

Increase Profits with a Carrier Ethernet Infrastructure

Service providers, rapidly transforming their service model from basic transport to managed services, are adopting a converged network platform that can generate sustainable competitive advantages and profits. The Cisco® IP NGN Carrier Ethernet design provides an intelligent, high-performance platform for delivering new managed services to consumers and businesses over a truly converged Carrier Ethernet infrastructure.

What You Will Learn

This paper explores the market opportunities for managed services delivered to both residential and business customers, and which areas will see the greatest growth in coming years. The paper then outlines how the Cisco IP Next-Generation Network (IP NGN) Carrier Ethernet design provides a superior platform for delivering converged managed services. An overview of the Cisco Managed Services Solution (MSS) follows, detailing how this comprehensive support solution helps service providers plan, deploy, and monitor secure managed services over Carrier Ethernet. The final sections discuss the cost savings and product components of a Carrier Ethernet infrastructure.

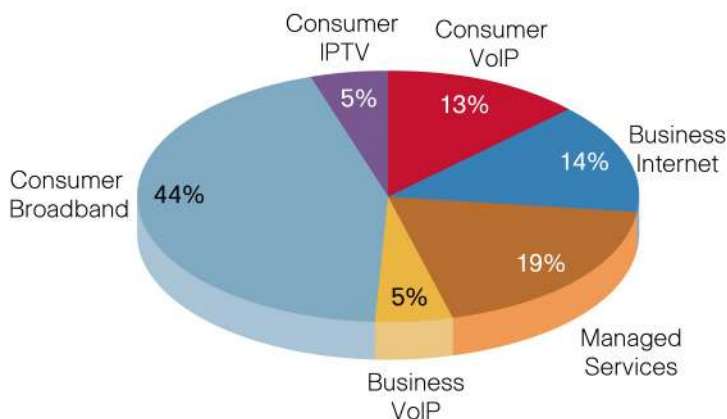
Opportunities for Service Provider Growth

Service providers that seek larger profits must aggressively pursue the hottest new growth areas. Managed services such as managed security, managed customer premises equipment (CPE), and managed unified communications have proven to generate significant revenue. Managed services for enterprise businesses and triple-play services for consumers are also noted as growth opportunities. This means the service provider network must evolve to a flexible, converged platform that can provide a rich combination of services and applications.

Business Service Opportunities

Business customers are particularly attracted to the promise of more bandwidth per dollar, when compared to other services, and the simplicity and familiarity of Ethernet technology. Bandwidth-on-demand is important for many enterprises as they move toward next-generation access solutions. The greatest opportunities in this market are IP-based managed services such as VPN, IP communications, security, and more, which together comprise almost 40 percent of net new revenues for service provider.

The cumulative net new revenue from 2005 to 2009 is expected to be US\$116 billion (source IDC, Gartner, Ovum, MRG, MPA, and Pyramid 2006). Figure 1 shows how this revenue is allocated between business and consumer services.

Figure 1. Carrier Ethernet Market Growth by Segment

The managed services segment for businesses is especially important because it includes high-value services that carry much better profit margins than basic transport services. Recent enhancements to the Cisco IP NGN are designed to help increase service providers' revenues and customer loyalty while making delivery of the services more cost-effective.

Residential Service Opportunities

Residential customers are primarily interested in high-speed services such as IP television (IPTV), voice over IP (VoIP), and broadband Internet access. For users in metropolitan areas with multiple dwelling units or multiple-tenant buildings with a mix of businesses and residents, or where communities have fiber installed to the home, Ethernet fiber to the home (E-FTTH) provides an excellent platform for service delivery. Fiber uniquely allows concurrent use of data, voice, video, and mobility applications, allowing service providers to bundle quadruple-play services into service packages that carry broad market appeal and generate significantly better revenues than single-service offerings. E-FTTH is an integral part of the Cisco IP NGN architecture and can deliver high-value consumer services such as TV on demand and interactive network gaming. With consumer services generating more than 60 percent of new managed services revenues, they are a key success factor for service providers.

