



CISCO BROADBAND SOLUTIONS

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As the worldwide leader in IP networking, Cisco Systems® offers the solutions and expertise to help service providers rapidly roll out residential and commercial “triple play” broadband services. From the networked home to the network core, across all access technologies, Cisco® network intelligence helps enable customized, secure, scalable broadband services that reduce churn, increase revenue, and enhance profitability.

BUILDING A FOUNDATION FOR TRIPLE PLAY BROADBAND

Worldwide broadband adoption has grown exponentially over the past several years. With rising usage has come demand for more bandwidth, more personalization, and data, voice, and video services—the triple play—to support new applications. These new demands present compelling business opportunities for service providers. The challenge is to deploy and scale these new services with the reliability and security customers expect while managing costs and growing profitability.

The answer is to take a strategic approach to enabling converged voice, video, and data services. By deploying intelligent, highly integrated technologies throughout the network, service providers can expand their offerings easily and cost effectively, better manage and control traffic across the network, and accelerate the delivery of triple play services.

The Cisco Advantage

Internet Protocol (IP) is the key to delivering secure, scalable, value-added triple play services. As the worldwide leader in IP networking, Cisco Systems is uniquely positioned to deliver proven IP broadband solutions that help service providers expand offerings quickly and profitably—over DSL, cable, Ethernet, Wi-Fi, or any other broadband architecture.

Cisco has extensive experience working with service providers worldwide to deliver voice, video, and data over IP networks. Through years of hands-on experience in many markets, Cisco has developed the most comprehensive portfolio of broadband solutions in the industry. From the networked home to the network core, across all broadband access technologies, Cisco can provide the intelligence, security, scalability, and performance to effectively provision and manage today’s rich broadband services.

Deploying a Service-Driven Broadband Network

To deliver the customized services that customers demand, service providers are changing assumptions about how to design and deploy networks. In the past, service providers focused first on building a network infrastructure, then on delivering the services that infrastructure could support. This transport-driven approach is being replaced by a business-driven approach. Today, the services that customers need increasingly influence the design of the broadband network infrastructure. To effectively meet customers' needs, service providers must have solutions that can deliver multiple services over a common infrastructure. Using a single, common infrastructure to support a variety of services also greatly improves return on investment (ROI) in the broadband network.

BUILDING A MORE INTELLIGENT BROADBAND NETWORK

Cisco Broadband Services Solutions reflect Cisco expertise across the entire service network and a strategic understanding of how all the components of a broadband service offering interact. Cisco solutions are designed to interoperate and support intelligent, IP services such as quality of service (QoS) across the network. As a result, service providers employing Cisco broadband solutions—whether in the network core or in the customer home—can more easily design, provision, and manage service-driven triple play solutions.

Supporting an extensive range of platforms, Cisco IOS® Software provides the industry's most diverse set of intelligent IP services, helping service providers accelerate deployments, manage network resources, deliver full-service offerings, and enhance average revenue per user (ARPU). Intelligent Cisco IP services provide a dynamic, highly flexible foundation for supporting QoS, customization, integration, and mobility to offer an optimized quality of subscriber experience (QoE):

- *QoS*—To address the latest high-demand, time-sensitive media services, service providers must have a robust QoS strategy. QoS policies identify and prioritize different types of network traffic to meet strict delivery and quality requirements of packets. For example, a lag of a few seconds may be acceptable for basic data services such as e-mail, but can seriously degrade a real-time voice or gaming application. Cisco networking components are optimized for QoS, providing consistent QoS policies end to end.
- *Customization*—Cisco IOS Software offers service providers greater freedom to set policies for network traffic, facilitating a broad range of user-specific, customized service offerings. Using Cisco Service Selection Gateway (SSG) technology, service providers can provision, monitor, and bill for multiple simultaneous services in a single subscriber session.
- *Integration with any broadband architecture*—Cisco network solutions are standards based and designed to deliver rich features and intelligence—independent of network architecture, transport technology, or access protocol. Instead of asking service providers to adapt to new technologies, Cisco solutions can accommodate new business or regulatory requirements, expanded service offerings, and a growing customer base.
- *Mobility*—Cisco network solutions provide built-in intelligence to support mobile users and help enable providers to extend QoS, security, and other services over wireless networks.

