

## Cisco Metro Ethernet Switching

Q. What is Cisco Metro Ethernet Switching?

A. Cisco Metro Ethernet Switching is part of Cisco Metro Solutions—a combination of systems and technologies consisting of optical transport, Ethernet switching, and IP, which work together to meet service provider infrastructure needs. Cisco Metro Solutions offer the following benefits:

- Comprehensive service portfolio to meet diverse customer requirements
- Greater efficiency and flexibility for existing infrastructures
- Proven industry leadership and delivery of unparalleled network scale and service availability
- Industry innovation for architectures, technologies, and standards

Q. What is new from the Cisco Metro Ethernet Switching portfolio?

A. Cisco Catalyst® 4500 Series with integrated resiliency for metro access and for aggregation of metro services

- Enhanced service security and scalability features across the portfolio
- IP video security enhancements across the portfolio
- Ethernet-to-ATM Layer 2 service interworking on Cisco 7600 Series and Cisco Catalyst 6500 Series
- Cost-effective Layer 3 virtual-private-network (VPN) access on Cisco Catalyst 3550 Series

- Improved scalability with enhanced optical services modules (OSMs) for Cisco 7600 Series and Catalyst 6500 Series
- An integrated management solution that focuses on provisioning and fault management for managing metro networks and services

Q. How is Cisco Metro Ethernet Switching defined?

A. In Cisco Metro Ethernet Switching, an Ethernet user network interface (UNI) is the customer data demarcation and Ethernet is the access technology to the service point of presence (POP). Key product components in the Cisco Metro Ethernet Switching portfolio include the Cisco Catalyst 3550 Series and 2950 Series switches, the Cisco Catalyst 4500 Series modular switches, the Cisco Catalyst 6500 Series, and the Cisco 7600 Series Internet routers. Other key components include the Cisco coarse wavelength-division multiplexing (CWDM) gigabit interface converter (GBIC) solution, the Cisco Catalyst 2950 Long-Reach Ethernet (LRE) Series switches, and Ethernet in the First Mile (EFM) solutions such as the Cisco ONT 1031 media converter and the Cisco 1105 Ethernet Subscriber Solution Engine.

Cisco Metro Ethernet Switching enables service providers to deliver profitable, comprehensive Ethernet services:

- With effective WAN services integration
- Through an unmatched breadth of service-delivery mechanisms
- By minimizing total cost of ownership

Q. What are the applications for Cisco Metro Ethernet Switching?

A. The two major applications for Cisco Metro Ethernet Switching are Ethernet to the business (ETTB) and Ethernet to the MxU (ETTX). ETTB is the delivery of metro services to large enterprises over high-capacity, point-to-point fiber-optic systems for interoffice, large business networks, and loop feeders. In large cities, the fiber laterals run to the multitenant units (MTUs) for large commercial tenants. In ETTB applications, the end customer often needs bandwidth higher than T1/E1 speeds—service-level agreements (SLAs) and quality-of-service (QoS) assurances are required, and tens of thousands of customers in a metro network may be involved.

ETTX is the application where services are delivered over the local loop to residential and small- and medium-size business (SMB) subscribers. ETTX is often an alternative to DSL or cable. For network operators building broadband or metro access networks, low cost per UNI is critical. Often, ETTX involves networks that support tens or even hundreds of thousands of customers in a metro network.

Q. How do you define EFM?

A. The term “Ethernet in the First Mile” describes topologies, an industry initiative, multiple Layer 1 and Layer 2 technologies, Ethernet or IP transport, and an Ethernet UNI or customer-facing interface. EFM refers to the first or last mile connection between the residential or SMB subscriber and the central office or headend. EFM is an industry initiative within the IEEE 802.3 committee with representation from 100 companies and more than 200 engineers. EFM defines multiple Layer 1 and Layer 2 technologies, for example, extended temperature range optics, Ethernet over voice-grade copper, and bidirectional 100- and 1000-Mbps optics for single-mode fiber. Finally, service providers associate EFM with both a transport technology and an Ethernet UNI.

Q. What is Cisco LRE and what are Cisco’s plans to standardize the technology?

A. Cisco LRE is a prestandard version of Ethernet over very high-bit-rate DSL (VDSL). Cisco is working within the IEEE 802.3ah Ethernet in the First Mile Task Force to standardize Ethernet over VDSL interfaces, and will support standards-based Ethernet over VDSL on its products when the standard is finalized.

