

# What enterprise executives need to know about Optical Ethernet network services

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## eBusiness and its challenge for the enterprise executive

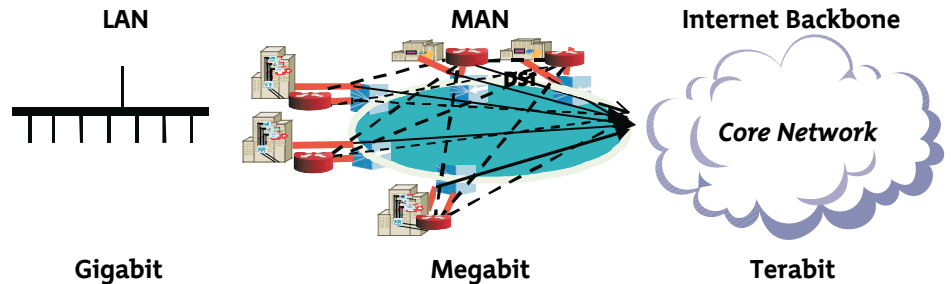
Successful eBusiness implementation is one of the primary challenges facing enterprise executives today—how to staff it, how to distribute it, how to deliver it, and how to maintain it. eBusiness includes conducting eCommerce and servicing customers over the Internet as well as interacting with suppliers. These uses of the network are critical to operating the business.

Innovative technology solutions, like Optical Ethernet, are emerging to address these challenges giving enterprise executives the means to excel in the eBusiness age.

Significant advances in technology usually drive changes to existing computing models. This paper assesses the capabilities of the current enterprise-computing model in meeting today's eBusiness requirements. The paper also provides an introduction to new high-performance services, delivered through Optical Ethernet, which will help enterprise executives to realize their eBusiness vision.

### Time to service—How eBusiness success is measured

How well an enterprise adapts to change and how quickly enterprise executives can deploy the latest services and applications for their customers are new criteria against which businesses are now being measured. In many industries, time-to-service is a strategic weapon where



*To realize the promise and rewards of eBusiness, enterprise managers require a radical new approach to traversing the Metropolitan Area Network (MAN) and addressing its current bottleneck.*

being first to market equates to competitive advantage and ultimately results in a leadership position for an enterprise.

Since eBusinesses are always “open,” the capability to add, delete, and change services quickly and seamlessly is an ongoing challenge. Today's best-effort Layer 3 networks are failing to meet all of the demands for real-time applications, such as IP telephony, desktop and web collaboration, and video conferencing. Compounding the situation is the lead-time that service providers need to fulfill requests for additional network services or changes in service to expedite delivery of these applications.

With Optical Ethernet networking, critical services can be rapidly deployed in response to an enterprise's needs.

### Contending with the bandwidth bottleneck

Bandwidth in the Local Area Network (LAN) has exploded. Five years ago, fifty users shared 10 megabits. Today, a single

user can consume that amount of capacity. Optical technology can now provide 10 gigabits on a single lambda and 160 lambdas over a single fiber for long distance and core networking services. With the boom of new applications, all of this bandwidth can be put to good use by today's enterprises. However, in order to enable the new eBusiness services that run on high-speed, high-bandwidth networks, enterprises need to interconnect their gigabit LAN backbones to each other as well as with the Internet.

While growth has driven the LAN to gigabit Ethernet speeds and to fiber optics in the Wide Area Network (WAN), access speeds in the Metropolitan Area Network (MAN) are still mostly in the megabit range. MANs, originally built for voice-centric traffic, are not robust enough to meet the gigabit requirements of today's enterprises in a data-centric world. Under the current MAN infrastructure (which is SONET-, ATM-, and frame relay-based), implementing next-generation services can be difficult.

Even as the residential community is improving performance (Ethernet via ADSL or cable modem), the enterprise customer is often still restricted to traditional interfaces, such as DS0 and DS1. To realize the rewards of eBusiness, enterprise managers need a radical new approach to traversing the MAN and addressing its current bottleneck.

### **Staffing—A critical shortage**

With the push for more and more processing, the demand for skilled computing resources is likely to continue to outpace their availability. The size and complexity of enterprise computing environments, plus the networks that power them, drive an almost insatiable demand for Information Technology (IT) talent. In the past year, there were over 800,000 IT jobs that remained unfilled, and that number will continue to climb as enterprise networks grow and become more complex.