Policy Management

Policy management allows operators to establish subscriber and service parameters that dynamically provide access to a choice of service levels, as well as a mechanism to better manage and bill for these services. Policy management services are a key element of Cisco Broadband Services Solutions. They support dynamic, policy-based network control, helping service providers to deliver highly customized business and consumer broadband services while reducing total cost of network ownership. Policies can be created to account for a wide range of user and service attributes, such as user identity, user location, user service level, time of day, available network resources, or network-use restrictions.

Cisco policy management solutions provide an open, extensible platform for end-to-end service management across multiple network components. With the extraordinary flexibility afforded by Cisco policy management solution, service providers have the granular control to deploy complex, policy-enabled network services that reduce their costs, generate new revenues, and increase ROI in the broadband network.

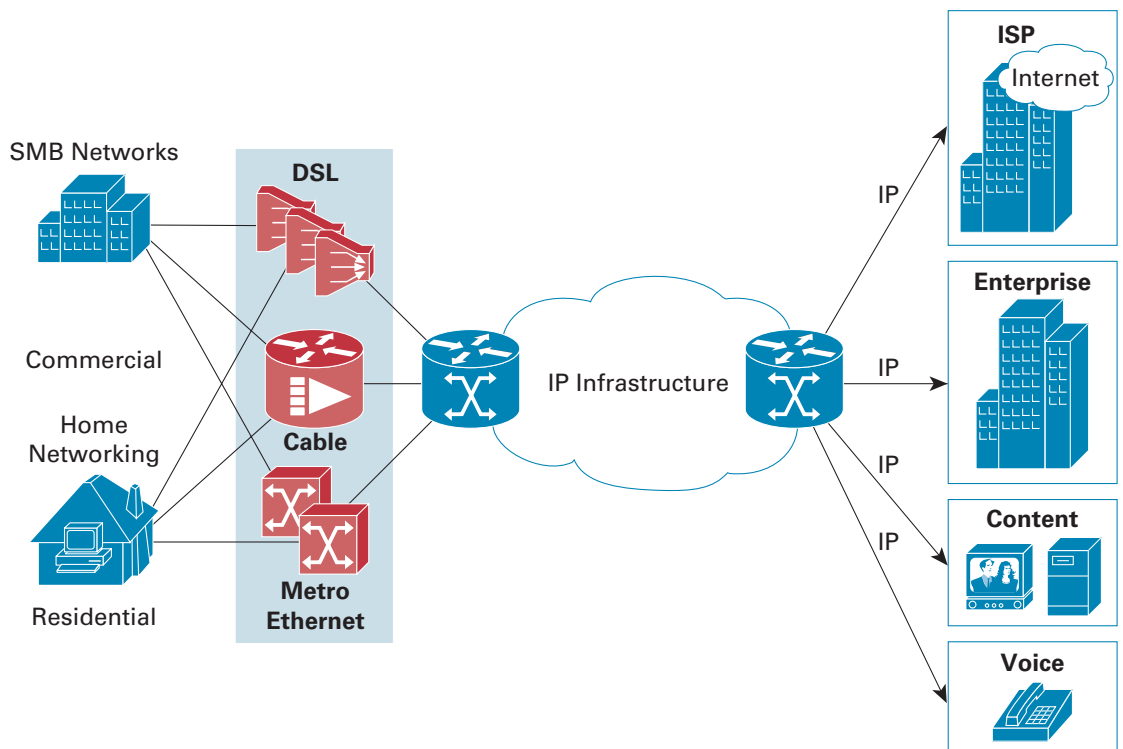
Service Control

Networks must be able to not only differentiate between types of IP traffic but must have the ability to monitor and classify traffic at the application and packet level as well—a function called service control. Cisco Service Control solutions overlay intelligence and application-level control on existing IP transport networks, helping service providers analyze, control, and meter application- and content-based services. Only the Cisco Service Control stateful deep packet inspection at Layer 7 permits providers to identify content running on any protocol, provide detailed analysis and control of complex, content-based applications, and prioritize sessions in real time. Cisco Service Control technology is transport- and content-agnostic, fully extensible, fully programmable, and easily integrates into the existing fabric of the network. The result is the ability to maximize the use of network resources, deliver customized service levels, and optimize the subscriber experience.

