

Cisco BLISS for Metro Ethernet

Executive Summary

In the last few years, the telecommunications industry has experienced the fast and extensive build-out of fiber backbone networks and increased demand for high-speed connectivity. Metro Ethernet networks require the build-out of IP and fiber-based networks to serve both business and residential subscribers in metropolitan (metro) areas.

This paper introduces the Cisco Broadband Local Integrated Services Solution (BLISS) for Metro Ethernet. Cisco BLISS for Metro Ethernet provides the network foundation and call-control and application intelligence to deliver integrated voice, data, and video services for residential and business users over a variety of broadband access technologies. Cisco BLISS for Metro Ethernet is just one example of these local services over broadband access solutions.

Service providers focusing on broadband access through this solution will capitalize on the high available bandwidth of their network by delivering high-speed Internet connectivity directly to individual residential and small and medium business (SMB) users, along with additional services, including voice and video. Adding services based on the Cisco BLISS for Metro Ethernet solution represents a low-cost way

for service providers to add high-value, high-margin services to their current services offerings. Other benefits of deploying a Cisco BLISS for Metro Ethernet network include reduced equipment and operations expenses by running a converged network, and increased customer satisfaction and retention by delivering a bundled and differentiated service offering.

End users benefit from Cisco BLISS for Metro Ethernet networks because they enjoy the highest available bandwidth, at a lower price, and they receive bundled voice, video, and data services from a single provider.

This paper also describes and illustrates the Cisco BLISS for Metro Ethernet architecture: a simple, cost-effective solution that can be built—as needed—on a data transport infrastructure platform rich in IP routing capabilities. With access in place, incremental additions of voice or specialized video services follow, depending upon the needs of the customers they serve. Because IP transport can be independent of the services it carries when service providers implement quality-of-service (QoS) capabilities, this solution can provide tremendous flexibility and many technology offerings to choose from for service providers.



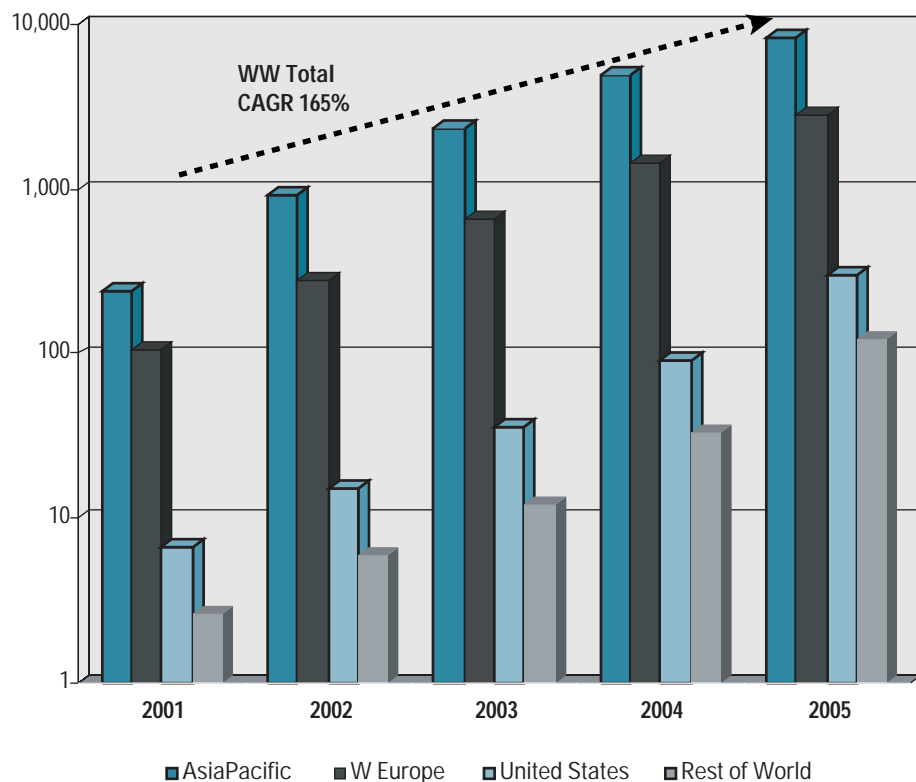
Market Dynamics

With the continued growth in Internet and data traffic, and the broader adoption of bandwidth-intensive services, business customers have continually demanded higher-speed offerings from their service providers. Residential customers have followed suit, abandoning their dialup Internet connections in favor of broadband alternatives. Many countries worldwide have observed these trends, and have policies in place to promote broadband networks, whether they employ cable, DSL, fiber, or wireless access.