Q. How does Cisco LRE play in the metro market?

A. Cisco LRE plays a significant role in ETTX applications. For the first time, the Cisco Catalyst 2950 LRE Series switches enable customers to extend intelligent services over existing phone and traditional wiring to distances up to 5000 feet. As part of the Cisco

Catalyst 2950 Series, the Cisco Catalyst 2950 LRE Series is ideal for metro access in residential markets. The switches enable a variety of residential metro services such as Internet access, voice over IP (VoIP), and broadcast video. The Cisco Catalyst 2950 LRE Series provides customers the ability to easily deploy and take advantage of all the enhanced features and functionality of the award-winning Cisco Catalyst 2950 Series switches while eliminating the costs of rewiring.

Q. How does Cisco Metro Ethernet Switching enable service providers to develop new revenue streams?

A. The metro area is attractive to service providers that want to provide more cost-effective, high-speed services to small, medium-size, and enterprise companies; retail service providers; as well as residential and small-office or home-office (SOHO) consumers. By offering high-speed services in the metro network, service providers can break the bandwidth barrier that currently exists between the customer’s LAN and the service provider’s own WAN backbone. This in turn allows service providers to initiate and offer more profitable services to customers.

For Layer 2 services, the service provider’s infrastructure needs to support the stringent demands of the latency-sensitive, mission-critical applications—such as packet voice and video applications—that small, medium-size, and enterprise customers will run. These applications require low latency and jitter control, and to run them, customers are demanding both high bandwidth at speeds greater than T1/E1 and competitive prices. Service providers operating traditional networks may be limited to offering consumers multiple T1/E1 and T3/E3 connections. In contrast, service providers using Cisco Metro Ethernet Switching can meet variable bandwidth demand above T1/E1 speeds—and do so with minimal changes to network infrastructure.

For Layer 3 services, such as IP virtual private networks (VPNs), success requires a carrier-scale provisioning and management system. Cisco Metro Ethernet Switching delivers both the infrastructure and the systems. When IP VPNs are extended to support voice, a robust set of QoS capabilities is required to deliver low latency and jitter control.

Content delivery networks (CDNs) require integrated content awareness to balance loads across CDN content engines and to prioritize traffic based on URLs or cookies. Cisco technology delivers this support. In short, Cisco delivers metro solutions that tightly link into enterprise environments that require integrated voice, video, and content applications. This integration allows service providers to link to enterprise applications supported by Cisco AVVID (Architecture for Voice, Video and Integrated Data), which is deployed in enterprises worldwide.

Service providers that address the residential and SOHO market face the challenge of maximizing service revenues from their investment in network plant. As a result, the broadband access market often requires serving businesses as well as residences and offering multiple services over a single infrastructure. Cisco Metro Ethernet access over fiber-optic networks can easily support cost-effective bandwidth from 1 to 1000 Mbps with additional applications as gaming, voice, and video. The same access network supports sophisticated Layer 2 and Layer 3 business site-interworking data services outlined above.

Q. How does Cisco Metro Ethernet Switching lower the total cost of ownership in both operating expenses (OpEx) and capital expenditures (CapEx)?

A. Cisco Metro Ethernet Switching lowers the total cost of ownership for a service provider through the use of Ethernet in the access network. Ethernet in the metro takes advantage of the enormous investments that have been placed in Ethernet in the LAN. Costs have decreased and speeds have significantly increased. In the Ethernet industry, for each order of magnitude increase in bandwidth, cost increases only three or four times. Product volumes and strong competition have also contributed to making product prices more attractive. Service providers can now take advantage of this technology and these price points for the next generation of metro services. As the leading Ethernet switching company, Cisco is the ideal partner to help service providers deploy metro Ethernet switching.

Another way that Cisco Metro Ethernet Switching lowers total cost of ownership is through Cisco Internet OSS. For most service providers today, operational expenses for services are a function of operations support systems (OSSs) and support staff. As a result, intelligence is often “trapped” in applications and people. With Cisco Internet OSS, intelligence is effectively “pushed” into the network equipment through the use of agents and “lighter” applications. Products such as the Cisco Element Management Software for the Cisco Catalyst 6500 Series and Cisco 7600 Series and the Cisco CNS 2100 Series Intelligence Engine for the Cisco Catalyst 3550 and 2950 series allow service providers to efficiently manage network elements. Through OSS automation, operational expenses can be minimized.