CISCO BROADBAND SOLUTION PORTFOLIO

Cisco offers a comprehensive portfolio of industry-leading solutions for broadband providers that meet the needs of both residential and commercial subscribers. Cisco solutions include DSL, cable, and Metro Ethernet offerings, as well as Linksys® solutions for home networks and small businesses. Regardless of the access technology, Cisco offers secure, intelligent, scalable broadband solutions (Figure 1).

Figure 1 Overall Broadband Network



DSL Broadband Aggregation Solutions

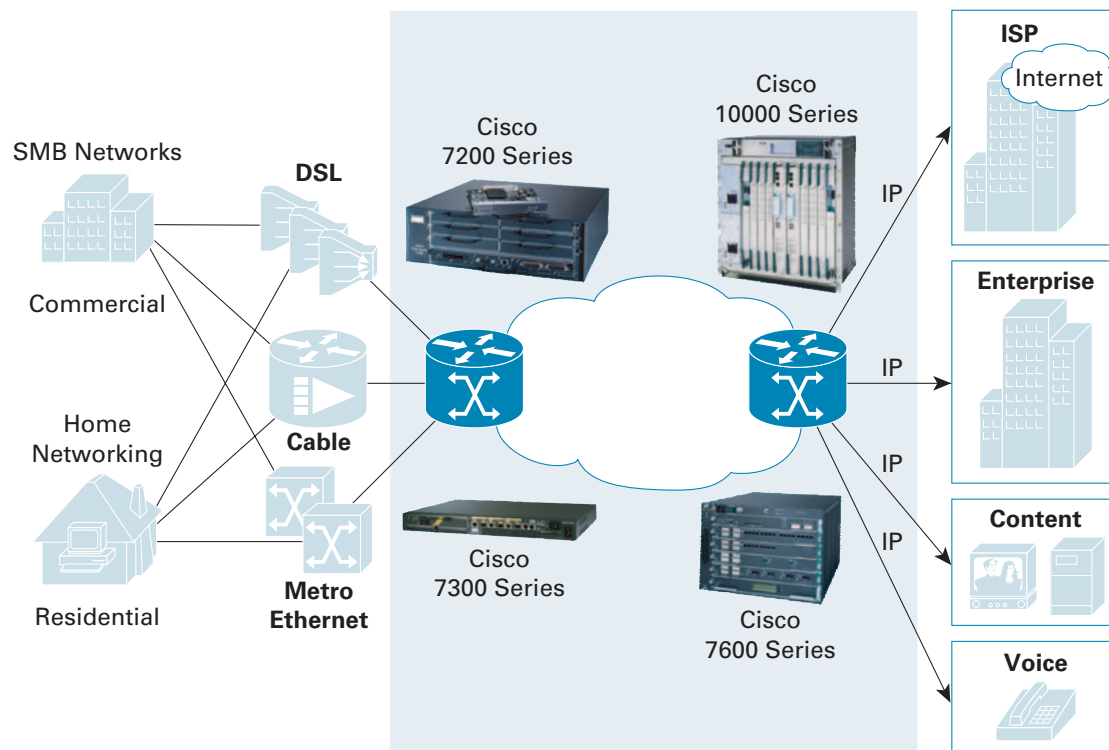
Cisco offers a broad range of xDSL broadband aggregation solutions sized to meet a variety of customer and network requirements (Figure 2). These solutions support any combination of broadband services, including Point-to-Point Protocol Termination and Aggregation (PTA), Layer 2 Tunneling Protocol network servers (LNSs), Layer 2 Tunneling Protocol access concentrators (LACs), routed bridge encapsulation (RBE), and Multiprotocol Label Switching (MPLS) VPNs for remote access. Cisco is also compliant with the DSL Forum TR-059 standard for QoS-enabled broadband services.

Cisco broadband aggregation solutions for DSL offer many unique advantages. Cisco DSL solutions provide four times the virtual switching capacity of most competing platforms, facilitating lower per-port subscriber costs. The Cisco DSL portfolio also includes a broad range of options, allowing service providers to use a combination of solutions depending on customer needs and to easily integrate new equipment as the subscriber base grows. All Cisco DSL solutions also incorporate advanced IP intelligence and proven Cisco resiliency, security, and high availability.