However, with the advent of bandwidth-intensive services such as entertainment and video services, the symmetry requirements of videoconferencing, or the flexibility and security required of commerce and household automation services, not all broadband architectures can support all the services that customers anticipate. Fiber-based networks continue to expand, based in part on their suitability to support customer needs today and in the future.

Metro Ethernet is emerging as a new form of high-speed access for both businesses and homes that can meet users' growing demand for bandwidth and speed. Broadly stated, Metro Ethernet represents the build-out of IP- and fiber-based networks to serve subscribers in metropolitan areas. Initially, this focused exclusively on large enterprise customers, but since that time, some service providers have found it profitable to extend these networks with Ethernet to the home (ETTH) and business (ETTB). Given its overall capacity, Metro Ethernet solves the growing bandwidth bottleneck in the last mile. Table 1 (IDC 28178, Volume 1, Tab: Markets) shows the emergence of Metro Ethernet, illustrating the growth of Metro Ethernet subscribers from 2001 through 2005.

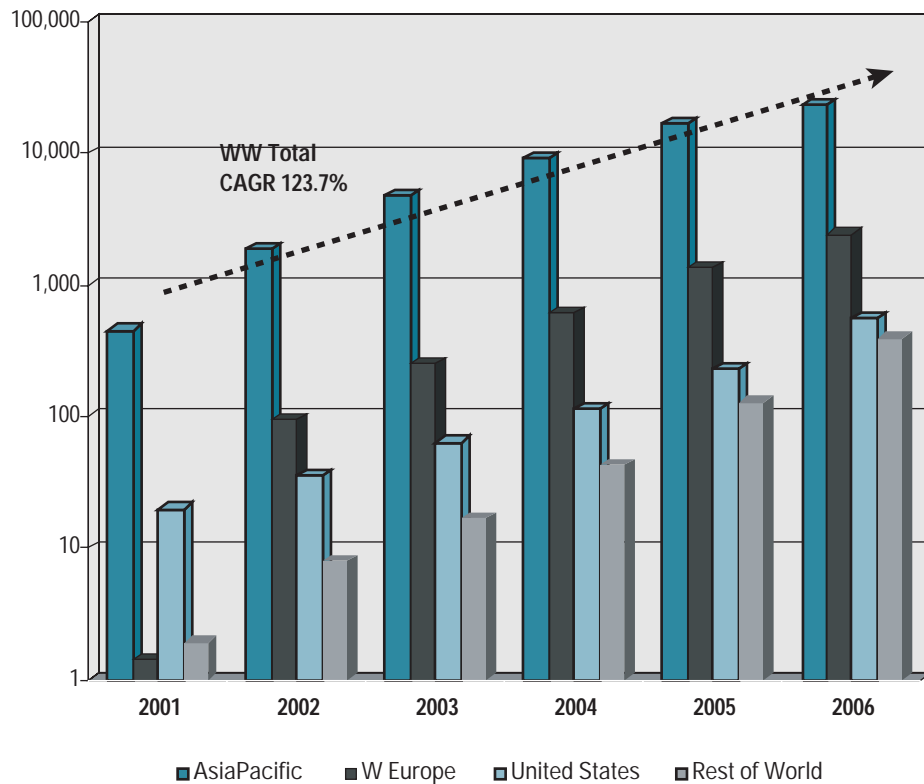
Table 1 Worldwide Metro Ethernet Subscribers, 2001–2005 (Thousands)





Metro Ethernet will score impressive global growth because it has many advantages over existing broadband technologies. First, it provides a highly scalable solution for last-mile access and for metro transport, based on the continued build-out of fiber in metropolitan-area networks across Europe, Asia, and the United States. Ethernet delivers the most scalable bandwidth, from 1 to 1000 Mbps, and eventually up to 10,000 Mbps. Beyond scalability, the network is easy to manage and supports many configuration changes without requiring on-site maintenance. Ethernet is already the accepted standard within the enterprise LAN, and service providers are now finding it cost-effective to deliver voice, video, and data services over Ethernet in metro environments. Service providers can expect to see increasing service revenue from Metro Ethernet networks based on their ability to support a variety of services. Table 2 shows IDC's forecast for worldwide Metro Ethernet services, from 2001 through 2006.

Table 2 Worldwide Metro Ethernet Services Revenue, 2001—2006 (\$M)



Several market accelerators make Metro Ethernet deployments even more attractive. The multidwelling unit (MDU) market is an excellent opportunity for Metro Ethernet service providers. With multiple tenants in a single business or residential building, the cost to serve them is dramatically reduced, giving service providers greater profit margins. Examples of MDUs include high-rise apartments, college dormitories, and new housing development parks. Today, fiber networks already serve many of these MDUs. Others sit close enough to an existing fiber network that fiber access would be easy to achieve.