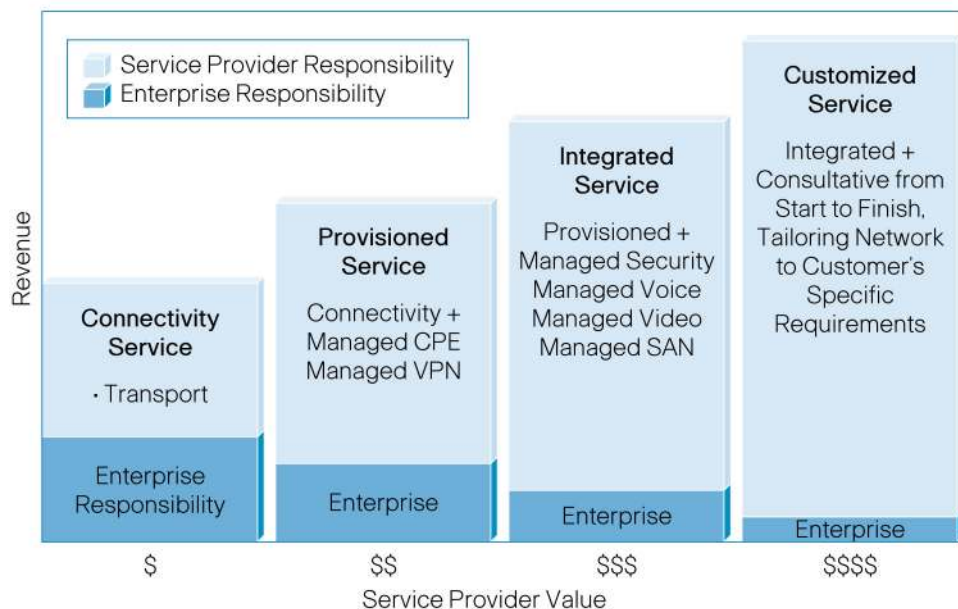
The Bandwidth Explosion

The rapidly spreading use of video on the Internet will lead to a sharp increase in network traffic. Cisco expects network loads to increase 300 percent a year over the next decade in the United States and Europe, which contrasts with recent annual growth in traffic loads closer to 100 percent. Increased network usage means new business opportunities and increased profitability for service providers, because much of the growth will include high-value services with increased profit margins. For this reason alone, service providers must move toward a higher-bandwidth technology such as Carrier Ethernet for their infrastructure.

Capitalizing on Managed Services Opportunities

Global managed services are a large and fast-growing market, and revenues are expected to reach \$42.4 billion by 2009 (source Ovum). Because businesses are increasingly focusing on their core activities and are outsourcing networking tasks, service providers have many opportunities to sell them value-added services. Figure 2 shows the changing market for service providers and illustrates how they will increase revenues in the upcoming years.

Figure 2. Managed Services and Service Provider Value



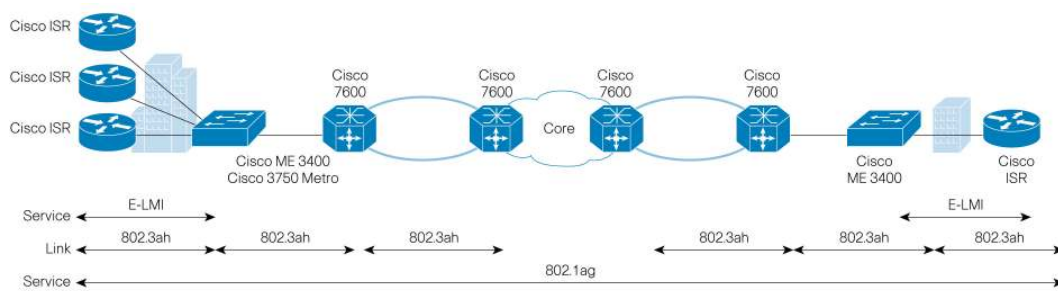
Today, the primary source of revenue for service providers is connectivity services: basic transport services such as high-speed Internet and enterprise VLAN support. The enterprise has the responsibility of managing all its network equipment and configurations. The first step toward increased revenue is provisioned services offerings such as managed CPE and managed VPNs, along with connectivity services. Moving up the value chain, providers can then offer integrated services such as security, voice, video, and storage area network (SAN) support. Ultimately, providers can assume the role of system integrator, designing and delivering customized networking services that meet the specific requirements of each customer. This section describes some of the provisioned and integrated services that providers might offer.

Managed Customer Premises Equipment

The Cisco integrated services router now has Ethernet interfaces that extend standards-based OAM capabilities all the way to the customer premises. Using OAM that spans the Cisco 7600 Series Router, Cisco ME 3400 Series Ethernet Access Switches, Cisco Catalyst® 3750 Series Switches, and Cisco integrated services router, service providers can configure, monitor, and test equipment remotely from the network operations center (NOC). This makes it possible to offer CPE-based managed services in a cost-effective way and makes it easy to add additional high-value managed services. WAN interfaces on the integrated services router are modular, so Ethernet can be added very quickly when migrating from ATM/Frame Relay with minimal effort by service provider technicians.

