

## MANAGED METRO ETHERNET SERVICES OVERVIEW FOR SMALL, MIDSIZED, AND LARGE ENTERPRISES

### EXECUTIVE SUMMARY

The amount of data being transported across internal and external business networks has grown exponentially. New Web-enabled business applications, multimedia, distributed computing, and storage-area networking are driving enterprise demand for wide-area network (WAN) bandwidth. While businesses are responding to these requirements by upgrading their local-area networks (LANs) to Gigabit Ethernet, WAN bandwidth has not kept pace and is increasingly seen as the bottleneck. Ethernet benefits in the LAN are well understood; now this technology is rapidly evolving to provide the same benefits in the WAN.

Metro Ethernet provides a flexible, scalable, and cost-effective alternative to private lines, frame relay, and Asynchronous Transfer Mode (ATM) connectivity solutions for WAN. Globally, service providers have started to offer Metro Ethernet Services, which use ubiquitous Ethernet technology to deliver converged voice, video, and data networking. Where traditional time-division multiplexed (TDM) access is rigid, complex, and costly to provision, Metro Ethernet Services provide scalable bandwidth in flexible increments, simplified management, and faster and lower-cost provisioning. Metro Ethernet provides a data-optimized connectivity solution for the Metropolitan-area network (MAN)/WAN based on technology which is widely deployed within the enterprise LAN.

Service Provider Metro Ethernet offerings include connectivity services, as well as Ethernet access services such as high-speed Internet access and IP virtual private networks (VPNs). Depending on the architecture and implementation, Metro Ethernet services can meet enterprise service-level agreement (SLA) requirements to support mission-critical data, voice, video, and storage networking. As the service supports interworking, businesses can continue to use their existing Frame Relay/ATM service where appropriate, and selectively deploy Ethernet where high-bandwidth, flexible connectivity is required.

Ethernet in the WAN delivers a number of benefits to IT organizations:

- High bandwidth wide-area networking enables consolidation of servers and storage resources, which results in improved asset utilization and lower overall cost.
- Scalable WAN bandwidth and “any-to-any” connectivity also enables IT to implement advanced business applications by converging voice, video, and data transport over a single network.
- Finally, with Metro Ethernet services, it is easier to implement initiatives like business continuity, storage virtualization, and grid computing that require scalable connectivity between data centers.

Metro Ethernet is one of the newer WAN alternatives and usage is steadily growing for intra-metro and inter-metro application. IDC forecast a 42 percent compound annual growth rate (CAGR) and expects the worldwide market for Metro Ethernet Service to grow from US\$1.1 billion in revenue in 2003 to US\$6.3 billion in 2008. The technology is maturing fast and standards are in place to accelerate service adoption. Businesses are taking advantage of the flexibility of Metro Ethernet services to address their current WAN challenges, while providing a scalable and flexible network foundation for future demands.

Today, a number of service providers offer metro Ethernet services with different SLA options for management, class of service (CoS), and availability. Finding the right Metro Ethernet solution for your organization begins with assessing and prioritizing your unique requirements, as well as becoming informed about your alternatives and some of the key decision points. This overview provides a starting place. More in-depth information is available on:

<http://www.cisco.com/go/managedservices>

or by speaking with a Cisco® representative or Cisco Powered Network® (CPN) designated service provider.

## **BUSINESS DRIVERS**

Businesses in all sectors of the economy are becoming dependent on networked information, communications, and transactions. Network usage and complexity has escalated, at the same time that bandwidth-intensive applications have become more widespread.

Many business find their existing WAN becoming a bottleneck. Traditionally businesses have built their LANs using Ethernet; while depending on services such as Private Line, Frame, and ATM for WAN. In the LAN, bandwidth has increased from 10 Mbps to 100 Mbps and beyond, while in the WAN the speeds are much lower—typically 64 Kbps to 2 Mbps (T1/E1). Existing WAN technologies offer limited scalability, and provisioning additional bandwidth is costly and complex. Due to expensive WAN bandwidth, enterprises have been forced to distribute their IT resources and co-locate them with users. This has resulted in proliferation of applications, servers, and storage across multiple locations, increasing cost and complexity.