As a result, enterprise executives need to do more with the resources that they currently have while leveraging the latest technological advances that will help to drive their businesses forward. Many managers are also under intense pressure to hold the line on IT spending while facing an unprecedented growth in user computing and communications requirements.

Optical Ethernet can provide solutions that help executives manage the staffing challenge while providing significantly more capability to the enterprise network.

### **Rethinking the client/server and networking models**

With the advent of a multitude of data-intensive applications associated with the Internet, including eCommerce, Customer Relationship Management (CRM), third-party interfaces with supply chain partners, and Network Attached Storage (NAS), the current client/server computing model and its supporting communications networks are becoming overloaded, increasingly complex, and expensive to implement and operate. Enterprise executives may need to rethink their approach and look for a long-term solution that maximizes return on investment and that satisfies strategic business requirements. Consider the following:

#### **What drives IT spending patterns?**

The client/server model evolved because networking between branches and corporate offices was slow and expensive. Today, applications and data continue to be distributed to the user. Enterprise computing systems push data to users' desktops via local and regionalized servers that are located all over the network. These servers must be configured, operated, and maintained at each location by skilled technicians. In addition, IT departments need to support existing, legacy computers and applications, including SAP, inventory management, and databases of all sorts, in potentially thousands of locations—all of which must be interconnected. As an Enter-

prise's requirements for communications services grow, the entire computing and networking environment becomes more complex, more expensive, and harder to operate and maintain.

#### **How have the enterprise computing and networking models changed?**

Yesterday's network design paradigm, the "80/20 rule," no longer applies. In the past, 80 percent of the network traffic stayed within the LAN, and only 20 percent flowed beyond the enterprise. Enterprise traffic consisted mostly of electronic mail and shared applications. Servers were usually local, and any traffic that left a site went to a legacy computer for database and processing applications.

With the growth of eBusiness, multimedia applications, video streaming, and real-time video conferencing, the traffic patterns are changing. More and more traffic is leaving the local enterprise network and is traversing the MAN and beyond to reach its destination. In fact, the old 80/20 paradigm is on the way to reversing itself completely so that 20 percent of the traffic is site-centric, while the remaining 80 percent leaves the originating enterprise site and traverses external networks.

#### **A new standard is needed**

Instead of bringing the data to the users by deploying even more servers across the network and requiring more

connections with costly services and personnel to support them, enterprises can leverage their networks to bring the users closer to the data, which is centralized in one or more locations. To accomplish this, more bandwidth and higher speeds will be demanded from the network to support the text, graphics, and streaming video that users want and need. By combining Ethernet with fiber optics, this new model can be achieved.

## What is Optical Ethernet?

*Optical Ethernet* combines the power of Ethernet and Optical technologies to extend corporate business applications across the metropolitan, the regional, and the wide area networks providing high-bandwidth, high-reliability, and high-performance.

Ethernet is the logical choice to begin the transformation of the MAN from a bottleneck to a strategic component of the eBusiness success formula because Ethernet:

- Has connected corporate networks within buildings for over 25 years
- Is already present in over 90 percent of businesses today
- Is a well-known, mature technology
- Can scale from megabits to gigabits per second
- Is already resident on most computers sold today

***Optical Ethernet enables service providers to offer enterprise customers these leading-edge solutions that break through the bandwidth bottleneck to achieve successful implementation of eBusiness solutions.***

| Name of service                               | Description  | Why it is important to enterprise executives  |
|---|--|---|
| <b><i>Optical LAN services</i></b>            | Connectionless LAN extension across the MAN and WAN to other sites with traffic prioritization   | Maximizes resources by extending the LAN across the MAN/WAN   |
| <b><i>Internet access services</i></b>        | Internet, Intranet, and Extranet access  | High-speed, connectionless access to the Internet; seamless communication   |
| <b><i>Wide area connectivity services</i></b> | Extends the LAN across the metro and long-haul networks  | Enables seamless, end-to-end connectivity   |
| <b><i>Multiservice transport services</i></b> | Provides voice, video, and/or data over the same line  | Inherently reliable and efficient; provides a single point of access for all traffic and allows for traffic prioritization                            |
| <b><i>Outsourced network services</i></b>     | Includes services, such as: <ul style="list-style-type: none"> <li>• Optical routing for Intranet and Internet</li> <li>• NAT/Address management</li> <li>• Security management</li> <li>• Enabled outsourced applications, such as storage networking services and disaster protection</li> </ul> | Value-added services that enable an enterprise to consolidate operations, simplify management, and free resources to concentrate on core competencies |

Ethernet uses a well-understood standards-based technology, Virtual Local Area Network (VLANs), to implement high-performance services. Ethernet is connectionless, protocol independent and, as a Layer 2 technology, it eliminates the need for the complex service configuration and conversion associated with running Layer 3 over multiple connection-oriented Layer 2 services.