Q. What business factors will drive service providers to deploy metro Ethernet services in significant volumes?

A. Ethernet is a technology that holds compelling benefits for both the service provider and the service provider’s end customers. In addition to generating incremental revenue, metro Ethernet gives service providers a new way to access (and more efficiently use) their existing core infrastructures, especially for delivering data rates

higher than T1/E1 to end customers. Ethernet-based service offerings also enable service providers to take advantage of the key characteristics of Ethernet:

- Prevalence and familiarity in end-customer networks
- Compelling price and performance traits and trends
- Near-continuous access speeds from 1 Mbps to 10 Gbps

Q. What are the specific elements of the Cisco Metro Ethernet Switching portfolio?

A. The Cisco Metro Ethernet Switching portfolio comprises the following elements and products:

Cisco CWDM GBIC Solution

<http://www.cisco.com/warp/public/cc/so/neso/olso/>

The Cisco CWDM GBIC solution allows scalable and easy-to-deploy Gigabit Ethernet services. The Cisco CWDM GBICs and CWDM optical add/drop multiplexers (OADMs) enable the design of a flexible and highly available multiservice network.

Cisco Catalyst 2950 Series Switches

<http://www.cisco.com/warp/public/cc/pd/si/casi/ca2950/>

The Cisco Catalyst 2950 Series intelligent Ethernet switches are an affordable line of fixed-configuration Fast Ethernet and Gigabit Ethernet switches, ideal for metro access in residential markets. The switches enable a variety of residential metro services such as Internet access, VoIP, and broadcast video.

Cisco Catalyst 3550 Series Switches

<http://www.cisco.com/warp/public/cc/pd/si/casi/ca3550/>

The Cisco Catalyst 3550 Series intelligent Ethernet switches are the ideal metro access switches for enterprise and small-and-medium-sized-business markets. These cost-effective, fixed-configuration switches enable a variety of metro services, such as transparent LAN services and business-class Internet access.

Cisco Catalyst 4500 Series Switches

<http://www.cisco.com/warp/public/cc/pd/si/casi/ca4000/>

The new Cisco Catalyst 4500 Series switches with integrated resiliency are designed specifically for aggregation of business services and for subscriber access in metropolitan-area networks (MANs) that take advantage of the simplicity and flexibility of optical EFM. These switches deliver integrated resiliency combined with the mechanisms for per-subscriber traffic management, security, performance, and QoS, which network operators and service providers need to deliver revenue-generating data, voice, and video services. With the Cisco Catalyst 4500, network operators can now extend control and intelligence to large and small sites at the MAN edge in their EFM networks.

Cisco Catalyst 4500 EFM Solutions

<http://www.cisco.com/warp/public/cc/so/neso/efmsol/>

Ideal for metro Ethernet aggregation and high-density access, Cisco Catalyst 4500 EFM solutions enable service providers to accelerate their growth and profitability with a service portfolio based on optical Ethernet connections to their customers.

#### Cisco Catalyst 6500 Series Switches

<http://www.cisco.com/warp/public/cc/pd/si/casi/ca6000/>

Ideal for metro Ethernet aggregation, the Cisco Catalyst 6500 Series delivers high-performance, multilayer switching solutions to the enterprise and service provider networks. Designed to address the increased requirements for gigabit scalability, high availability, and multilayer switching, the Cisco Catalyst 6500 Series delivers exceptional scalability, price, and performance, and it supports a wide range of interface densities while providing an infrastructure for the delivery of secure converged network services. The addition

of intelligent service modules provides unprecedented control and granularity of services in high-performance networking environments.

#### Cisco 7600 Series Internet Router

<http://www.cisco.com/warp/public/cc/pd/rt/7600osr/>

The Cisco 7600 Series delivers metro aggregation with high-touch Layer 2 and 3 IP services. The Cisco 7600 Series provides Gigabit Ethernet, Dynamic Packet Transport (DPT), and Synchronous Optical Network (SONET) DS0 to OC-48/STM-16 WAN connectivity, with dense Ethernet LAN connectivity up to 10 Gigabit Ethernet. Complete Layer 2 and 3 Multiprotocol Label Switching (MPLS) protocol support means that customer networks can benefit from highly scalable and secure Differentiated Services (Diff-Serv) and quality guarantees.



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