Cisco Router B-RAS Portfolio for DSL Aggregation

- *Cisco 10000 Series Router*—The industry's only edge router that dramatically reduces the cost of broadband subscriber services with line-rate delivery of 60,000 sessions tightly coupled with QoS and other service-enabling features. This unique combination improves operational efficiency and increases revenue potential for broadband subscriber services. The Cisco 10000 Series delivers consistent, high-performance features for carriers deploying broadband services. Built upon proven high availability and innovative, adaptive network processing technology, the DSL Forum TR-059-compliant Cisco 10000 Series delivers the highest total session capacity and robust provisioning capabilities.
- *Cisco 7600 Series Router*—The industry's first router to offer integrated, high-density Ethernet switching, carrier-class IP/MPLS routing, and 10-Gbps interfaces coupled with robust broadband aggregation, allowing providers to deploy revenue-generating services. The Cisco 7600 Series helps carriers to improve operational efficiency at the network edge while maximizing ROI. The Cisco Multiprocessor WAN Applications Module for the Cisco 7600 Series powers up to 32,000 LNS

Figure 2 DSL Broadband Aggregation Solutions



sessions per module for first-of-its-kind, intelligent Ethernet subscriber services.

- **Cisco 7301 Router**—The industry’s high-performance, single-rack-unit router with 1 million packets per second (mpps) processing. With three built-in Gigabit Ethernet interfaces and one slot for a port adapter, the Cisco 7301 is highly flexible for a variety of applications. For broadband aggregation, the Cisco 7301 supports up to 16,000 subscribers sessions, making it ideal for “pay-as-you-grow” broadband deployment models.
- **Cisco 7200 Series Router**—The most flexible and widely deployed platform in the industry delivers an unparalleled breadth of IP services at up to 1 mpps along with extensive WAN and LAN connectivity options in a modular and compact form factor, supporting up to 16,000 simultaneous broadband subscriber sessions.

Broadband Solutions for Cable

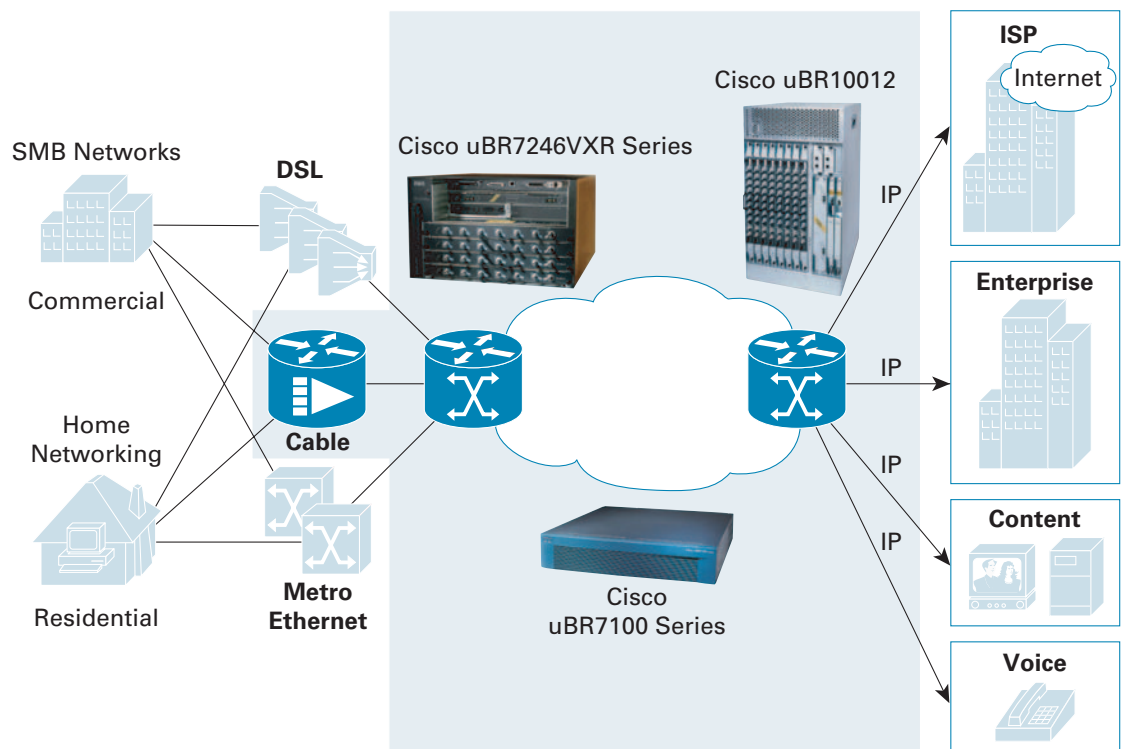
With more than 400,000 DOCSIS® upstream ports deployed and a complete portfolio of advanced IP solutions, Cisco has the technology and expertise to help cable operators build intelligent, large-scale, multiservice cable IP networks. Using the rich set of

