

Cisco uBR-MC28C and Cisco uBR-MC28C-BNC DOCSIS Line Cards

Cable operators must ensure that their network maximizes both the number of subscribers and revenue per subscriber, as well as minimizes capital expenditures and operating costs. The network should also help sustain competitive advantage by enabling cable operators to deliver best-in-class quality for multiple communications services.

With the exponential growth in demand for high-speed Internet access, cable service providers—including local cable operators (LCOs), multiple system operators (MSOs), and alternate broadband service providers—have been looking for solutions to provide broadband data and voice services to businesses and homes. Broadband data and voice services are particularly appealing to cable operators because these capabilities enable new, revenue-generating services such as high-speed, always-on Internet connectivity, Internet Protocol (IP) telephone service, entertainment on demand, and virtual private network (VPN) connectivity.

Deploying new data, voice, and video services also means cable operators must be able to scale network bandwidth and support large numbers of subscribers efficiently and cost effectively. In particular, Cable Modem Termination System (CMTS) equipment in a headend or hub must offer high port density and flexible configuration for delivering different service mixes.

The Cisco uBR-MC28C and Cisco uBR-MC28C-BNC Data-over-Cable Service Interface Specifications (DOCSIS) line cards add scalability to the Cisco uBR7246VXR and Cisco uBR7223 Universal Broadband Routers in a Radio Frequency (RF) line card configured with two downstream ports and eight upstream ports. By deploying the Cisco uBR-MC28C or Cisco uBR-MC28C-BNC line card, cable operators can offer multiple services for greater revenue, control the costs of network growth, and protect their investments in Cisco products for cable networks. The Cisco uBR-MC28C and Cisco uBR-MC28C-BNC are ideal for cable operators that need additional port density in the CMTS to meet increasing bandwidth requirements.

The Cisco uBR-MC28C and Cisco uBR-MC28C-BNC card support four primary applications:

- Flexible delivery of voice and data services from a single CMTS
- High-penetration data services
- DOCSIS-based data services delivered to set-top boxes where downstream bandwidth is at a premium
- High-speed Internet and intranet business service with symmetrical data rates

Flexible Voice and Data Services from a Single CMTS

Based on their success with high-speed data services, cable operators now plan to offer voice telephony services over their IP networks. Primary-line and secondary-line services that leverage the emerging DOCSIS and PacketCable™ standards offer a new revenue source to operators.

Voice and data services have their own unique traffic patterns, quality-of-service (QoS) requirements, bandwidth needs, and other characteristics. Some cable operators may choose to provision each service separately but on a common platform for software, provisioning, network management, and interconnection to the network backbone. Other operators will attempt to integrate all service offerings, but also on a common hardware and software platform. To support a variety of market scenarios, the CMTS must deliver the bandwidth required for each service in the upstream and downstream channels. These scenarios include combined data and voice service to every customer and a mixed scenario where some customers subscribe to data service, some to voice service, and some to data-plus-voice service.

Because both voice-only and data-only services are primarily downstream-intensive, downstream bandwidth is at a premium in combined voice and data services. The Cisco uBR-MC28C and Cisco uBR-MC28C-BNC line cards provide double the downstream port capacity of a Cisco uBR-MC16C line card to accommodate these services.

Adding voice to the service mix also requires a different configuration of upstream and downstream channels than that used to deliver data and video services. To ensure acceptable call quality, voice services must receive symmetrical upstream and downstream bandwidth, typically a constant 8 kbps for each call.

By supporting dual 1 x 4 downstream-to-upstream port ratios, the Cisco uBR-MC28C and Cisco uBR-MC28C-BNC cards deliver the capacity and symmetry necessary for high-quality delivery of voice-over-IP (VoIP) services. Voice-only, data-only, and combined voice and data services can be delivered to different subscribers on the same card for more efficient use of a Cisco uBR7246VXR or Cisco uBR7223 and the associated headend space, power, cooling, and management resources (Figure 1). When the Cisco uBR-MC28C or Cisco uBR-MC28C-BNC line card is deployed in a Cisco uBR7246VXR chassis, cable operators gain a CMTS with the high port density, processing power, and network clock option to economically support voice and data services separately or as an integrated offering.