The management protocols include IEEE 802.1ag for service verification, IEEE 802.3ah for link-layer troubleshooting, and MEF Ethernet–Local Management Interface (E-LMI) with Cisco RapidStart, a Zero-Touch functionality built into the integrated services router for service status and auto provisioning of CPE. Cisco is the first manufacturer to implement E-LMI on both customer-premises and provider-edge network elements. Figure 3 shows an end-to-end configuration and the management protocols.

Figure 3. End-to-End Management



Without Ethernet OAM, the NOC operator lacks the visibility into the network necessary for effective troubleshooting. The only alternative is to mobilize a truck and send people out into the field. Technician visits are one of the most significant contributors to the operating expenses of managing an access network. Not only are they expensive, but they also require a great deal of time.

Managed CPE has advantages far beyond simple monitoring and troubleshooting. Using Ethernet OAM, service providers can change service features, such as bandwidth allocations, with simple software configurations at the NOC. And they can add new services such as managed VPN, security, and managed IP communications, just as easily.

Managed IP VPN Services

Enterprise IT managers increasingly rely on managed VPN services to contain costs, improve security, streamline their corporate networks, and strengthen external relationships with customers, suppliers, and partners. According to a 2006 study by Ovum, worldwide managed IP VPN services revenue is expected to rise from US\$12.1 billion in 2005 to \$19.4 billion by 2009, achieving close to a 13 percent compound annual growth rate. The inherent any-to-any connectivity of IP VPNs lowers the total cost of ownership for a service provider. Managed VPN services simplify deployments of QoS for data and voice traffic, improve security, and offer critical capabilities such as high availability and multicasting. Managed VPN services have emerged as a solid starting point to deploy many value-added services while helping enterprises converge existing networks onto a consolidated infrastructure to support combined data, voice, and video services.

Managed Voice Services

The market for managed business voice services offers tremendous potential. Forecasts from research firms Ovum, Gartner, and Probe estimate that service providers will generate more than US\$12 billion through 2007 from business voice services in the United States alone. The Cisco IP NGN Carrier Ethernet design provides an excellent platform for delivering voice services because the IP and Multiprotocol Label Switching (MPLS) protocols can classify and prioritize voice traffic and can support authentication and encryption when necessary. Because users expect voice circuits to have very high availability, resiliency is especially important. Service providers can

implement resiliency using fast spanning tree (802.1w) at the access layer and use route processor redundancy, stateful switchover, and MPLS reroute in the core.

Voice over Carrier Ethernet is already available from service providers worldwide. In the United States, for example, Cbeyond in Atlanta, Georgia, uses a Cisco network to deliver an integrated package of high-quality local and long-distance telephony services, high-speed Internet access, and Internet-based applications to small businesses for approximately the same price that small businesses typically pay for local and long-distance phone service alone. The cost savings that service providers achieve using the Carrier Ethernet design can be passed on to business customers, triggering faster service adoption and greater customer loyalty.

Managed Security Services

The compound annual growth rate for managed security services is almost 30 percent worldwide (source Infonetics 2006). Businesses are losing money and credibility with inadequate security systems that cannot mitigate viruses, unauthorized access, distributed denial-of-service (DDoS) attacks, and insider network abuse. At a time when network attacks are increasing and the methods used to perpetrate break-ins are becoming more technically sophisticated, customers and their network service providers require a comprehensive security solution.

Because service providers are much better prepared to manage security features than many businesses, they can capitalize on this opportunity. The first line of defense for securing the customer's network is the Cisco integrated services router, where the service provider can manage a firewall, intrusion detection, secure VPNs, DDoS protection, traffic filtering, context-based access control, and much more.