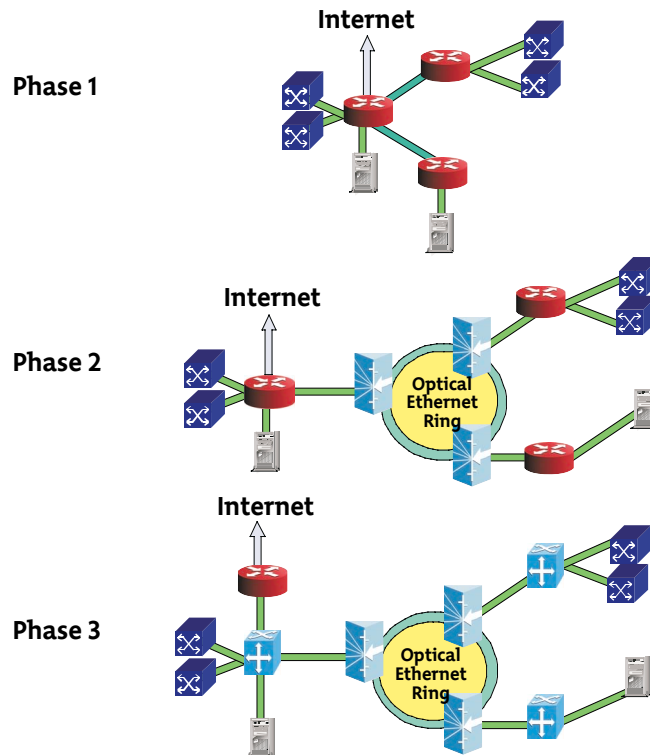
Optical technology, which is already successfully deployed in Internet backbone networks, offers these additional benefits to the Ethernet networks that enterprise managers already know and use:

- Simplified networking
- Scalability
- Quality of Service (QoS)
- Security
- Reliability

### Simplified networking

Because it operates at Layer 2 instead of Layer 3, an Ethernet-based network is, by its nature, simpler to operate, faster to implement, and easier to maintain.

Optical Ethernet technology enables enterprise managers to move routers to the edge of the network where they add the most value. Instead of requiring a router at every site connected to the network, one central site houses a single enterprise router, and all Ethernet traffic that accesses this enterprise router travels



*In this example, Optical Ethernet technology enables enterprise managers to move routers to the edge of the network where they add the most value.*

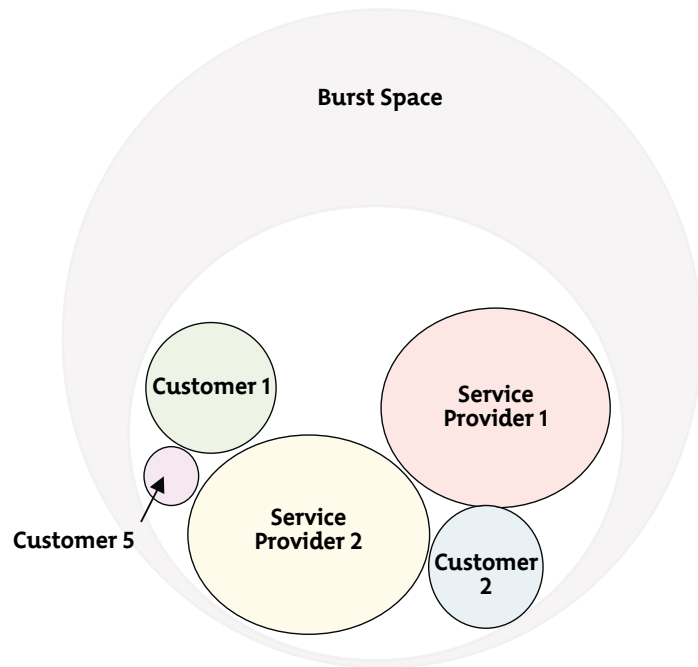
via an optical ring or point-to-point connection to the central site where the routing then takes place.