Also important for the quality of voice calls is improving carrier-to-noise ratios on the channel. By using multiple upstream channels to serve smaller combining ratios of neighborhood fiber nodes, the Cisco uBR-MC28C and Cisco uBR-MC28C-BNC cards help operators optimize the quality of the return path signal and improve call quality.

Figure 1 The Cisco uBR-MC28C and Cisco uBR-MC28C-BNC Line Cards Give Cable Operators the Channel Capacity and Flexibility to Offer Subscribers a Mix of Voice-Only, Data-Only, and Voice-plus-Data Services

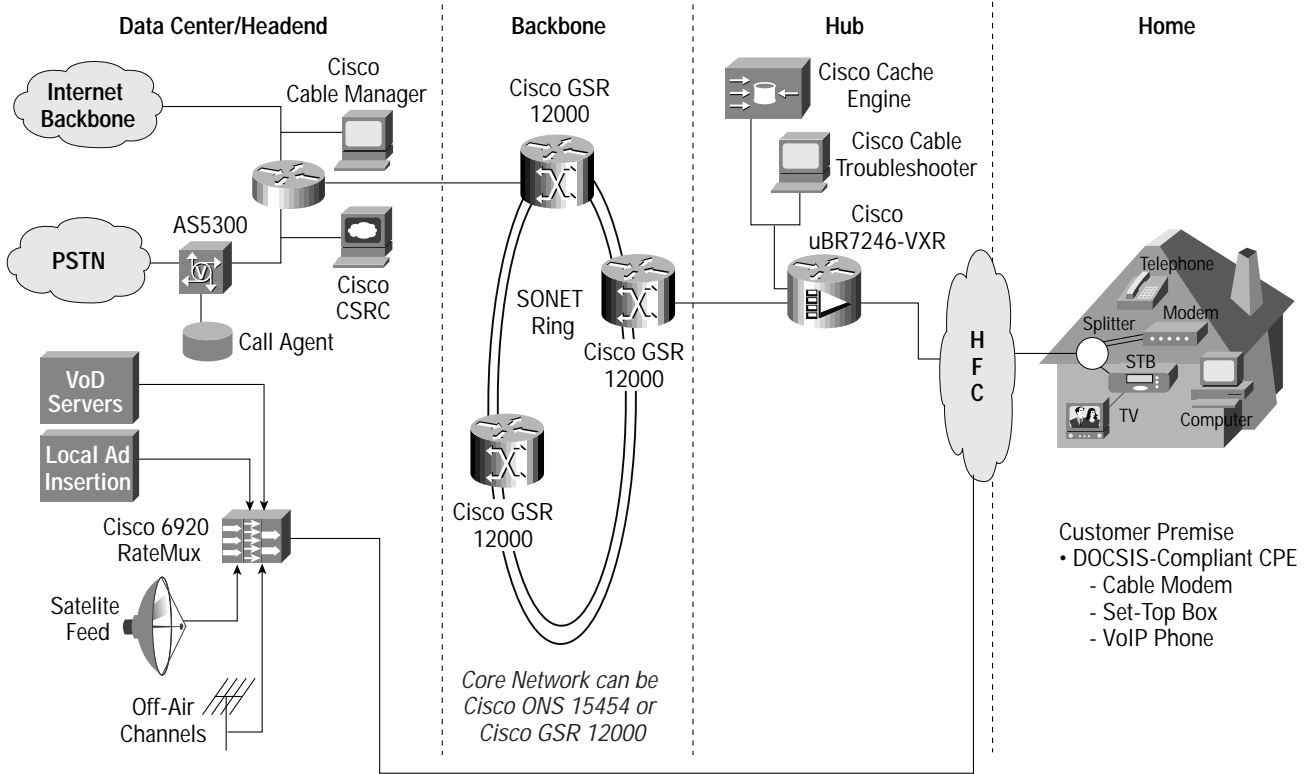


Table 1 shows the key features and benefits of delivering combined voice and data services with the Cisco uBR-MC28C and Cisco uBR-MC28C-BNC card.