Many different entities can initiate Metro Ethernet network deployment. Most incumbent service providers already have fiber in the ground serving a large number of enterprises, SMBs, and residential customers located within the metropolitan service areas. Competitive service providers have targeted metro customers as the basis of their business strategy. Besides traditional service providers, in many parts of the world, governments and utilities are promoting the build-out of broadband networks. Utilities want to pursue this initiative because it allows them to expand into a new service offering, using existing the fiber-optic facilities and the rights-of-way (for example, fiber-optic ducts) that they already own. Municipal governments look at the build-out of these networks as an effective means of attracting new businesses and residences to metropolitan areas because of the leading-edge telecommunication services that they can receive. Frequently, service providers, utilities, and municipalities partner together to build and operate fiber networks in a cost-effective and timely manner.

The Cisco BLISS for Metro Ethernet Solution

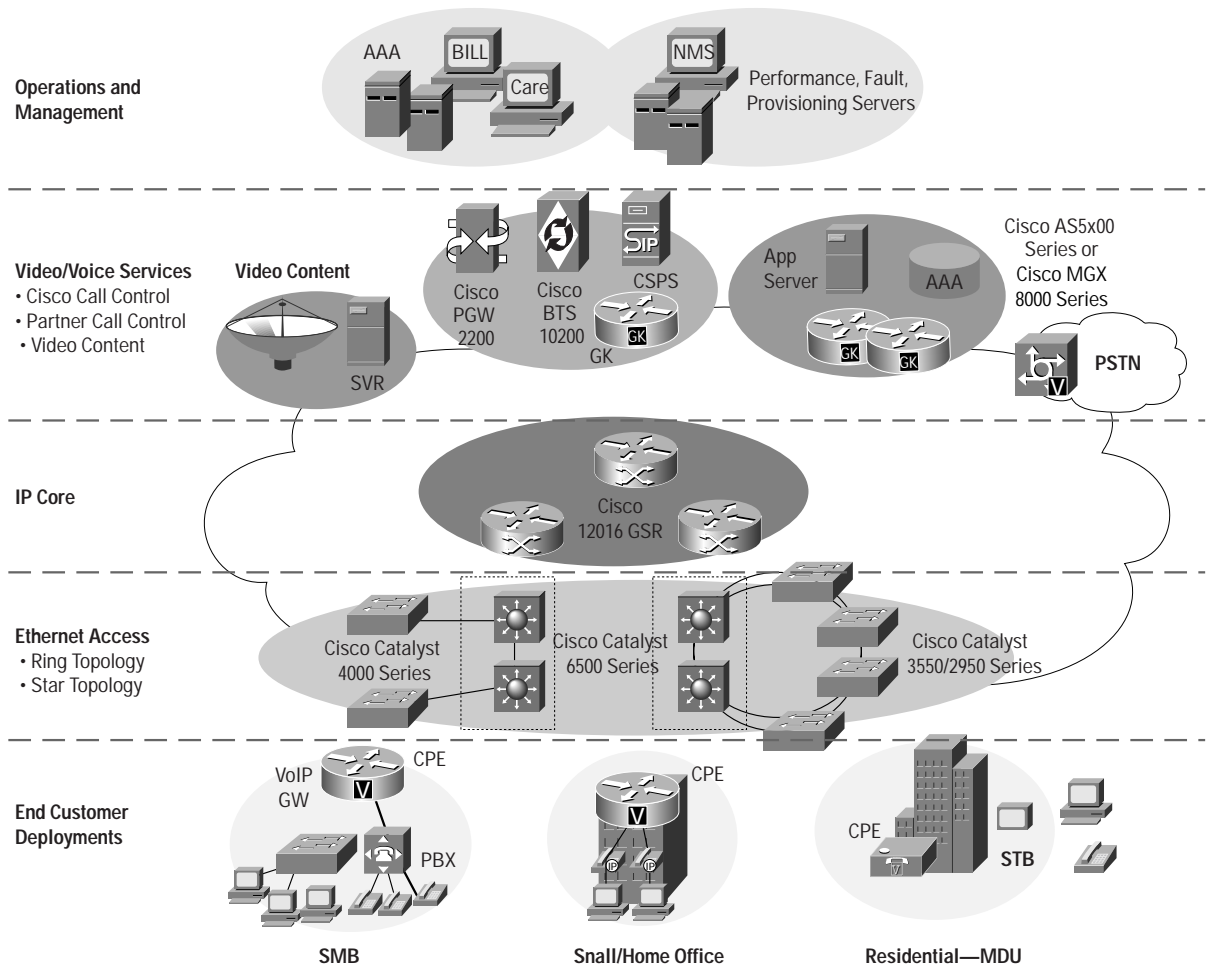
Cisco BLISS provides the network foundation and call-control and application intelligence to deliver integrated voice, data, and video services for residential and business users over a variety of broadband access technologies. Cisco BLISS for Metro Ethernet is just one example of these local services over broadband access solutions; others cover additional access technologies, including cable, DSL, and T1/E1. In each of these solutions, Cisco integrates the components to deliver a robust IP-based network infrastructure capable of supporting a variety of services. On top of this network, Cisco can also provide the service-level architectures to deliver feature-rich, secure services. For example, Cisco has a variety of networks suitable for delivering basic and enhanced voice services. Additionally, the Cisco BLISS for Metro Ethernet solution is capable of incorporating partner products, to provide even more network flexibility and choices for Cisco customers.