Using a centralized router simplifies the enterprise network and can result in significant cost savings as individual site routers are eliminated, as well as the complexity and cost of operating and managing them. Only LAN-to-LAN connections and Internet traffic are passed through enterprise routers. All local traffic stays within the less complex Layer 2 network.

Who owns the enterprise router and where it is located depends on the enterprise's business strategy. For example, the equipment and the central site can be owned and operated by an enterprise's telecommunications service provider. The enterprise can outsource Layer 3 routing, including any traffic that traverses the Metropolitan Area Network (MAN) to a service provider. This allows enterprises to realize savings in staffing, hardware, floor space, technical training, and other IT budget items.

## Scalability

An Optical Ethernet network can provide unprecedented scalability for metropolitan area networks by enabling enterprises to choose bandwidth increments from one megabyte to ten gigabits, depending on their needs. Some service providers offer services that allow enterprises to provision additional bandwidth-on-demand to accommodate uneven or bursty traffic flows. Consuming bandwidth on a “just in time” basis can eliminate an enterprise’s need for fixed-cost leased lines, which offer only a fraction of the bandwidth available with Optical Ethernet usually at substantially higher cost.



## Quality of Service (QoS)

Unlike traditional Ethernet, Optical Ethernet is not a best-effort-based technology. When implemented as a Virtual Private Network (VPN), Optical Ethernet provides the means to handle the all intersite eCommerce traffic required by today’s enterprises. Such a VPN can provide guarantees for mission-critical applications, including sales order and inventory management, and enable the enterprise to realize sales revenue in a timely manner.

For example, the enterprise manager can control the flow of traffic simply and globally by using a fixed service to map all of the enterprise traffic by the type of service. A classification filter would then read the tagged Ethernet frame to

*With Optical Ethernet, enterprises buy only the bandwidth they need.*

determine the traffic prioritization. Optical Ethernet supports marking of traffic at the network edge using the 802.1p standard.

## Security

Site-to-site access is inherently more secure using fiber optics technology because, by default, photonic technology is more difficult to compromise or penetrate than are packets flowing through a traditional, leased line.

Because the Optical Ethernet services can extend beyond the corporation, enterprises can continue to use their existing security mechanisms, including fire-

walls, Network Address Translation (NAT), and encryption to protect their data without any changes.

## Reliability

Optical Ethernet is inherently more reliable since it combines the strength and simplicity of Ethernet with the robustness, the resiliency, and the “five nines” (99.999) reliability that is proven with optical networks. Carrier-grade, self-healing equipment adds to the inherent reliability of the fiber optics technology so a service provider can accommodate “always open” eBusiness applications for an enterprise.

## Flexible portfolio of services

Adopting Optical Ethernet networks will enable enterprise managers to choose from a variety of specialized services that can be rapidly deployed, easily provisioned, and remotely maintained by a service provider or by the enterprise itself.

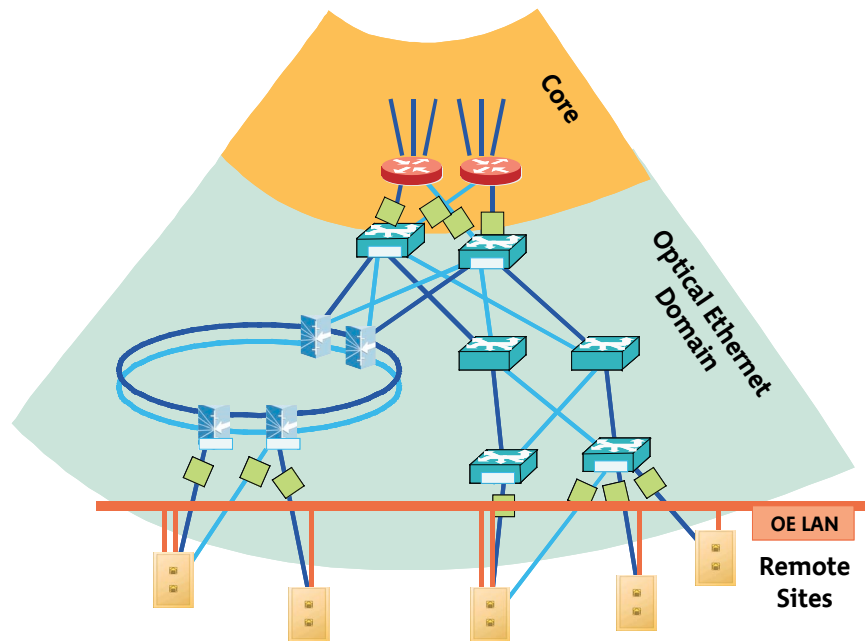
For enterprise managers, the possibilities are exciting, and the risks are minimized. They will be able to implement or contract for competitively priced, high-speed, high-value services, such as:

- Optical LAN services
- Internet access services
- Wide area connectivity services
- Multiservice transport services
- Outsourced network services

## Optical LAN services

Optical LAN service (OLS), the foundation of Optical Ethernet applications, extends the LAN across the metropolitan, regional, and wide area networks by using secure Virtual Local Area Network (VLAN) technology. Analogous to a Transparent LAN or VPN service, OLS is simple to implement and delivers immediate value, including:

- Increased bandwidth without changes to the existing enterprise network topology
- Robust and scalable transport infrastructure



*To the enterprise user, an Optical LAN appears as a robust, trustworthy Ethernet segment.*

- Cost-effective network simplification
- Power, reach, and reliability of optics

Optical LAN services include the connectivity that service providers currently offer to enterprise customers but with significantly more bandwidth, higher speeds, and faster deployment for a time-to-service advantage.

After the Optical LAN services are in place, enterprises can add other Optical Ethernet services to enhance the effectiveness of their IT infrastructures and to facilitate the implementation and delivery of their eBusiness products and services.

OLS allows service providers to share resources and provision fiber among multiple customers to leverage their cost structure and offer competitive service pricing. For enterprise managers, this means an easy, cost-effective way to securely link enterprise sites across the globe.

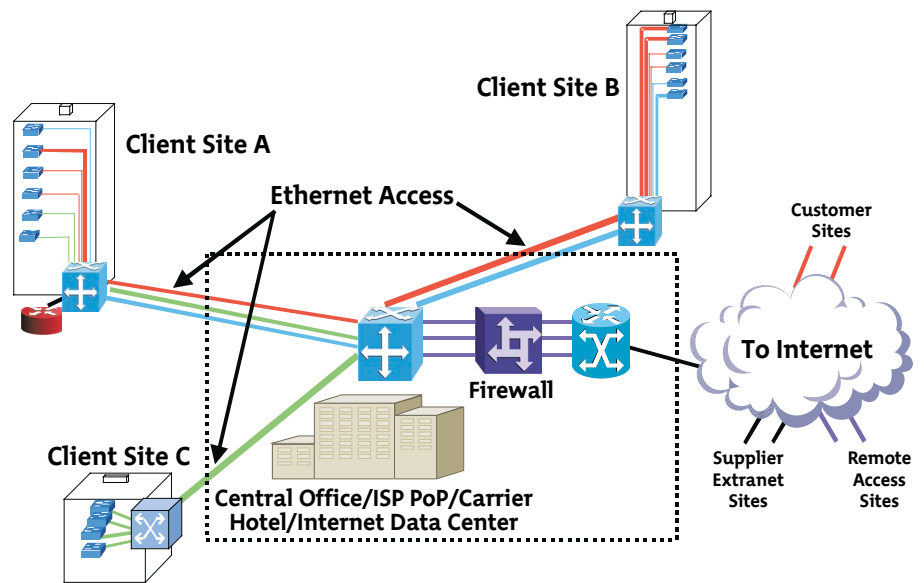
## Internet access services

For many eBusiness-oriented companies, the Internet has become pervasive throughout the firm. These companies aggressively link their customers, suppliers, business partners, and remote employees through the:

- Internet by maintaining web sites for sales and customer service
- Extranets that connect suppliers and business partners for improved inventory and supply chain management
- Intranets and enterprise data portals that provide remote and mobile employees access to the corporate network

While all of this access is possible with today's mix of LAN, MAN, and WAN networking technologies and services, it is often slow. This has a negative impact on productivity and can cause customer, employee, and supplier dissatisfaction.