Table 1 Key Features and Benefits for Flexible Voice and Data Services

Feature	Benefit
Eight Upstream Ports	Meets higher bandwidth requirements; improves return path signal quality when used with lower fiber-node combining ratios
Greater Port Density	Reduces number of chassis needed and minimizes operational costs for power and cooling; minimizes real estate use in headend or hub
DOCSIS 1.1-Based (Software Upgradable)	Supports advanced functionality and allows DOCSIS 1.0 and DOCSIS 1.1 modems and set-top boxes to coexist in the same upstream channel
Clock Card Support	Seamless integration with current VoIP deployments that support G.711 applications such as fax and analog modem

High-Penetration Data Services

The outlook for the cable market is better than ever as industry analysts expect the market to enjoy attractive growth rates. Unprecedented use of the Internet and needs for high-bandwidth applications have created an exploding demand for broadband, two-way services. The data segment of the two-way services market is projected to experience a 10-year compound annual growth rate (CAGR) of approximately 42 percent.

As market penetration rates for data-only services reach higher levels, cable operators need a CMTS platform that will scale economically with greater port density and downstream bandwidth. With two standard downstream ports providing dual 1:4 port ratios in a single line card slot, the Cisco uBR-MC28C and Cisco uBR-MC28C-BNC cards enable cable operators to deploy data services in a variety of ways. For example, the operator can use two frequencies for serving a larger number of data customers or can segment value (regular) and premium subscribers by assigning them to separate frequencies (Figure 2).

Figure 2 By Using Separate Frequencies on the Cisco uBR-MC28C or Cisco uBR-MC28C-BNC Card, Cable Operators Can Segment Customers with Premium and Value-Added Services

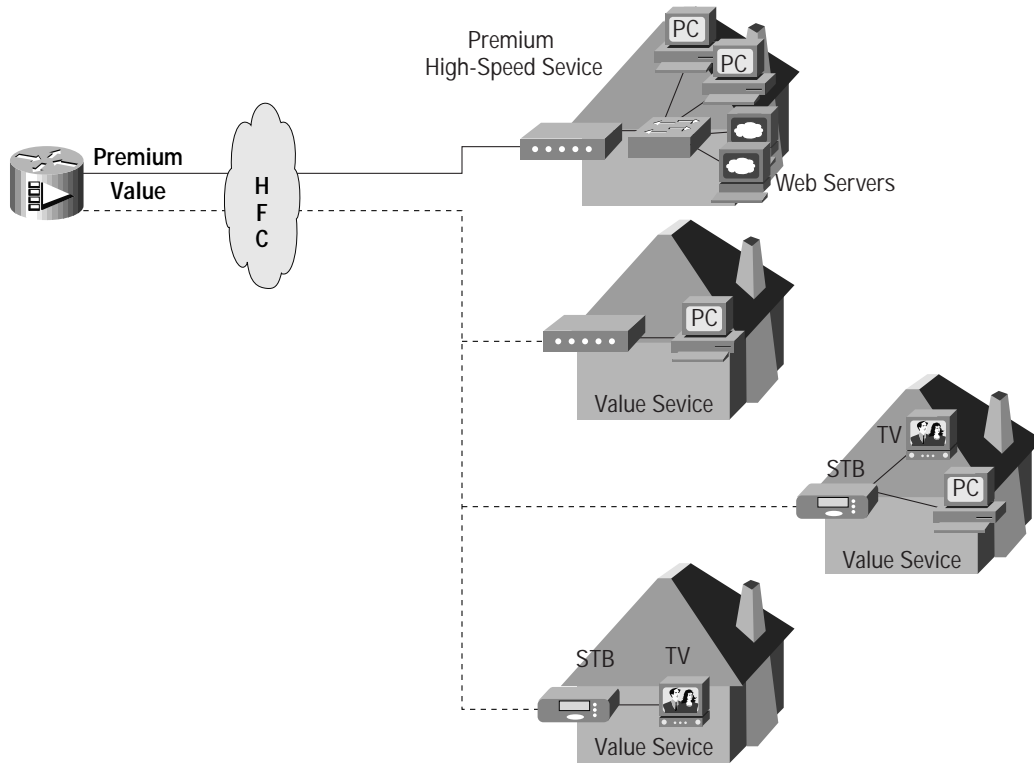


Table 2 shows the key features and benefits of using the Cisco uBR-MC28C and Cisco uBR-MC28C-BNC card in a high-penetration data market.