Service providers focusing on broadband access with this solution will typically sell high-speed Internet connectivity directly to individual residential and SMB users. But data services are just the start of their product offerings. These service providers can add additional services, such as voice and video, with low incremental expenses, resulting in significant increases in service revenue. For example, service providers can deliver the distribution of streaming or stored video content (broadcast television and video on demand), private networking (virtual private networks [VPNs]), network-based storage, local voice services, enhanced communication services such as unified messaging, business IP telephony services, videoconferencing and surveillance, and Web content or specialized hosting services to their customer base. Frequently, the companies that own and operate the network infrastructure will partner with content providers to build rich content to accelerate their profitability. These ETTx service providers want to deliver data, voice, and video over simple and inexpensive Ethernet transport, employing technology that is nearly limitless in terms of its ability to support services today and tomorrow.

In the future, service providers can expand these services to include entertainment applications, such as gaming, new transactional services including more convenient shopping, remote and residential storage information services such as e-learning, real-time remote collaboration, household automation, and transparent LAN services. These services offer future growth opportunities for service providers, enticing them to build a network capable of supporting greater opportunities. Figure 1 illustrates the Metro Ethernet solution.



Figure 1
Cisco BLISS for Metro Ethernet Solution



The Cisco BLISS for Metro Ethernet Value Proposition

The Cisco BLISS for Metro Ethernet value proposition brings benefits to both service providers and their end customers.

Cisco BLISS for Metro Ethernet enables service providers to capture next-generation service delivery opportunities profitably; the solution enables them to:

- Eliminate the bandwidth bottleneck in the local loop and deliver a truly scalable broadband solution
- Cut equipment costs and operational expenses for multilayer access networks, dramatically
- Provide the ability to upgrade bandwidth without making hardware changes
- Deliver multiple revenue-generating services over a single access infrastructure
- Increase the speed of services delivery, opening up new revenue opportunities



- Differentiate service offerings over other broadband alternatives because of the scalability, symmetric bandwidth, and manageability advantages of Metro Ethernet
- Improve customer retention as a result of bundled and unique service offerings

End users also benefit from Cisco Metro Ethernet networks; they:

- Enjoy the highest available bandwidth from any access technology
- Benefit from significant drops in the price they pay for bandwidth
- Receive bundled voice, video, and data services from a single provider
- Subscribe to a highly flexible network that is capable of supporting future incremental services
- Experience increased bandwidth flexibility and granularity; the solution is highly adjustable to meet their communication needs
- Control their own service configuration with self-care and service management

Architectural Overview

The Cisco BLISS for Metro Ethernet architecture is a simple, cost-effective solution that can be built—as needed—on a data transport infrastructure platform rich in IP routing capabilities. With access in place, incremental additions of voice or specialized video services follow, depending upon the needs of the customers they serve. Because IP transport can be independent of the services it carries when service providers implement QoS capabilities, this solution can provide tremendous flexibility and many technology offerings to choose from for service providers.