With Optical Ethernet, however, access will be augmented by higher speed and much greater bandwidth. If, for example, your current connection is a T3 line, with Optical Ethernet, you can have a 10 gigabit Ethernet pipe that delivers 60 times more bandwidth to service applications and transactions. Optical Ethernet service literally opens the bottleneck for network traffic running between enterprises, the MAN, and Internet Service Providers (ISPs), resulting in powerful performance gains.



*Optical Ethernet allows LAN frames to find their way across the WAN in the same connectionless manner that they find their way across a LAN. The result is that there is no distinction between the LAN, MAN, and WAN networks with Optical Ethernet.*

## Wide area connectivity services

The Optical LAN segment, which does not have physical distance limitations, can span sites that are miles apart and is designed to deliver high-bandwidth support for data, voice, and video applications throughout the enterprise and across the WAN. Using Ethernet MAC addresses, flooding, and learning capabilities, Optical Ethernet allows LAN frames to find their way across the WAN in the same connectionless manner that they find their way across a LAN. The result is that no distinc-

tion exists between the LAN, MAN, and WAN networks with an Optical Ethernet network.

The benefits are many. A service provider simply provides fiber connectivity, and an enterprise or service provider installs and configures the Ethernet equipment. There is no requirement for a skilled technician to map or provision traffic across the WAN to individual egress sites, as is done today with leased lines or other virtual circuit services, such as frame relay, ATM, and path-based services, including IP and MPLS.

## Multiservice transport services

In addition to offering a broadband, high-speed, data service, enterprise managers can also consolidate legacy voice, data circuits, and private line services all on the same network infrastructure through an enterprise-owned or service-provider network.

By consolidating the voice and data networks onto one infrastructure, enterprises save the cost of owning and operating separate networks. Consolidation can drive savings in capital equipment, facilities costs, headcount and overhead, support personnel, and training.

Enterprises can also look to service providers to deliver the low latency and low jitter demanded by bandwidth-intensive applications, such as Voice over IP (VoIP), video on demand, and High-Definition Television (HDTV).

## Outsourced network services

Today, with pressure to maintain and operate increasingly complex networks, many companies are moving towards consolidating network operations in order to concentrate on their core competencies, to minimize risk to their bottom line, and to combat IT staffing shortages.

Since Optical Ethernet is based on familiar Ethernet technology, many enterprise managers feel confident in outsourcing the maintenance of this stable and familiar part of the network to a service provider, as well as adding

some of the services that Optical Ethernet has enabled.

Some of the specialized, value-added services that enterprise managers may seek from service provider partners include:

- *Optical Routing for Intranet and Internet Services*—Enables the enterprise manager to outsource gateway services to a service provider. The enterprise manager is responsible for the network up to the gateway port, while the service provider manages the more complex gateway, itself. The enterprise router can be either located at the enterprise site or, to be more efficient, centralized and shared at the service provider's location.
- *Network Address Translation (NAT)/Address Management Services*—Removes the headaches associated with network address translation and re-translation by allowing a service provider partner to consolidate and manage these services.
- *Security Services*—Relieves the enterprise of the daunting task of managing security regardless of the number of additions, moves, and changes in the network; may include VLAN configuration, firewalling, and encryption.
- *Enabled Outsourced Applications Services*—Allows an enterprise manager to consolidate operations by contracting with a service provider to manage some or all of the IT functions, such as asset management, performance monitoring, and fault

isolation and maintenance for applications, workstations, and the LAN itself. The emerging area of remote data management, through Storage Area Networks (SANs) and Internet Data Centers (IDCs), is another task that enterprise managers might outsource.

## Is Optical Ethernet right for your business?

At Nortel Networks, we believe that the growth in demand for bandwidth is just beginning, and that Ethernet will soon become the global protocol of choice for enterprise and service provider networks.

The emergence of Optical Ethernet represents the type of revolutionary innovation that is transforming the technology landscape and driving enterprise executives to leverage their eBusiness applications, to focus on their core business, and to improve their bottom line results.

Optical Ethernet solutions will initially appeal to executives with specific needs that are strategic to meeting their business goals. Firms with an immediate need to lower an expanding IT budget, those with requirements for bandwidth of OC3 or greater, and companies interested in outsourcing to a technology provider in order to focus on their core business are all strong candidates for Optical Ethernet services. Optical Ethernet services can be obtained through a service provider or an Optical Ethernet network can be implemented by an enterprise.



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