Table 2 Key Features and Benefits for High-Penetration Data

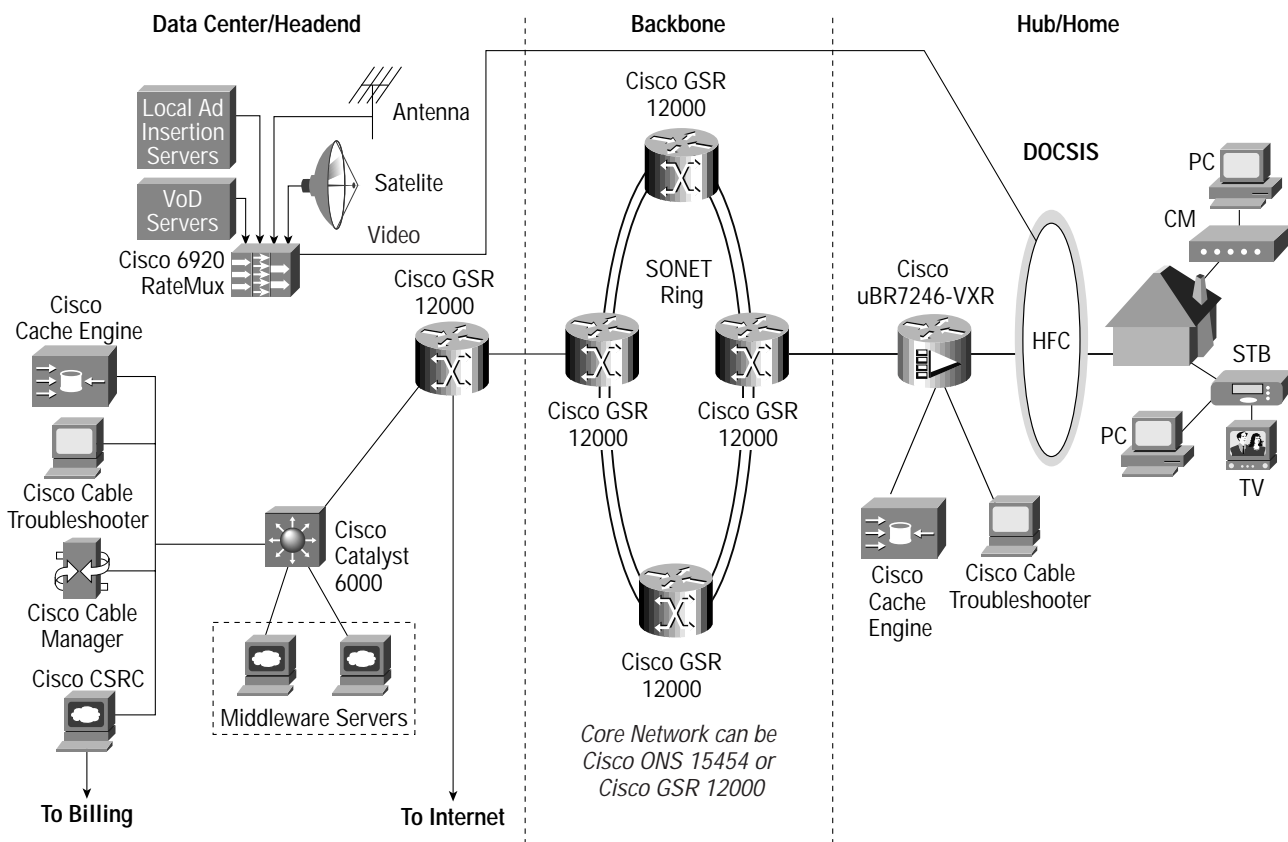
Feature	Benefit
Two Downstream Ports	Expands capacity of Cisco uBR7246VXR and Cisco uBR7223 to meet growing bandwidth needs; postpones or eliminates need to purchase additional systems to meet increased demand
Operable in Cisco uBR7246 VXR and Cisco uBR7223 Products	Investment protection; expands port densities in existing deployments of these units
Dual 1x4 Port Configuration	Separate DOCSIS MAC domains present opportunities for segmenting premium subscribers
Compatible with existing Cisco uBR-MC11C, MC12C, MC14C, MC16C, MC16S, and MC16E modem cards	Ensured interoperability; choose from a wide range of port density options to meet varying market penetration rates and service deployment strategies

