MIB • CLAB-TOPO-MIB • DOCS-MCAST-AUTH-MIB • DOCS-MCAST-MIB • DOCS-SEC-MIB • DOCS-IETF-BPI2-MIB • DOCS-IETF-QOS-MIB
Cisco DOCSIS MIBs	• CISCO-DOCS-EXT-MIB • CISCO-DOCS-REMOTE-QUERY-MIB • CISCO-DOCS-QOS-EXT-MIB • CISCO-CABLE-SPECTRUM-MIB • CISCO-CABLE-AVAILABILITY-MIB • CISCO-DOCS-EXT-CAPABILITY-MIB • CISCO-CABLE-WIDEBAND-MIB
Cisco generic MIBs	• CISCO-SYSLOG-MIB • CISCO-SMI-MIB • CISCO-TC-MIB • CISCO-PRODUCTS-MIB • CISCO-FLASH-MIB • CISCO-CONFIG-MAN-MIB • CISCO-CONFIG-COPY-MIB • CISCO-MEMORY-POOL-MIB • CISCO-BULK-FILE-MIB • CISCO-SONET-MIB • CISCO-TCP-MIB • CISCO-RTTMON-MIB • CISCO-FTP-CLENT-MIB • CISCO-IPMROUTE-MIB • CISCO-QUEUE-MIB • CISCO-IMAGE-MIB • CISCO-ENVMON-MIB • CISCO-ENTITY-VENDORTYPE-OID-MIB • CISCO-PRODUCTS-MIB

Table 2. System Requirements

Item	Description
Power supplies	Dual AC or DC PEMs must be installed at all times
Hardware	Cisco PRE4 Dual Cisco UBR10-DTCC
Flash memory	At least 1 GB of flash memory is required for Cisco IOS Software
Software	Cisco IOS Software Release 12.2(33)SCE or later

Warranty Information

Warranty information is available on Cisco.com at the Product Warranties page.

Ordering Information

Table 3 provides ordering information. To place an order, visit the Cisco Ordering Home Page. To download software, visit the Cisco Software Center.

Table 3. Ordering Information

Product Number	Description
RF Line Cards and Cables	
UBR-MC3GX60V(=)	Cisco 3GX60V DOCSIS 3.0 Broadband Processing Engine; base hardware
SWLIC-MC3GX60V-DS	1 downstream license (minimum 16)
SWLIC-MC3GX60V-US	1 upstream license (minimum 16)
CABRFSW3G60QTIMF2	3G60 to RF Plant
CABRFSW3G60QTIMF2=	3G60 to RF Plant
CABRFSW3G60QTPMF2	RF Switch to HFC Plant
CABRFSW3G60QTPMF2=	RF Switch to HFC Plant
CABRFSW3G60QTIMM2	3G60 to RF Switch
CABRFSW3G60QTIMM2(=)	3G60 to RF Switch
eDelivery Upgrade Licenses	
L-MC3GX60V-SWLIC=	Container product number for upgrade licenses applicable to 3G60
L-MC3GX60V-DS	1 downstream license
L-MC3GX60V-US	1 upstream license
Cisco IOS Software	
Cisco IOS Software	Release 12.2(33)SCE or later
SU14MK9U-12233SCE(=)	Cisco ubr10k-PRE4 Series IOS DOCSIS 3DES LAWFUL INTERCEPT
SU14MK8U-12233SCE(=)	Cisco ubr10k-PRE4 Series IOS DOCSIS BPI LAWFUL INTERCEPT

A minimum configuration of 16 counts of both SWLIC-MC3GX60V-DS and SWLIC-MC3GX60V-US is required when purchasing Cisco uBR-MC3GX60V hardware.

Notes on Licenses

- If purchasing multiple line cards, each line card in the order must have the same number of upstream and downstream licenses. Upgrade licenses may be purchased in case customers need line cards with different licenses.
- eDelivery allows for electronic delivery of purchased license product activation key (PAK).
- Partial fulfillment is supported. If customers wish to purchase upgrade licenses for multiple hardware devices (for example, if they wish to upgrade all their Cisco uBR-MC3GX60V BREs), partial fulfillment allows all upgrade licenses to be generated using a single PAK if the customer desires. This can greatly increase operational ease of license upgrades.
- Partial fulfillment is supported with Cisco License Manager (CLM).

- Downstream and upstream upgrade licenses can be mixed and matched under a single L-MC3GX60V-SWLIC= PAK.
- Return materials authorization (RMA): Cisco Services will replace faulty hardware with hardware that has no downstream or upstream licenses. Customers will need to transfer licenses from the failed board to the new board to make it operational.

Cisco Services

Cisco Services make networks, applications, and the people who use them work better together.

Today, the network is a strategic platform in a world that demands better integration between people, information, and ideas. The network works better when services, together with products, create solutions aligned with business needs and opportunities.

The unique Cisco Lifecycle approach to services defines the requisite activities at each phase of the network lifecycle to help ensure service excellence. With a collaborative delivery methodology that joins the forces of Cisco, our skilled network of partners, and our customers, we achieve the best results.

For More Information

For more information about the Cisco uBR-MC3GX60V Broadband Processing Engine, visit http://www.cisco.com/en/US/products/hw/modules/ps4969/prod_literature.html.

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