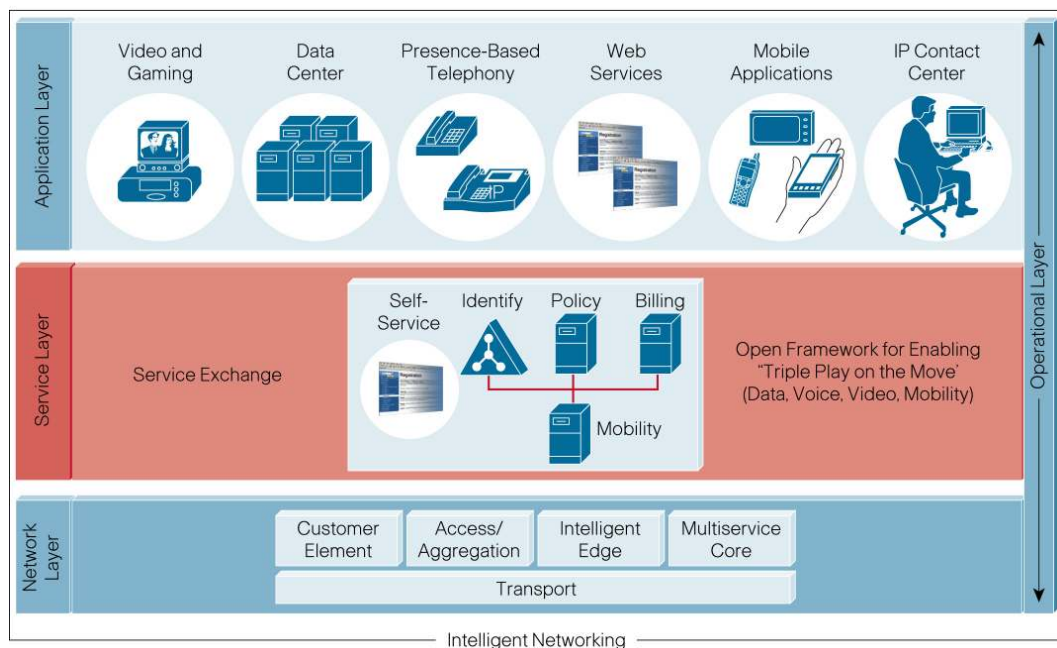
Managed Storage Area Networks

High-tech companies now store terabytes of data, and the growth continues—in some cases storage capacity is doubling every year. Cisco, for example, currently has 500 terabytes of storage. Many companies are planning for growth to a petabyte (1000 terabytes) of storage in the near future. The average enterprise now has 50 to 100 terabytes. The SAN topology is often geographically distributed and requires the high-speed communication links that Carrier Ethernet can provide.

This growth in storage has been driven by corporate applications, particularly enterprise applications such as resource planning and customer relationship management, which are highly networked and typically run from a corporate or divisional data center. These applications support day-to-day business operations, creating enormous challenges for storage. They have been the principal driver of new storage solutions over the past few years, especially for the SAN.

The Cisco IP NGN Carrier Ethernet Design

The Cisco IP NGN (Figure 4) delivers a vision and architecture that can bring about a broad, sweeping transformation of service providers' networks and business models. It can deliver a sustainable competitive advantage and increase profit opportunities for service providers by helping them develop and plan their organizations, network architectures, and business models for the future.

Figure 4. Cisco IP NGN Model

The Cisco IP NGN model shown in Figure 4 defines three layers: application, service, and network. At the network layer, the IP NGN Carrier Ethernet design implements the converged NGN architecture using Carrier Ethernet and IP/MPLS. With the IP NGN Carrier Ethernet design, service providers can deliver Ethernet-based business services and residential triple-play services over a single converged Ethernet infrastructure and increase revenue per customer without significantly increasing capital expenditures.

With the IP NGN Carrier Ethernet design, each service is pragmatically treated with the appropriate level of intelligence to optimize its delivery over Carrier Ethernet. For example, video services employ Layer 3 for efficient multicast and resiliency with per-service QoS. The IP NGN efficiently uses network resources to control costs and achieve consistently high service quality. This is a flexible design that has intelligence to support content injection to monetize future services and is optimized to converge both consumer and business services.

Cisco provides the Service Exchange Framework (SEF) as a mediation and interworking entity between existing and emerging service delivery protocols, enabling a gradual, smooth, and profitable migration toward a next-generation architecture based entirely on IP Multimedia Subsystem (IMS) standards. The Cisco SEF approach basically previews what IMS will address after service providers assess their investments in existing broadband service delivery architectures. The Cisco solution allows environments featuring business policies and authentication, authorization, and accounting (AAA) tools to be built and utilized today, but is also capable of supporting core IMS and other service subsystems when service providers are ready to implement them.

Advantages of Carrier Ethernet

Carrier Ethernet can deliver cost-effective, high-speed connectivity for metropolitan area network (MAN) and WAN applications. It has the advantages of being easy to use, relatively inexpensive, efficient in its transmission of data, and supported by a multitude of vendors. Many businesses of all sizes today want a scalable way to extend their corporate LANs into a MAN or WAN. Carrier

Ethernet services provide scalable bandwidth in flexible increments, with simplified management and faster, lower-cost provisioning. Companies needing to link multiple offices around a metropolitan area or to connect data centers for backup or disaster recovery purposes can benefit from Carrier Ethernet.