There are a number of factors driving WAN bandwidth demand, including distributed business processes, new business applications, recent industry regulations, increased consolidation of IT resources, and an on-demand computing model. A recent survey by Sage research cites cost-effective high-bandwidth as the main challenge for an enterprise WAN. However, it is not just large businesses that are seeing increased demand for WAN bandwidth. Even small and medium-size businesses are looking for ways to increase productivity, scale operations, and reduce communications costs by leveraging the benefits of Internet and managed broadband services.

While network usage has continued to grow, IT budgets have not. In order to enhance productivity and maintain a competitive position in their industry, businesses are seeking cost-effective ways to increase their WAN bandwidth and support sophisticated applications. Businesses are keeping pace with evolving e-business models by turning to *Metro Ethernet*, which supplies high-bandwidth to both the LAN and WAN.

## **BUSINESS BENEFITS**

Metro Ethernet delivers a compelling value proposition for business networking. Metro Ethernet services provide an efficient data-optimized solution for WAN/MAN. Ethernet-based access and connectivity services deliver the following benefits to businesses:

### **Scalability**

Ethernet is a proven technology with unmatched scalability. Compared to alternatives like PL/Frame/ATM, Ethernet can scale from 10 Mbps to 1000 Mbps, often without a change in technology or Customer Premise Equipment (CPE). With support for rate limiting available in Ethernet switches, service providers can offer a wide range of granular bandwidth increments using the same CPE.

### **Cost Effective**

Ethernet economics are proven in the LAN. This technology now delivers the same advantage to the WAN. The cost per Mbps of bandwidth is lower for Ethernet services in comparison to other alternatives. Additionally, per-port cost for Ethernet CPE is lower than those for ATM/SONET/SDH and there is no need to oversubscribe bandwidth. Businesses can purchase only the bandwidth they need, when they need it, which reduces their operating expenses. Ongoing operational costs are also lower for Ethernet, because the knowledge base for this technology is widely available within the enterprise. Finally, Ethernet also facilitates initiatives like server and storage consolidation that lead to lower overall IT cost.

### **Flexibility**

Metro Ethernet provides a flexible WAN solution for business networking. The service can be used for connectivity as well as an access mechanism. Metro Ethernet can also be used as a local loop alternative for high-speed access to Layer 3 services such as Internet and IP VPN, eliminating any first-mile bottleneck. Existing Frame/ATM services can interwork with Ethernet, enabling smooth migration to this service. Finally as Metro Ethernet offerings support multiple CoS, businesses can converge their voice, video, and data applications over a single WAN infrastructure.

### **Simplicity**

Most enterprise customers have standardized on Ethernet for their LAN. Now with Ethernet-based services for the WAN, the network architecture is greatly simplified. Metro Ethernet delivers a plug and play connectivity solution for the WAN. This is particularly attractive for certain MAN applications like distributed computing, data replication, and business continuity. As this is a L2 service, end users continue to maintain control over their IP domain. Finally, Metro Ethernet allows end users to provision additional bandwidth quickly when needed, with some providers even offering on-demand capabilities.

## SERVICES DESCRIPTION

Based on this framework, Service Providers today offer a variety of essential services.

Type of Service	Connectivity Type	End User Service Example
Ethernet LAN Service (E-LAN)	Fully meshed ( <i>any-to-any</i> ) Multipoint connection	Transparent LAN Service
Ethernet Line Service (E-Line)	Point-to-Point connection	Ethernet Private Line

## METRO ETHERNET CONNECTIVITY MODELS

### Transparent LAN Service

Transparent LAN Service (TLS) offerings support different types of Service Level Agreements, in addition to supporting bandwidth profiles similar to those available for Frame Relay. Some providers also offer multiple CoS for best effort, delay-sensitive, packet-loss-sensitive traffic. With TLS service, businesses can implement converged networking and support mission-critical data and real-time applications such as voice and video over Metro Ethernet.