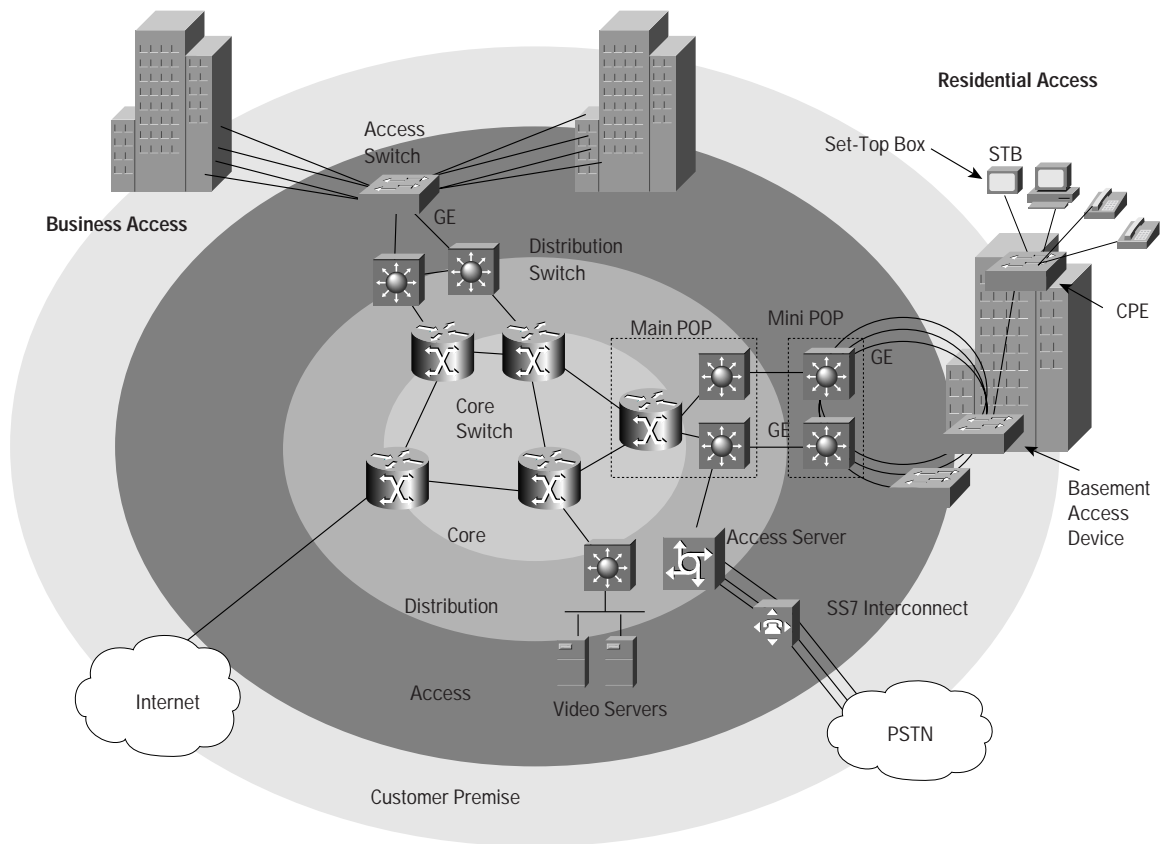
An Ethernet-to-the-dwelling solution will deliver *always-on* 10/100-Mbps Ethernet connectivity, scalable up to gigabit speeds, depending upon the service provider's requirements and end-user needs. It sits above *midband* technologies such as xDSL or cable modem and offers competitive pricing and operating costs.

Transport Architecture

The Metro Ethernet architecture consists of 10- or 100-Mbps Ethernet to each unit in the MDU, connected through a Cisco Catalyst[®] switch serving a whole area or building. From there, a gigabit or multi-Gigabit Ethernet connection runs to the service provider's central office for connection to the metropolitan-area network (MAN) optical fiber network. In the central office, Cisco Catalyst Layer 3 switches move Gigabit Ethernet traffic from the metropolitan rings and deliver it to the backbone. The result is virtually unlimited bandwidth to multiple users. Note that these network components can be configured in either a fiber-based ring topology or a star topology, providing the ability to work on new or existing fiber layouts. Figure 2 illustrates the Metro Ethernet architecture.



Figure 2
Cisco BLISS for Metro Ethernet Transport Architecture



The transport architecture comprises the following Cisco components:

- Core: Cisco 12000 or 12400 Internet Router
- Distribution: Cisco Catalyst 6500 or Cisco 7600 Optical Switch Router (OSR)
- Access: Cisco Catalyst 3550, 2950, 3550, or 4000