Data Services to Set-Top Boxes

Within the realm of broadband entertainment solutions, the digital set-top infrastructure enables cable service providers to deliver a new generation of interactive data and video services to enthusiastic customers. Many MSOs are now beginning to deploy digital set-top boxes and, in the future, many if not all of these boxes will contain a DOCSIS modem to provide Internet connectivity through the television.

Infrastructure solutions for digital set-top boxes extend the current cable infrastructure to support expanded service offerings and increasing revenue streams. Building on the existing equipment within the cable network, components in the digital set-top infrastructure solution enable delivery of interactive program content to subscriber homes (Figure 3). An impressive breadth of compelling data and video applications can come together through the set-top box, such as enhanced TV, targeted advertising, electronic commerce, interactive video and gaming, tailored Web browsing, e-mail, and chat.

Figure 3 The Cisco uBR-MC28C and Cisco uBR-MC28C-BNC Support Deployment of Digital Set-Top Boxes to Subscriber Homes for Delivering Interactive Content and Services



Data-only services to set-top boxes require large amounts of downstream bandwidth, but very little upstream bandwidth. The scalability of the Cisco uBR-MC28C and the Cisco uBR-MC28C-BNC line cards enable the same broadband infrastructure to accommodate both standard traffic volumes and high traffic volumes associated with peak demand periods. Through dual RF domains on a single line card, the Cisco uBR-MC28C and Cisco uBR-MC28C-BNC make it easy for cable service providers to add increasing numbers of STB subscribers without requiring additional CMTS units or expanding the network configuration.

In addition, the assured interoperability of existing line cards with the Cisco uBR-MC28C and Cisco uBR-MC28C-BNC line cards within a Cisco uBR7246VXR or Cisco uBR7223 chassis lowers the cost of ownership and extends an operator's current network infrastructure. Key features and benefits of the line cards are presented in Table 3.

Table 3 Key Features and Benefits for Data Services to Set-Top Boxes

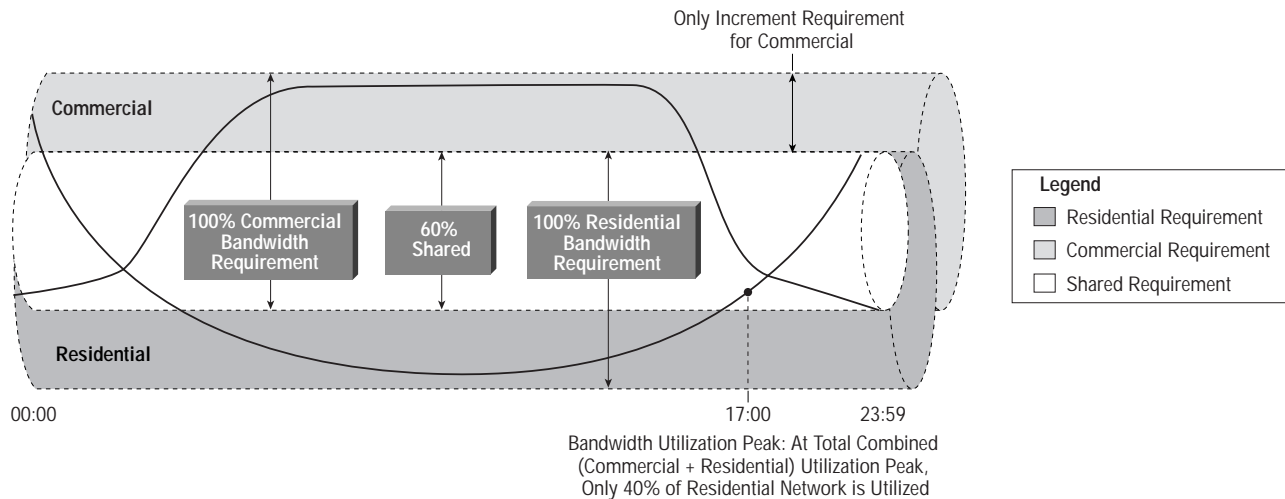
Feature	Benefit
Two Downstream Ports	Expands capacity of Cisco uBR7246VXR and Cisco uBR7223 to meet growing bandwidth needs; postpone or eliminate need to purchase additional systems to meet increased demands
DOCSIS 1.1-Based (Software Upgradable)	Supports advanced functionality and allows modems and set-top boxes compliant with either DOCSIS 1.0 or DOCSIS 1.1 to coexist in the same upstream channel
Compatible with Existing Cisco uBR-MC11C, MC12C, MC14C, MC16C, MC16S, and MC16E modem cards	Ensured interoperability; choose from a wide range of port density options to meet varying market penetration rates and service deployment strategies
Operable in Cisco uBR7246VXR and Cisco uBR7223 Products	Investment protection; expands port densities in existing deployments of these units
Supports Cisco NetFlow Switching	Customizes statistics collection for use by many billing applications
Supports all DOCSIS-required MIBs	Enables DOCSIS network-management capabilities