Business Agility

Service providers that deploy Carrier Ethernet services are in a good position to offer new services to their customers. Often, service providers can add new services without upgrading the CPE or sending an installer, which means faster, easier introduction of new service offerings and quicker reactions to competitive changes in the market. Existing protocols and equipment often take months of planning and deployment before new services are available.

Expense Reductions

Carrier Ethernet reduces capital and operational expenses for service providers in the following ways:

- **Less expensive equipment:** Customers only require a Cisco integrated services router. Because of Ethernet's widespread use and its technical simplicity, the equipment is relatively inexpensive compared to equipment supporting other protocols.
- **Familiar technology:** Enterprises already using Ethernet in their LANs typically have in-house skills for managing, maintaining, and troubleshooting these networks and need few additional skills to manage a connection to a Carrier Ethernet network.
- **Long life:** Gigabit Ethernet over optical fiber provides enough bandwidth to ensure a long lifespan – 20 years or more – for the network infrastructure.

Platform Unification

Carrier Ethernet is a far more flexible platform than older technologies and has the following inherent advantages:

- **Broadband capacity:** Carrier Ethernet supports bandwidths from 10 Mbps to 1000 Mbps for point-to-point or point-to-multipoint connections between multiple customer sites, and standards are being developed for even higher speeds.
- **Scalable bandwidth:** Carrier Ethernet bandwidth can be increased or decreased from megabits per second to gigabits per second in increments of megabits per second. The bandwidth is easily changed with software reconfiguration, and usually does not require faster network interface cards or CPE.
- **Symmetrical transmission speeds:** Carrier Ethernet provides Internet access that is extremely fast for both send and receive, which is important for applications like video conferencing. Most existing broadband DSL connections are asymmetrical, which assumes that most users will download more data than they upload.
- **Integration and compatibility:** Transmitting data from an Ethernet-based LAN to an Ethernet-based MAN eliminates the need for protocol translations, which can introduce overheads in terms of delays and traffic volume. It is also less likely that the data will lose features.

Why Adopt Cisco Carrier Ethernet?

Cisco offers far more than the intrinsic advantages of Metro Ethernet Forum (MEF) service connectivity (MEF 9/MEF 14). Cisco's IP NGN Carrier Ethernet design and comprehensive

solutions for managed services provide the building blocks for increased service profitability and decreased operational expenses. A key enabler of these advantages is the end-to-end management of operations, administration, and maintenance (OAM) that Cisco uniquely provides. The Cisco IP NGN Carrier Ethernet design extends Ethernet OAM all the way to the integrated services router (ISR), enabling the addition of managed services.

Service Management to the Customer Premises

Cisco supports end-to-end OAM capabilities for Carrier Ethernet. With the Cisco integrated services router at the customer premises, service providers can extend manageability to the CPE. This capability allows service providers to rapidly deploy managed business services with a higher level of confidence.

End-to-end management has many benefits, including the following.

- Lower management expense: With OAM capabilities to the customer premises, many service changes and problems can be resolved in the network operations center.
- Lower deployment expense: Cisco RapidStart reduces the amount of time a technician must spend at the customer site when installing a new router.
- Greater customer confidence: As service providers add more carrier-class features, such as SONET/SDH-like restoration, class of service/QoS, and end-to-end service-level agreements (SLAs), their networks can support business-critical applications with performance guarantees.

Comprehensive Solutions

Cisco provides a broad solution for service providers that want to deploy Carrier Ethernet and managed services. The solution includes the Cisco IP NGN Carrier Ethernet design, the Cisco integrated services router, and the Cisco Managed Services Solution (MSS). The Cisco MSS is a comprehensive solution that assists service providers with the planning, implementation, and monitoring of secure managed services over Carrier Ethernet. Once the Carrier Ethernet platform is in place, service providers are well positioned to capitalize on the fast-growing managed services market. Other Carrier Ethernet equipment providers tend to focus on triple-play IPTV without offering CPE-based managed services.

Cisco Support in Deploying New Managed Services

With the Cisco integrated services router as the endpoint of a Carrier Ethernet solution, Cisco MSS simplifies the planning, deployment, provisioning, and management of CPE and security. For the service provider, this means increased efficiency and lower TCO for Carrier Ethernet services. Cisco MSS has three parts:

- Professional services: Support the planning, deployment, and optimization of managed services through a lifecycle approach
- Integrated services router: Provides OAM features for remote management
- Network management software: Provisions, configures, and monitors the CPE

Initially, Cisco works with the service provider to plan and design the service. The solutions developed are based on pre-tested templates that support managed VPN and security services (IPsec, NAT, firewall), and provide the capability to add other high-value managed services later.