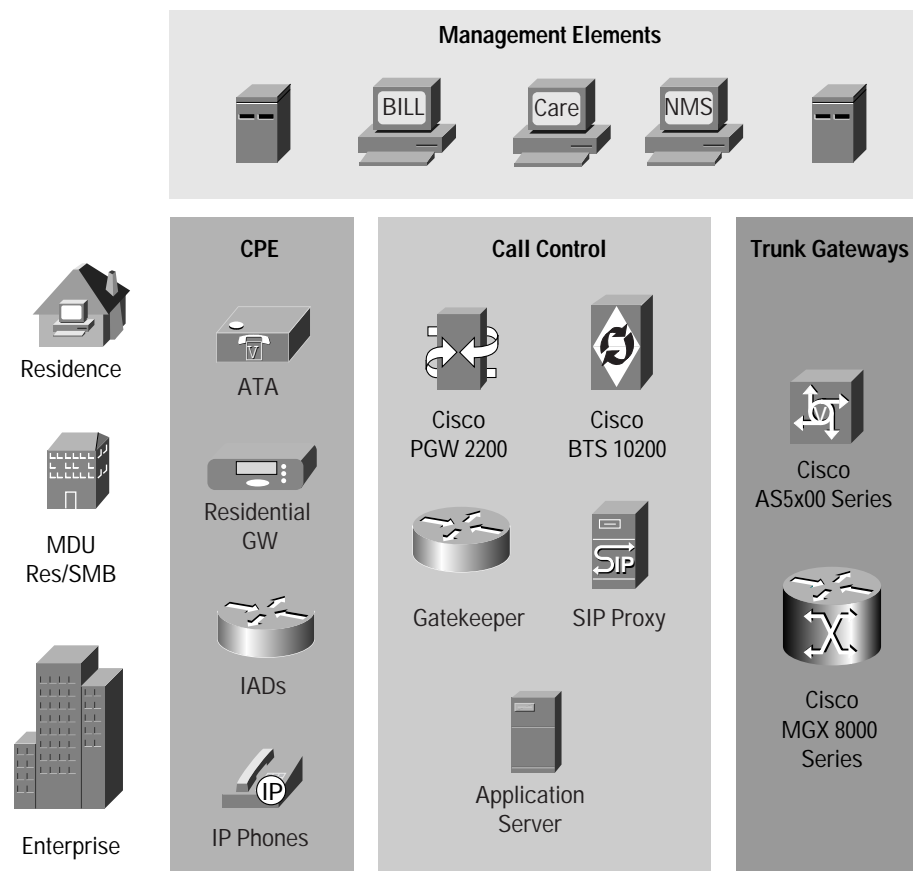
Voice Service Architecture

Cisco BLISS for Metro Ethernet supports a variety of voice architectures today, including support for H.323, Session Initiation Protocol (SIP), and Media Gateway Control Protocol (MGCP) signaling protocols. Selecting the appropriate call-control architecture and signaling protocol is based upon numerous factors, including services required, network scalability, initial and incremental cost, customer-premises-equipment (CPE) capabilities, and technology maturity. However, the neutral transport foundation makes it possible to choose the right voice architecture, and easily integrate it with the transport infrastructure.



Each voice architecture contains a variety of Cisco and third-party voice components. The Cisco components include call-control and signaling devices (Cisco H.323 gatekeepers, the Cisco SIP Proxy Server, the Cisco BTS 10200 Softswitch, the Cisco PGW 2200 PSTN Gateway Signaling Controller), voice trunking gateways (Cisco AS5350 and AS5400 and Cisco MGX[®] 8000 Series carrier voice gateways), CPE and integrated access devices (Cisco ATA 186 and 188 analog telephone adapters, Cisco 1700, 2400, 2600, and 3600 Series products), and other peripheral components (application servers, announcement servers, billing devices, and route servers). Figure 3 illustrates the architecture components used to deliver voice services in the Metro Ethernet solution.

Figure 3
Cisco BLISS for Metro Ethernet Voice Architecture



The following sections offer further details about the voice architecture alternatives that exist in the Cisco BLISS for Metro Ethernet solution.



H.323 Gatekeeper Architecture Overview

Given the technology maturity of H.323, H.323-based networks have been the most widely deployed networks in the world. This implies that service provider experience and component availability is higher for H.323 networks than for any other packet voice signaling protocol. Consequently, many service providers have chosen to deliver local services based on an H.323 gatekeeper architecture.

The architecture uses Cisco gatekeepers (Cisco 3660 and 7200) to control the H.323 endpoints and interconnect to the transit network and public switched telephone network (PSTN). As an optional element, a partner-provided application gatekeeper can be introduced to expand the set of services available within the solution.

SIP Proxy Server Architecture Overview

SIP-based networks have gained significant attention in recent years based upon the flexibility that the SIP protocol provides to establish, maintain, and terminate calls between multiple endpoints. This enhanced intelligence within SIP endpoints will pave the way for innovative service offerings such as presence-based applications that will change the services end users can expect from future communications networks. Consequently, Cisco supports local voice architectures that employ SIP over its Metro Ethernet solutions.