Symmetrical Internet and Intranet Service for Business Customers

Data services that replace the leased lines offered by incumbent local exchange carriers (ILECs), competitive local exchange carriers (CLECs), and new market entrants are an important offering for cable operators to reach the highly attractive business market. Yet the data traffic generated by businesses has different characteristics than the traffic demands of residential subscribers. Business applications typically require symmetrical upstream and downstream bandwidth with higher traffic volumes than residential customers. All business customers are on line at the same time during the business day, allowing for only limited oversubscription of the bandwidth available in a CMTS channel.

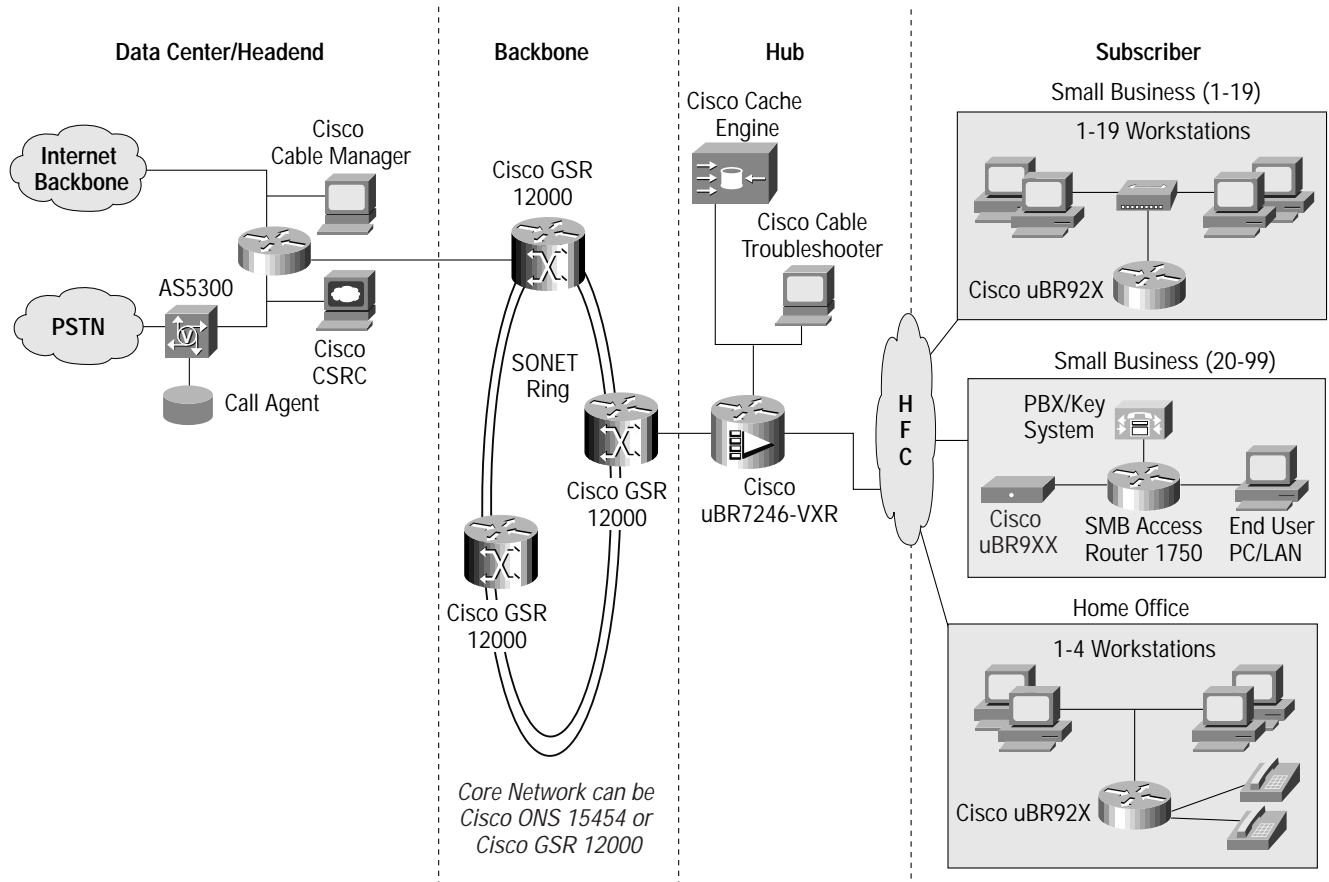
With the Cisco uBR-MC28C and the Cisco uBR-MC28C-BNC card, cable operators can deliver the bandwidth capacity and symmetry necessary to support Internet and intranet communications for business customers. In many cases, this support can be delivered on the same CMTS as data services for residential customers, who typically use cable services at times outside the normal business day. Residences have their peak usage during the night, while businesses have their peak usage during the day (Figure 4).