Vertical markets benefiting from TLS include government, education, healthcare and finance, which require large bandwidth to enable applications such as imaging, eLearning, videoconferencing, business continuity, and distributed computing.

### Ethernet Private Ring

Ethernet Private Ring services deliver dedicated bandwidth and highly reliable connectivity. They provide enterprises with the reliability of optical transport, as well as the flexibility and simplicity of Ethernet. This is a premium service, used primarily for intra-metro applications requiring high reliability for dedicated bandwidth and security. Applications include a dedicated campus ring, data center/storage connectivity, and business continuity.

Enterprise verticals such as finance, utility, healthcare manufacturing, high-technology, and transportation should consider this service for mission-critical applications requiring high bandwidth intra-Metro connectivity.

### Ethernet Relay Services

Ethernet Relay Services (ERS) is similar to Frame Relay, enabling businesses to implement a hub and spoke network (such as those often used for branch connectivity). This service enables an enterprise to access the Internet, Intranet, and extranet over a single physical connection to the Service Provider network.

ERS is well suited for applications requiring aggregation of a large number of remote branch connections. The service supports SLAs similar to those available for TLS.

### Ethernet Wire Service

Ethernet Wire Service (EWS) provides point-to-point L2 Ethernet connectivity. The service can be used for applications like LAN extension to a remote location or storage back-up/archiving applications which are not time-sensitive (for example, TLM back-up). EWS can also be used within a metro area to access other hosted services or co-location sites. One of the main applications of this service is that of a local loop alternative, to provide Ethernet services such as Internet and IP VPNs.

### **Dedicated Internet Access**

One of the fast growing Ethernet services is dedicated Internet access. Most providers offer Ethernet access to Internet. These offerings are usually tiered and tariffed based on bandwidth. Providers offer a range of Bandwidth from as low as 10 Mbps to 1000 Mbps.

Dedicated Internet access is attractive for customers in verticals such as high-technology, media, education, retail, as well as any Web-based businesses that require large bandwidth to the Internet for hosting or co-location application.

### **Ethernet Access to IP VPNs**

Service providers worldwide are delivering advanced, scalable network-based IP VPN services with Ethernet access. IP VPNs allow enterprises to out-task services such as network-based firewalls, hosting, content, and IP telephony. Enterprises should consider Ethernet access to IP VPNs for locations requiring large bandwidth such as corporate office or data centers.

## **BUSINESS REQUIREMENTS**

Metro Ethernet delivers a flexible, scalable solution for MAN/WAN business requirements. As this service is now available from most providers, businesses will find it attractive to buy managed Metro Ethernet services instead of building their own Metro Ethernet network. When considering Metro Ethernet services, the enterprise needs to evaluate a provider's offerings against the key requirements below.

### **Multiple Classes of Service**

Implementing a truly converged Metro Ethernet network requires multiple CoS to support mission-critical data, voice, video, and storage traffic.

### **Service Uptime**

This is an important element of a Metro Ethernet service level agreement. Providers today offer different tiers of service uptime. These tiers include high uptime and high resiliency, as well as fully redundant premium service options with 24x7 availability. For mission-critical applications, an enterprise should consider premium Metro Ethernet offerings.

### **Security**

Ethernet is a plug and play technology, making security ramifications particularly critical. Providers should address security risks, such as Denial of Service (DoS) attack and MAC attacks.

### **Additional Requirements**

Other key business requirements include support for multicast traffic, tools for customer network management, real-time bandwidth provisioning, and protocol handling.

## CASE STUDY

### Dedicated SONET Ring Solution Uses Cisco Technology to Support Rutgers' Educational and Business Goals

#### Business Challenge

Rutgers wanted to run its business operations like a Fortune 500 company to be able to provide the highest quality education, increase research support, and continue its commitment to public service through education. The university's point-to-point T-1 and OC3 network architecture lacked flexibility, redundancy for disaster recovery, and the ability to cost-effectively scale to support high-bandwidth applications and future growth (made possible by Ethernet Interfaces).