With the Cisco MSS, service providers can use a zero-touch configuration process to deploy the Cisco integrated services router:

- Step 1. Service provider stages the Cisco integrated services router with security service provisioning templates
- Step 2. Service provider ships the preconfigured Cisco integrated services router to the customer site.
- Step 3. Customer connects the Cisco integrated services router to the WAN link.
- Step 4. Cisco RapidStart automatically brings up Carrier Ethernet.
- Step 5. The Cisco integrated services router communicates with Cisco MSS at the NOC to request activation of pre-provisioned security services.
- Step 6. The NOC operator acknowledges request and activates the configuration.

Cisco management software has open APIs that support interaction with the operations support system (OSS) and business support system (BSS) for service activation and billing requirements.

Reduce Operational Expenses

Carrier Ethernet services can provide operational savings of approximately 30 percent, mostly because of the reduced labor needed by field technicians to provision and test Carrier Ethernet services. And the Cisco MSS program helps service providers reduce front-end expenses related to planning and design. The following sections discuss how.

Lower Service-Deployment Costs

The operational expense of delivering service to a new customer can be significant. It requires resources from planning, engineering, field technicians, and network operations. But one of the largest expenses is deploying new equipment to the customer location. Service providers can significantly reduce the time and expense of deploying Carrier Ethernet at the customer site using Cisco RapidStart, which uses standards-based E-LMI communications based on MEF16 to automatically configure the Cisco integrated services router.

Cisco RapidStart works as follows:

- Step 1. Technician installs the Cisco integrated services router at the customer site
- Step 2. The Cisco integrated services router communicates with the service provider's Cisco ME 3400 Series Ethernet Access Switch
- Step 3. The switch responds with available Ethernet connection services
- Step 4. The Cisco integrated services router confirms connections

This procedure significantly reduces the amount of time that technicians spend at the customer site because they only need to install the equipment; configuration and startup is automatic.

Simplify Service Upgrades

Service upgrades for managed CPE is often as simple as software configuration at the NOC. There is no need to travel to the customer site to install higher-bandwidth interfaces or change the demarcation point. A single 100 Mbps Ethernet port can simultaneously support Internet access, voice, and transparent LAN services over separate logical VLANs. With older services, this is much more difficult and expensive, and given the 45-Mbps limit of Frame Relay, may require

multiple connections. Because of the simplicity of configuring new services on existing CPE, the payback for the new service is nearly immediate.

Reduce Capital Expenses

Ethernet networking costs are decreasing rapidly due to economies of scale, less expensive routing and switching equipment, higher port density, and increasing competition. Many analysts believe that emerging Ethernet-based network architectures will set the standard for price, performance, scalability, and speed of provisioning.

Estimate the Profitability of Carrier Ethernet

Service providers have business models that vary widely in their revenue and cost structures. Cisco has developed several tools to help service providers estimate the profitability of Carrier Ethernet and managed services, using their own business model.

One of these tools is the Service Provider Profitability Tool, an Excel spreadsheet where service providers enter their business, service, and cost information. This information includes the number of employees and sites, service offerings, equipment used, leasing expenses, as well as operational expenses such as maintenance, customer service, and provisioning. The results include ROI and payback period, and are displayed in both graphs and in tables. Figure 5 shows the calculated profitability for a service provider that deploys a number of managed services to a company with 500 employees.

Figure 5. Sample Results from Service Provider Profitability Tool

HQ Platform: Cisco 2851 Branch Platform: Cisco 2821		Sample Business with 500 Employees and 12 Sites							
	MRS	Firewall	VPN	MLS	IPC	RA-VPN	IDS/IPS	WLAN	Total
Recurring Revenue	\$3,000	\$2,400	\$2,400	\$7,500	\$20,000	\$200	\$2,400	\$600	\$38,500
Recurring Costs									
Maintenance	\$362	\$-	\$228	\$729	\$329	\$-	\$283	\$35	\$1,966
Operating Lease	1,630	0	976	859	709	0	0	142	4,317
Customer Service	75	75	75	1,075	1,075	6	75	75	2,531
Additional Sales Care	180	144	144	450	1,200	12	144	36	2,310
Additional G&A	225	180	180	563	1,500	15	180	45	2,888
Other IP Service Costs	0	0	0	0	5,975	0	0	0	5,975
Recurring Margin	\$528	\$2,001	\$797	\$3,824	\$9,211	\$167	\$1,718	\$267	\$18,514
Nonrecurring Revenue	\$6,000	\$3,000	\$3,000	\$3,000	\$25,000	\$250	\$3,000	\$1,800	\$45,050
Nonrecurring Costs									
Sales and Marketing	\$4,320	\$3,456	\$3,456	\$10,800	\$28,800	\$288	\$3,456	\$864	\$55,440
Provisioning	510	168	168	168	168	168	168	168	1,688
Hardware (Incl. NMS/OSS)	126	0	1,791	273	0	0	1,890	450	4,530
Net Nonrecurring Costs	\$1,044	\$(624)	\$(2,415)	\$(8,241)	\$(3,968)	\$(206)	\$(2,514)	\$318	\$(16,608)
Payback (Months)	0	1	4	3	1	0	0	0	1
ROI for 1 Year, %	249%	745%	232%	435%	468%	493%	428%	338%	433%