Figure 4 Traffic Patterns for Commercial and Residential Customers Show Different Periods of Peak Network Usage throughout the Day



These complementary use patterns allow the commercial service to leverage much of the residential bandwidth to the Internet. The MSO does not need to purchase separate Internet capacity and can leverage a common network infrastructure for both business and residential customers (Figure 5).

Figure 5 Because Not all Customers Access Broadband Services at the Same Time, Cable Operators can Use the Same Network Infrastructure to Serve the Complementary Traffic Patterns of Business and Residential Customers



Network reliability is critical for retaining business customers. The shared nature of the cable plant means that problems in one area of the network can have a significant impact on other areas. The Cisco uBR7200 Series products as well as the Cisco Cable Manager and Cisco Cable Troubleshooter applications enable dynamic network monitoring, problem isolation in both the RF plant and the backbone network and proactive network management. In addition, all Cisco equipment components can be replaced while the equipment remains online to minimize disruption of service to customers.

The Cisco uBR-MC28C and Cisco uBR-MC28C-BNC cards offer several features and benefits for serving business customers with symmetrical data services, as shown in Table 4.

Table 4 Key Features and Benefits for Business Data Services

Feature	Benefit
Dual 1x4 Port Configuration	Offers symmetrical bandwidth opportunities for advanced services such as VoIP and small/medium-sized business Internet and intranet access
Supports Cisco NetFlow Switching	Customizes statistics collection for use by many billing applications
Supported by Cisco Cable Manager and Cisco Cable Troubleshooter	Supports proactive network management and determination of cable plant problem areas for increased equipment reliability and availability
Hot-Swappable via Online Insertion and Removal (OIR); Rapid Initialization during OIR	Ease of maintenance and minimized impact to the rest of the system

For more information on the Cisco uBR-MC28C and Cisco uBR-MC28C-BNC DOCSIS line cards, visit <http://www.cisco.com/cable>.



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

European Headquarters
Cisco Systems Europe
11, Rue Camille Desmoulins
92782 Issy Les Moulineaux
Cedex 9
France
www-europe.cisco.com
Tel: 33 1 58 04 60 00
Fax: 33 1 58 04 61 00

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

Asia Pacific Headquarters
Cisco Systems Australia, Pty., Ltd
Level 17, 99 Walker Street
North Sydney
NSW 2059 Australia
www.cisco.com
Tel: +61 2 8448 7100
Fax: +61 2 9957 4350

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