#### Solution

Rutgers turned to a long-term CPN partner to provide a managed, secure, reliable, and survivable backbone for all of its business operations. The need for a high bandwidth and quickly scalable network pointed to a next-generation SONET solution. This dedicated SONET ring (DSR) provides gigabit Ethernet interfaces and scalability to an OC-192 ring. The service provider's premium Synchronous Optical Network (SONET) service provided Rutgers with a solution based on the Cisco ONS 15454 Multiservice Provisioning Platform (MSPP). The Cisco ONS 15454 platform combines the ability to provide current, traditional SONET interfaces and circuits (both electrical and optical) with the ability to provide next-generation SONET interfaces such as Ethernet, all protected by the self-healing SONET architecture. The premium DSR service addresses the increasing demand for data-optimized dedicated SONET service. The service draws on the Cisco ONS 15454 MSPP features to provide customers with a reliable, cost-effective, flexible, and efficient multiservice solution using a single platform—greatly simplifying the network.

#### Results

This next-generation OC-48 ring will resolve Rutgers' current network constraints and lay a flexible foundation to address future service/technology requirements. When this dedicated SONET ring is installed, Rutgers will be able to alleviate single points of failure and provide protection in the event of a disaster. Adding bandwidth on the Cisco ONS 15454 platform will be faster and possible at a much lower cost than adding more point-to-point lines, enabling the university to keep pace with ever-increasing bandwidth demands for information access, research, and collaboration. This will enable Rutgers to continue attracting top caliber students and faculty.

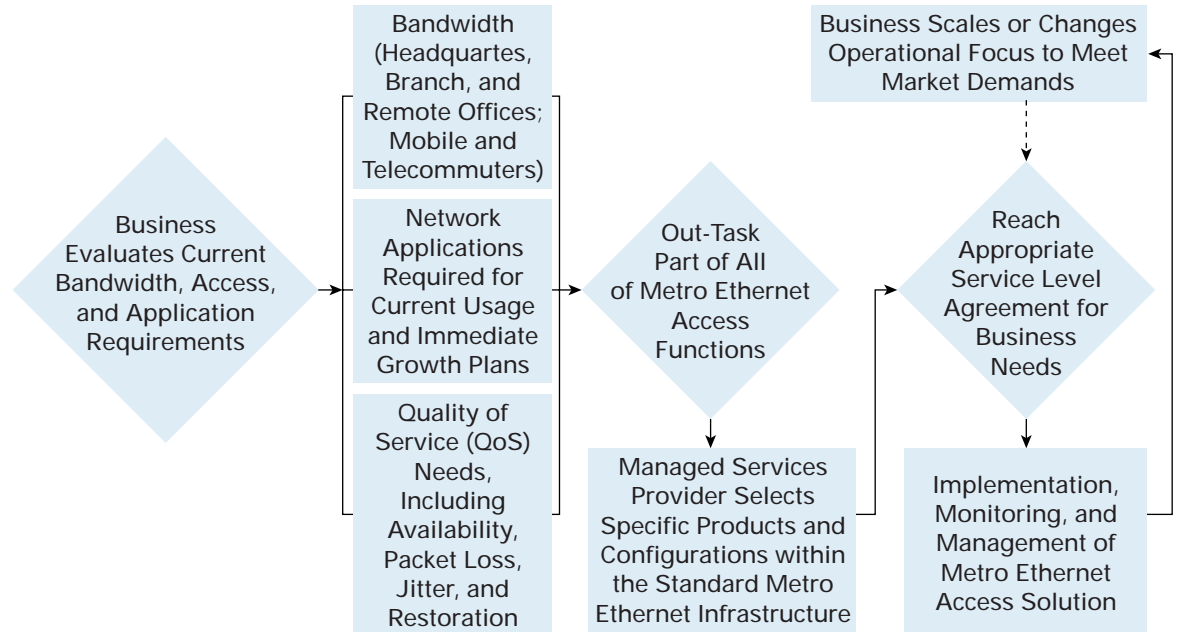
#### Decision Tree

Regardless of business size, you can begin evaluating your organization's Metro Ethernet Access requirements, by considering desired bandwidth, applications, and quality of service.