field-proven DOCSIS-qualified Cisco products and solutions, cable operators can deploy new solutions and services on a converged cable IP infrastructure with confidence (Figure 3).

Cisco offers the industry’s broadest, most complete line of standards-based CMTS solutions, helping enable an unprecedented array of capabilities to support differentiated services for large numbers of subscribers. The Cisco uBR Family of universal broadband routers offer full Layer 3 IP intelligence with rich edge capabilities, including content awareness, traffic monitoring and control, advanced bandwidth management, network security, and QoS services.

Cisco was a pioneer in cable broadband and is the global leader in cable broadband solutions, setting the bar for scalability, performance, resilience, and investment protection. Cisco offers DOCSIS-based solutions and is leading the way in DOCSIS Set-top Gateway and Next Gen architectures in support of advanced broadband services such as VoIP, video telephony, gaming, and bandwidth on demand.

Figure 3 Broadband Solutions for Cable



Cisco CMTS Portfolio

- *Cisco uBR10012 Universal Broadband Router*—A new class of CMTS that manages the volume, capacity, and complexity of large cable headends or distribution hubs typically 1,000 to 64,000 subscribers. It combines the revenue-generating features and stability of the market-leading Cisco uBR7200 Series Universal Broadband Router with an architecture that is optimized for aggregation and virtually limitless future growth.
- *Cisco uBR7246VXR Universal Broadband Router*—A member of the Cisco uBR7200 Series, the leading platform in the industry, this solution combines the functionality of a CMTS with a Layer 3 router. The Cisco uBR7246VXR typically supports 1,000 to 10,000 subscribers. The Cisco uBR7246VXR provides a single, multiservice, scalable platform that gives cable operators and Internet service providers (ISPs) the ability to deliver IP data, voice, and commercial services to DOCSIS- or EuroDOCSIS-compliant cable modems and set-top boxes.
- *Cisco uBR7100 Series Universal Broadband Router*—Offers a standards-based, cost-effective, Layer 3 CMTS in a compact 2RU chassis designed for small cable deployments, typically 100 to 2000 subscribers. The Cisco uBR7100 Series is a compact, easy-to-use product for hotels, universities, and other multi-dwelling unit applications. The product further supports PPPoE bridging operations.
- *Cisco uBR 3x10 RF Switch*—As part of the Cisco high availability CMTS solution set, the Cisco uBR 3x10 RF Switch works with the Cisco uBR10012 and uBR7246VXR to help cable operators achieve carrier-class system availability, minimize service disruptions, and simplify operations. With a Cisco communications-grade CMTS, the Cisco uBR 3x10 RF Switch delivers unprecedented levels of availability, scalability, and flexibility for deployment of advanced, revenue-generating services.

Metro Ethernet Solutions

Metro Ethernet networks are enabling service providers to offer a wide range of new connectivity and value-added services, including Layer 2 and Layer 3 VPNs, storage networking, videoconferencing, and hosted IP telephony over metropolitan-area networks and wide-area networks.