The network is based on the use of the Cisco SIP Proxy Server. This product supports a variety of functions, including redirect, transaction stateful or stateless proxy, and registrar. The Cisco SIP Proxy Server authenticates SIP endpoints and establishes connections from these endpoints to other endpoints, voice gateways, and application servers based on routing information and calling party authorization.

Softswitch Architecture Overview

Many service providers want a network that not only replicates the functionality of today's communication networks, but also is flexible enough to support enhanced services. Most of these service providers design their networks on a softswitch-based architecture. A softswitch allows service providers to centralize network intelligence (for example, call control, features, management) within a single set of devices, providing an easy mechanism for them to own and operate their network. A softswitch architecture offers other advantages: it delivers carrier-grade reliability; supports open interfaces to other network elements; and offers high scalability to handle large call volumes.

Cisco BLISS for Metro Ethernet architectures use the Cisco BTS 10200 Softswitch. Not only does it provide an extensive set of call-control features and services, but it also can use H.323, MGCP, and SIP protocols, supporting the broadest ability to interconnect various network components.

PSTN Interconnection Architecture Overview

Each of the three network architectures, gatekeeper, SIP proxy, and softswitch, must interconnect with the PSTN to receive or terminate calls from the PSTN. A trunking gateway that interconnects with the PSTN through Signaling System 7 (SS7) ISDN User Part (ISUP), ISDN Primary Rate Interface (PRI), or R2 signaling methods enables the necessary connection.

In the case of the PRI or R2 signaling, an H.323 trunking gateway is typically used to interconnect to a PSTN switch. The Cisco AS5000 Series products are suitable for this application. In the case of an SS7 signaled interconnection, a Cisco PGW 2200 could be introduced as a signaling controller, controlling a voice gateway (Cisco AS5000 or Cisco MGX 8000 Series) to interconnect to the PSTN switch. The Cisco PGW 2200 currently supports over 90 SS7 variants, supporting its application nearly worldwide.



Voice Services

The complete list of basic and supplementary voice services available in the network is a function of the voice architecture selected (gatekeeper, SIP proxy server, or softswitch), the capabilities of the endpoints, and the existence of other network peripherals. However, the following list provides an example of some of the voice services that have been delivered within the Cisco BLISS for Metro Ethernet solution.

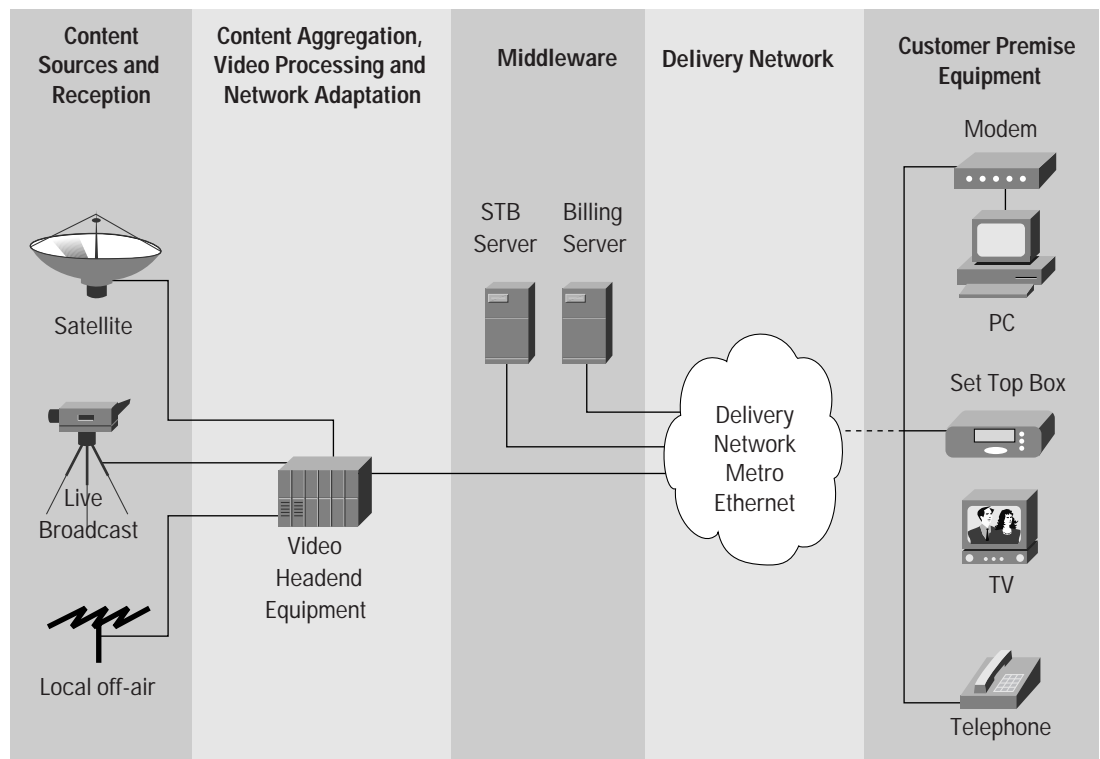
- On-net to on-net calling (voice over IP [VoIP] to VoIP)
- On-net to off-net calling (VoIP to PSTN)
- Off-net to on-net calling (PSTN to VoIP)
- Country-specific dialing plans
- Country-specific tone support
- Nationwide and international calling
- Dual tone multifrequency (DTMF) signaling
- Fax services
- Network announcements
- Emergency services
- Local number portability
- Call forward unconditional (CFU)
- Call forward busy line (CFB)
- Call forward on no answer (CFNA)
- Call barring
- Call waiting
- Call waiting deluxe (CWD)
- Call redial on busy
- Three-way calling (TWC)
- Malicious call ID (MCID)
- Anonymous call rejection (ACR)
- Do not disturb (DND)
- Multiple directory number (MDN)
- Message waiting indicator
- Calling number identification presentation (CLIP)
- Calling number identification restriction (CLIR)
- Private branch exchange (PBX) or key system interconnect for business
- Centrex feature set (softswitch)
 - Extension dialing
 - Call hold
 - Call retrieve
 - Distinctive ringing for direct inward dial (DID) versus internal calls