This sample shows how quickly a service provider can earn back the initial investment (one month) and estimates the ROI (433 percent). Many of the managed services have virtually no payback period because they can be provisioned in software over the existing Carrier Ethernet service, with no new equipment and no site visits.

Service providers who want to use these tools should contact their local Cisco account manager.

Ensure Service Quality and Availability

An initial concern about Carrier Ethernet was its ability to handle delay-sensitive traffic, like voice and video, and its ability to sustain high availability with QoS guarantees that customers have come to expect. Service providers are especially interested in these characteristics because their business customers require service guarantees in the form of SLAs. Ethernet technologies and protocols now can satisfy the most demanding business requirements.

High Availability

A highly available network is one that continues to deliver services to customers even when equipment or communication links fail. High availability relies primarily on redundant equipment and communication links that recover from a failure in milliseconds. For example, customers can have two links to the service provider, so that if one goes down the other can take over. Protocols such as Spanning Tree Protocol can detect the failure and quickly reroute traffic to the operational link.

Routers and switches in the core and access network support many high-availability protocols, including nonstop forwarding, stateful switchover, route processor redundancy, and MPLS fast reroute. And for detection of failures at the customer edge, 802.3ah monitors the link and 802.1lag manages the service. Today's Ethernet networks can match the availability of traditional voice circuits, which are expected to always be available.

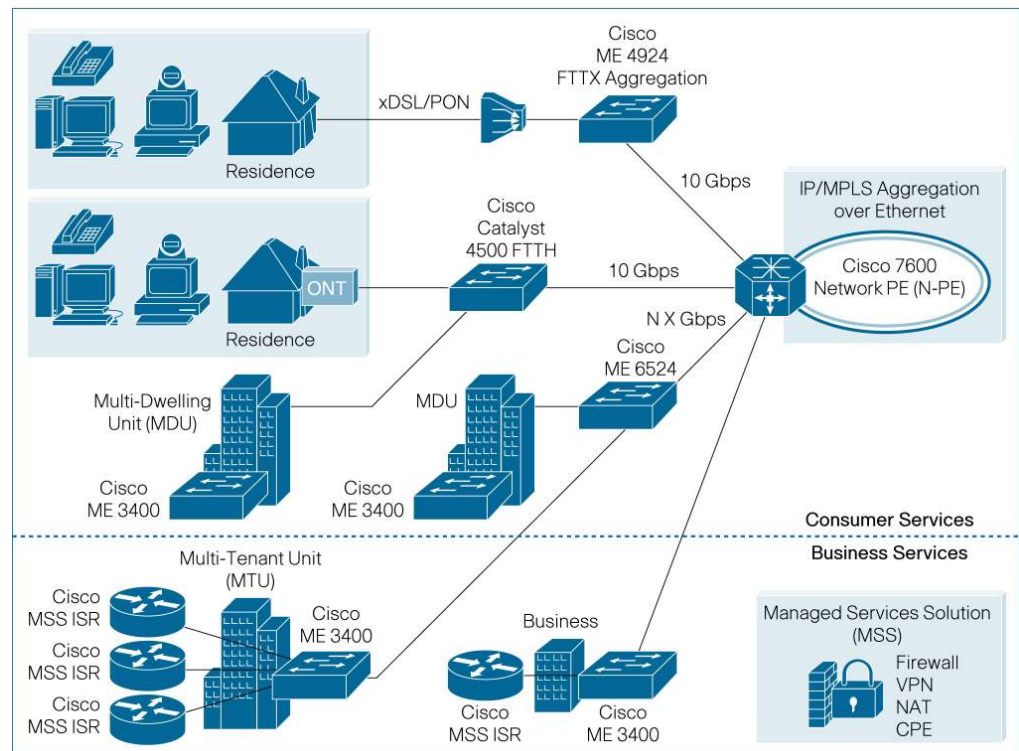
Quality of Service

With the Cisco IP NGN Carrier Ethernet design and its Carrier Ethernet transport, QoS can be applied in a granular way because the infrastructure classifies each frame or packet in the network based on its Ethernet class of service (CoS), VLAN, access interface, or even by application. This allows service providers to offer QoS specific to an application, guaranteeing minimum delay, jitter, packet loss, and bandwidth for that application. As services other than voice and data are added to the network, defining the attributes of a service becomes increasingly important and is the foundation for service differentiation among service providers.