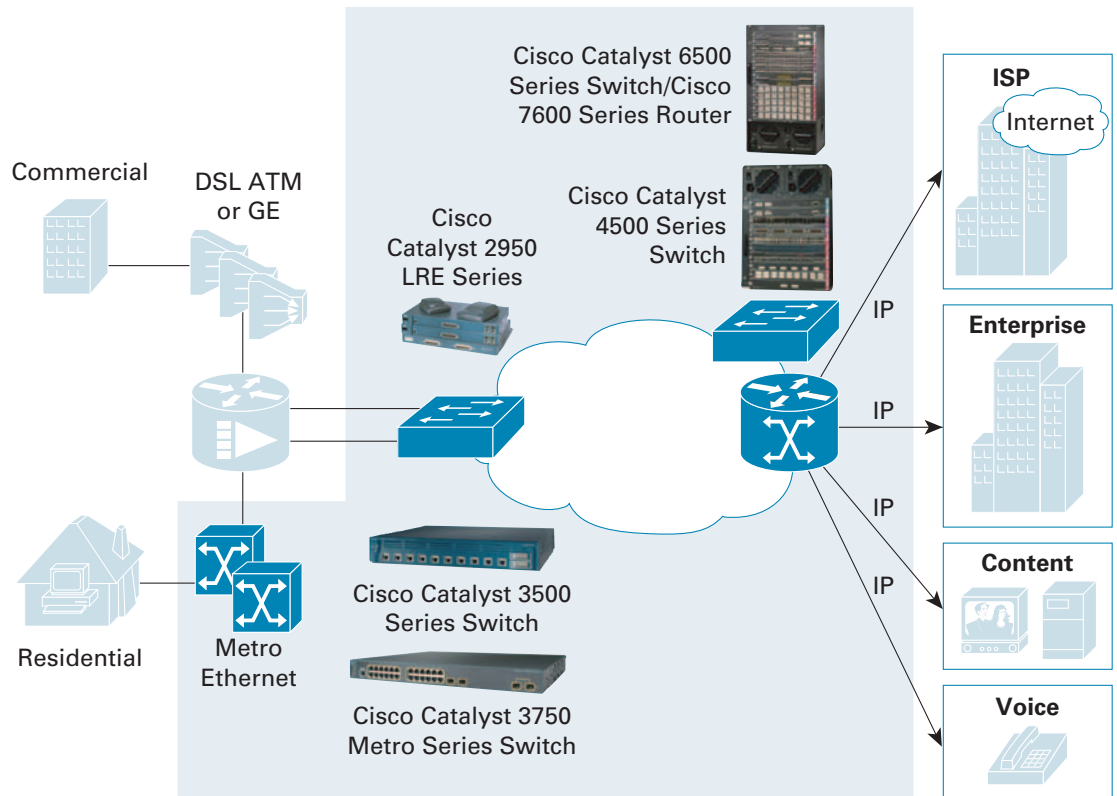
Cisco Metro Ethernet solutions provide a flexible, cost-effective infrastructure for expanding service offerings and delivering triple play applications in a format that enterprise and small-business

customers prefer (Figure 4). Using the solutions' advanced network security and rich QoS capabilities, service providers can offer their customers compelling, customized service packages. Cisco Metro Ethernet solutions are also designed to closely integrate and interoperate with a provider's existing transport infrastructure, providing a relatively low-cost option for adding new revenue-enhancing services.

Cisco Metro Ethernet Portfolio

- *Cisco 7600 Series Router*—The industry's first router to offer integrated, high-density Ethernet switching, carrier-class IP/MPLS routing, and 10-Gbps interfaces coupled with robust broadband aggregation, allowing providers to deploy revenue-generating services. The Cisco 7600 Series helps carriers to improve operational efficiency at the network edge while maximizing ROI.
- *Cisco Catalyst® 6500 Series Switch*—Delivers secure, converged services from the wiring closet to the core network to the data center to the WAN edge.
- *Cisco Catalyst 4500 Series Switch*—Extends resilience and control from the backbone network to the network edge with intelligent network services that include advanced QoS, scalable performance, comprehensive security, and simple manageability.
- *Cisco Catalyst 3750 Metro Series Switch*—These customer-located switches bring greater intelligence for Metro Ethernet access, enabling the delivery of differentiated Metro Ethernet services.
- *Cisco Catalyst 3550 Series Switch*—A line of enterprise-class, stackable multilayer switches with Fast Ethernet and Gigabit Ethernet configurations that provide high availability, security, and control to enhance the operation of the enterprise network.
- *Cisco Catalyst 2950 LRE Series Switch*—A line of fixed-configuration stackable and standalone devices that provide wire-speed Fast Ethernet and Gigabit Ethernet connectivity for small and medium-sized businesses (SMBs), branch-office networks, and metro access applications. The Cisco Catalyst 2950 Series is the most affordable switching product line from Cisco, facilitating basic and intelligent services at the network or metro access edge.