Video Services

Video over IP is another attractive offering that Metro Ethernet can enable for service providers. Figure 4 shows an end-to-end solution for the transportation of video over the Metro Ethernet broadband infrastructure. The main elements within this video architecture are the content source, content aggregation, processing and adaptation, and set-top box delivery. When considering the network architecture, the method of cell replication or the ability to multicast is also important. Metro Ethernet delivers video services to a set-top box (STB) that decodes the digitally transmitted signal.

Figure 4
Cisco BLISS for Metro Ethernet Video Architecture



Taking advantage of this architecture over the Cisco BLISS for Metro Ethernet solution, service providers can offer next-generation video services, including gaming, specialized content delivery, video broadcast, videoconferencing, and surveillance.

Operations

The Cisco BLISS for Metro Ethernet solution also helps reduce the cost of operations by synchronizing control of geographically distributed devices, device groups, and network-wide services. It can meet the demands for rapid services deployment and self-provisioning bandwidth while protecting traditional infrastructure investments and driving down staffing costs.

Partners

The Cisco BLISS for Metro Ethernet solution has an architecture that enables the easy integration of complementary partner components, including a broad variety of partner products:

- Access Media, i3 micro, Telsey: Residential gateways
- Tandberg: Video distribution
- Kreatel, Roxus, Sigma: Set-top boxes
- NetCentrex: Gatekeeper
- IP Unity: Voice mail and unified communications
- Cognitronics: Announcement server

These products have been tested to work as part of the tightly integrated end-to-end solution.

Conclusion

The Cisco BLISS for Metro Ethernet Solution is more than a viable way to deploy broadband to end users—it is a disruptive technology that can revolutionize the way service providers do business by giving them offerings that surpass even the most sophisticated and rapid offerings available today.

If you are considering a Metro Ethernet or ETTx implementation, consider Cisco first. Cisco products are leading the industry to deliver the most robust and feature-rich broadband infrastructure. Cisco also delivers optimal voice and video architectures as part of this network, providing immediate revenue-enhancement opportunities. As a service provider teaming with Cisco's expertise and technology, your Metro Ethernet deployment will be successful.

To learn more about Cisco BLISS for Metro Ethernet and related products and solutions, visit <http://www.cisco.com/go/telephony> or contact your Cisco account manager.



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 International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

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, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 317 7777
Fax: +65 317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on the **Cisco Web site at www.cisco.com/go/offices**

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia
Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland
Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland
Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden
Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

All contents are Copyright © 1992–2002, Cisco Systems, Inc. All rights reserved. Catalyst, Cisco, Cisco IOS, Cisco Systems, the Cisco Systems logo, and MGX are registered trademarks or trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries.

All other trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company.
(0208R) 202902/ETMG 11/02