In addition, enterprises will want to consider the following:

- Ethernet-based server consolidation for business continuity and secure management
- Networked storage offers automation of storage management, economic consolidation of resources, enhanced resilience of improved data back-up and recovery

The material presented here can provide a starting place for discussion on your unique business needs with a managed service provider.



### Financial Analysis

It is becoming clearer to enterprise customers that Metro Ethernet can save them hundreds of thousands of dollars. To illustrate this point the Metro Ethernet Forum (MEF) conducted a business case that analyzed the potential savings over a three-year period realized by Metro Ethernet Private Line Data services over today's traditional options. For this study, MEF assumed a metro area consisting of one large site with 500+ employees and four Medium sites with between 100–499 employees. It was assumed that these sites required connectivity for two Metro data applications: Dedicated Internet Access and Private Line over a three-year period. The bandwidth requirements were from 3 Mbps to 36 Mbps. Results showed that the Ethernet model generated a 70 percent increase in savings to the enterprise over both the traditional Private Line and Frame Relay models. The actual savings in dollars amounted to a US\$1.7M savings over Frame Relay and a US\$2.13M savings over Private Line. The percentage of total savings are greater at larger sites where bandwidth requirements are higher; so savings actually increases as bandwidth increases. These savings do not account for the additional savings generated by a reduction in hardware capitalization, installation, and engineering and operational support costs.

Business Model	Applications	Time Interval	Bandwidth	Cost Savings with Ethernet Model
One large site with 500+ employees and four medium sites with between 100–499 employees	Dedicated Internet Access	3 years	3 Mbps–36 Mbps	70 percent increase in cost savings
One large site with 500+ employees and four medium sites with between 100–499 employees	Private Line	3 years	3 Mbps–36 Mbps	US\$2.13M savings over Private Line; US\$1.7M savings over Frame Relay

## CPN PROGRAM

Cisco is the leader in enterprise networking, and medium and large businesses can enjoy the same reliability, scalability, and flexibility of network services by looking for the CPN designation when they choose to out-task these capabilities. An increasing number of business customers are able to access managed business voice services based on Cisco solutions that include scalable, flexible architectures supporting operations and mandatory regulatory voice features.

Businesses are looking to service providers with the CPN designation to supply reliable, industry-leading, out-tasked services that enable advanced applications based on Cisco end-to-end network equipment and technology, including:

- Compliance with stringent requirements and standards
- Confidence that out-tasking partners are using industry standard technology
- Optimized deployment of security services in a timely manner
- Lower infrastructure investment

Over 500 of the most successful service providers around the world are members of the CPN program. Situated in more than 56 countries, these program members offer a wide range of services—over networks built with Cisco products and solutions—for small and large businesses alike.

Service providers with the CPN designation are committed to using end-to-end Cisco equipment in their networks, and meet high standards of operational excellence and customer service and support.

## FOR MORE INFORMATION

To learn more about Cisco-based managed metro Ethernet services visit:

<http://www.cisco.com/go/managedservices>

Look for Cisco overviews on other managed services including:

- Security Services
- Virtual Private Network Services
- Business Voice Services



Corporate Headquarters  
Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
[www.cisco.com](http://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](http://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](http://www.cisco.com)  
Tel: 408 526-7660  
Fax: 408 527-0883

Asia Pacific Headquarters  
Cisco Systems, Inc.  
168 Robinson Road  
#28-01 Capital Tower  
Singapore 068912  
[www.cisco.com](http://www.cisco.com)  
Tel: +65 6317 7777  
Fax: +65 6317 7799

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