Figure 4 Metro Ethernet Solutions



Home Networking and Small Business Solutions

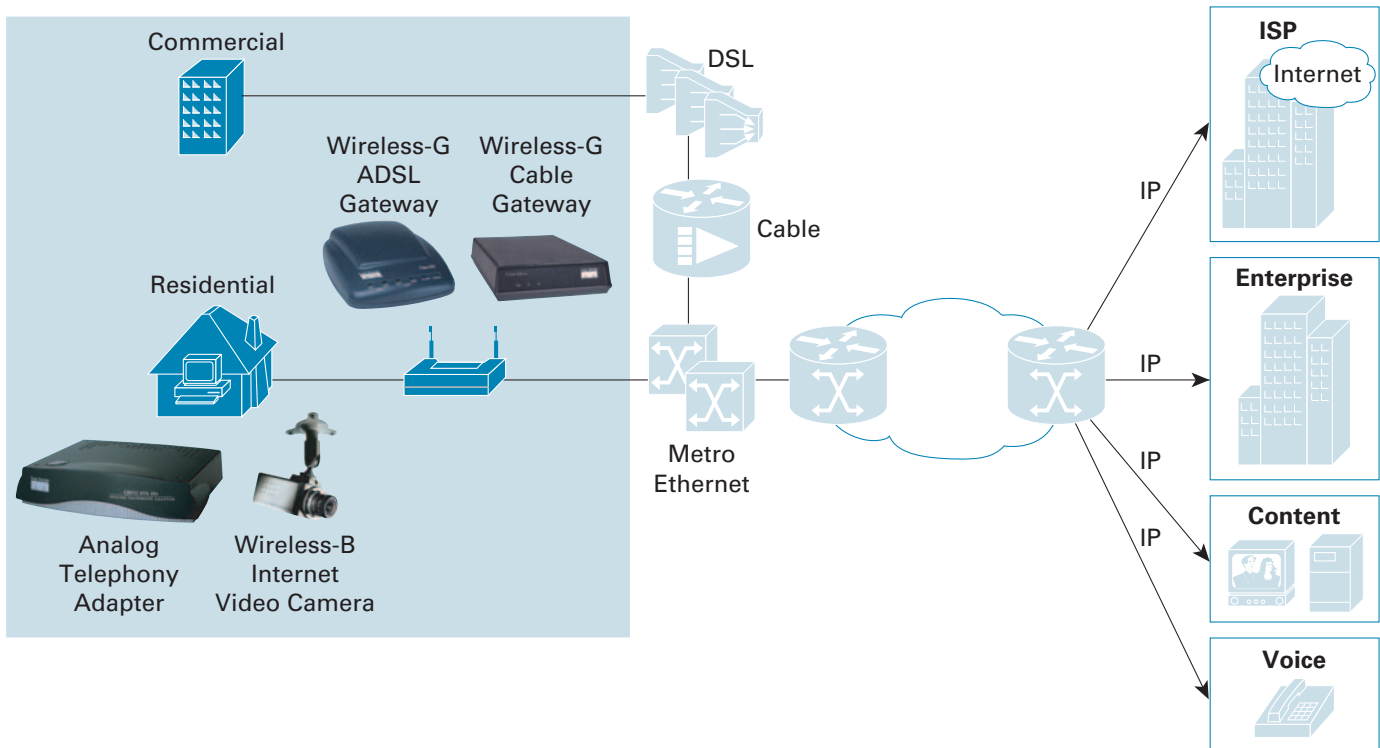
Most service providers agree that eventually all data and media services for the home will be delivered over a single broadband connection. Consumers continue to influence this movement as they demand a richer variety of triple play and bundled services. This transformation will create a greater need to monitor and control network traffic within a home or small-business network, as well as across the larger infrastructure. The trend also offers an exciting opportunity for service providers to strengthen customer relationships, reduce churn, and increase revenue per user by bundling home networking gear with service offerings.