Cisco platforms offer robust QoS using 802.1p CoS and differentiated services code point (DSCP) at Layer 2 and Layer 3 respectively. This network traffic management intelligence helps ensure that network traffic is classified, prioritized, and scheduled in an optimal way, efficiently servicing bandwidth-hungry, time-sensitive applications. Service providers can choose either to deploy intelligent CPE devices that mark application-specific traffic with appropriate tags, or to police and mark traffic per application type at the distribution layer

The Cisco Solution

The Cisco IP NGN Carrier Ethernet design with its Carrier Ethernet transport provides a flexible platform for both consumer and business services. Figure 6 shows the topology of a converged Carrier Ethernet network.

Figure 6. IP NGN Converged Carrier Ethernet Design

On the consumer side, Figure 6 shows xDSL and FTTH access to single-family residences or multi-dwelling units. For businesses and business-oriented multi-tenant units, direct fiber connections to the Cisco ME 3400 Series switches are used. This series has two new models that can be used in either consumer or business applications. The Cisco Catalyst 4500 Series Switch and Cisco ME 4924 Ethernet Access Switch support the consumer applications for FTTH Ethernet as well as for xDSL and Passive Optical Network (PON) aggregation. Scientific Atlanta®, a Cisco company, provides an in-home termination device – an optical network terminal (ONT) – for consumer services. Cisco MSS combined with the integrated services router provides CPE-based managed security services over the same IP NGN Carrier Ethernet infrastructure.

The Cisco IP NGN Carrier Ethernet design includes the Cisco ME 3400 Series Ethernet Access Switches, which provide the primary platform for business services over Carrier Ethernet. These switches are the first in the industry optimized for both residential triple-play and business VPN services. The Carrier Ethernet design also includes Cisco 7600 Series Routers, Cisco ME 6500 Series Aggregation Switches, Cisco Catalyst 6500 Series Switches, Cisco Catalyst 3750 Series Switches, and Cisco 1841, 2800 Series, and 3800 Series Integrated Services Routers. Optical switches include the Cisco ONS 15310, ONS 15454, and ONS 1531 MA platforms.

The following products complement the Carrier Ethernet line:

- Cisco Catalyst 4900 Series Switches with the Cisco ME 4924 Ethernet Access Switch with 10 Gbps access aggregation capacity for xDSL or PON deployments.
- Scientific Atlanta's FTTH optical network terminal (ONT) for Ethernet and video. This innovative indoor customer premises device can serve as the network termination point at the subscriber's location. It features an Ethernet interface for 10/100 Mbps high-speed data, voice services and IP video, and a coaxial interface for broadcast video.

Broadband routers such as the RT042 from Linksys[®], a division of Cisco. The QoS feature on the RT042 allows consumers to define how much of the available bandwidth is allocated to each device on their home network. This allows users to prioritize time-sensitive data such as VoIP phone calls or streaming media ahead of less-sensitive e-mail and Web browsing. The dual Internet ports allow for a second Internet line for additional bandwidth.

Conclusion

Service providers can now confidently deliver profitable business and residential services over a Carrier Ethernet infrastructure by adopting the Cisco IP NGN with the Cisco IP NGN Carrier Ethernet design. On this platform, they can generate new revenues from secure managed services, reduce operational and capital expenditures, accelerate deployment with the Cisco Managed Services Solution, and assure service levels with end-to-end management. Most importantly, the IP NGN architecture has the flexibility and application intelligence that enables providers to heighten the value of their services, moving beyond simple connectivity to managed application services for both consumers and businesses. By managing these value-add services, providers can increase profits and create a loyal customer base.

For More Information

To learn more about Cisco Managed Metro Ethernet services and other Metro Ethernet solutions, visit: <http://www.cisco.com/go/metroethernet>.



Americas 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: 408 527-0883

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

Europe Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: +31 0 800 020 0791
Fax: +31 0 20 357 1100

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

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