Cisco offers a variety of solutions to both protect and expand the customer base today, while laying a foundation for delivering fully converged triple play services in the near future. Linksys, a division of Cisco Systems and the leading home networking vendor, offers a complete line of broadband gateways, wired and wireless routers, network adapters, and accessories for home networking and small business applications (Figure 5).

Other advantages of Linksys home networking solutions include the following:

- *Home networking market expertise*—Linksys has been the leader in home networking for several years and has developed comprehensive understanding of the needs and requirements of home networking customers.
- *Retail penetration and brand recognition*—Today, Linksys captures approximately 55 percent of the North American retail market for home networking products and is rapidly increasing market share internationally as well, providing a name customers know and trust. This large retail footprint also offers service providers a unique opportunity as a go-to-market vehicle and an additional channel for attracting new customers.
- *Vast customer support infrastructure*—Service providers can roll out home networking services that incorporate the Linksys global customer support infrastructure—the most extensive in the industry. Specialists undergo exhaustive training in home networking and troubleshooting in a consumer environment.

Figure 5 Home Networking and Small Business Solutions



Linksys Home Networking and Small Business Portfolio

Linksys Broadband Gateways:

- *Wireless-G ADSL Gateway (WAG54G)*—An easy-to-install, all-in-one solution for home users, incorporating an asymmetric DSL (ADSL) modem, 4-port 10/100 Ethernet switch, 802.11g wireless access point, and firewall and VPN capabilities.
- *Wireless-G Cable Gateway (WCG200)*—An all-in-one home networking solution for cable broadband subscribers that incorporates a DOCSIS 1.1- and 2.0-certified cable modem, 802.11g wireless access point, 4-port 10/100 Ethernet switch, USB port, and security and VPN capabilities.

Linksys Peripherals:

- *Analog Telephony Adapter (PAP2)*—Helps enable high-quality, feature-rich telephone service through a cable or DSL Internet connection. With an appropriate Internet telephone service

provider, users enjoy clear telephone reception and reliable fax connections, even while using the Internet at the same time for normal data operations.

- *Wireless-G Gaming Adapter (WGA54G)*—Provides 802.11g wireless connectivity for any Ethernet-equipped game console, allowing home users to play online from any room in the house.
- *Wireless-B Media Adapter (WMA11B)*—Provides an 802.11b wireless connection between a PC and home entertainment center, allowing home users to access digital music and pictures stored on their PCs from a standard television or stereo.
- *Wireless-B Internet Video Camera (WVC11B)*—A compact, self-contained Web camera with an integrated Web server, allowing users to broadcast live video over an 802.11b wireless connection directly to the Internet, without attaching the camera to a PC.

THE NEXT STEPS TOWARD TRIPLE PLAY BROADBAND

Cisco continues to develop and test new triple play solution suites, working with enterprise and service provider customers to bring converged, value-added data, voice, and video services into the future. Some recent examples include the Cisco Broadband Local Integrated Services Solution (BLISS) and Cisco Gigabit Ethernet Optimized VoD Solution.

BLISS enables service providers to deliver multiple voice and data services over a common broadband access network. The BLISS distributed architecture with centralized call control makes it an ideal framework for service providers that want to retail and/or wholesale integrated voice and data services, regardless of whether the services are targeted at a single city, a region, or the entire country.

The Cisco Gigabit Ethernet Optimized VoD Solution is aimed at cable operators experiencing a fundamental shift in their business as they move from broadcast to unicast content delivery. This solution delivers more bandwidth per interface than traditional video solutions, and significantly lowers costs due to reduced interface costs and fewer required wavelengths and fibers. In addition, the switched Gigabit Ethernet connections enable the optimization of each VoD server's port, resulting in the need for fewer overall VoD server ports.

PARTNERING WITH CISCO SYSTEMS

With its solutions approach to broadband services and its proven IP expertise, Cisco Systems offers service providers much more than just networking products. Cisco has worked with some of the largest, most successful providers in the world, and has a strong track record of delivering high-performing, long-lasting broadband solutions that help providers rapidly deploy and profit from triple play services.

Cisco also offers unparalleled network lifecycle support to help providers more effectively plan, design, prepare, implement, manage, and optimize broadband service offerings. Drawing on decades of industry-leading Cisco network expertise, service providers can enable the secure, scalable, high-performance broadband services that meet the needs of broadband customers today and in the future.

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